

# Attention-Deficit/Hyperactivity Disorder in a Diverse Culture: Do Research and Clinical Findings Support the Notion of a Cultural Construct for the Disorder?

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*There is still some debate in the literature whether Attention-Deficit Disorder/Hyperactivity (ADHD) is best conceptualized as a biological disorder or if it is best understood as a cultural construct. This review aims to contribute to disentangle this issue assessing clinical and research data on ADHD in a complete diverse culture from a developing country. We performed a systematic computerized review of the literature on ADHD in Brazil. All investigations were included if dealing with ADHD prevalence, etiology, symptomatological construct, or treatment. Findings were compared to those from studies in developed countries. The prevalence rates of ADHD (5.8% using DSM-IV criteria, 1.5% using ICD-10), the bi-dimensional factor construct extracted from factor analyses (inattention and hyperactivity/impulsivity), the pattern of ADHD comorbidity in clinical samples, the family genetic data suggesting a 39% family transmission in clinical samples and the role of some potential candidate genes in dopaminergic and noradrenergic systems, as well as data on the efficacy of methylphenidate in the disorder are all very similar to findings from developed countries. Taken together, these findings suggest that ADHD is not a cultural construct, reinforcing the importance of applying similar research methodology in different cultures to make findings comparable.*

**Key Words:** ADHD, hyperkinetic disorder, inattention, hyperactivity, cultural context

For any psychiatric diagnosis to be truly comprehensive and culturally valid, it must handle a huge number of variables, like ethnicity, religion, habits, and values. As well established, cultural aspects can influence psychiatric diagnosis by several ways, for example defining and creating specific sources of distress and impairment, or determining the way people interpret and value the symptoms (Mezzich et al 1995). These aspects seem to be even more important for the majority of child mental health disorders where the quality of the environment is crucial in shaping the expression of the biological vulnerability to the disorder.

There are several examples of mental disorders either developed within a cultural context, or presenting different symptomatic presentation in a diverse culture. In cultures from Latin America, specific syndromes with somatic constellation of symptoms (e.g., “*Ataque de Nervios or Susto*”) are prevalent and associated with environmental stressors like threats or family conflicts. More important, some factor analytic investigations documented that even well established clinical entities might have different clinical profiles in these cultures. For instance, the rate of somatic symptoms as part of major depression is significantly higher in Latin American countries than in the United States (for an extensive review of this issue, see Berganza et al 2001). However, it is important to note that taking into account cultural aspects to better understand a disorder is not the same as defining it as a cultural construct.

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The diagnosis of Attention-Deficit/Hyperactivity Disorder (ADHD) has been recognized in different countries and cultures (see Faraone et al 2003). In addition, there are some evidences suggesting that cultural factors may modulate the clinical manifestation of disruptive behavior disorders and ADHD (Livingston 1999; Reid 1995). Thus, the debate whether the disorder is best conceptualized as a cultural construct or a more stable construct with strong neurobiological correlates continues in the medical literature (Ali 1996; Anderson 1996). Recently, the *British Journal of Psychiatry* promoted a debate on this issue (Timini and Taylor 2004).

Different perspectives can tackle this issue. The most traditional is to present data supporting, for example, the neurobiological basis of the disorder (see Castellanos and Tannock 2002), or the limitation of these findings (Timini 2002). Since the vast majority of the investigations on ADHD were generated in North America and some Western European Countries, one interesting approach to this issue is to assess clinical and research findings on the disorder from a completely diverse culture. Similar clinical and research data to those found in cultures from developed countries would suggest a more stable disorder due to universal neurobiological correlates; different findings would suggest important impact of cultural aspects. In fact, this is a way to reframe the question of equivalence proposed by Reid (1995): ‘to attain valid cross-cultural assessment of ADHD, we must address the fundamental question of equivalence, namely: Do the scores (diagnosis) on a given scale (by a given criteria) mean the same thing across different cultural groups?’

This paper reviews all the literature on ADHD research and clinical data in Brazil to address the aforementioned question of equivalence. Our hypothesis is that similar data to those found in different cultures will emerge when similar methodology is applied. If this were the case, the cross-culture or external validity of ADHD would be higher, not supporting the notion of a disorder with a cultural construct.

## Review Strategy

To accomplish this task, we proceeded a systematic computer review of the literature using four data bases: PubMed, PsycINFO, Scielo (Scientific Library on Line) and Lilacs (Latin American Litera-

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**Table 1.** Prevalence of ADHD/HD in Nonreferred Samples in Brazil

| Study                  | Information Source/Type of Sample       | Nosology                                 | Ages (in years)   | ADHD/HD Prevalence % (95% CI) <sup>a</sup> |
|------------------------|---|--|-------------------|--|
| Barbosa 1995           | Parent or teacher/school                | Conners Rating Scale                     | 6–13              | 8.8  |
| Cury and Golfeto 2003  | Parents or teachers/school              | Strengths and difficulties questionnaire | 6–11              | Parents: 16.8<br>Teachers: 8.3             |
| Fleitlich-Bilik 2002   | Parent, teacher, and adolescents/school | ICD-10                                   | 7–14              | 1.5 (6–2.5)                                |
| Guardiola et al 2000   | Teachers/school                         | DSM-IV (only criterion A)                | 6–8 (first grade) | 18   |
| Poeta and Neto 2004    | Teacher and parents/school              | Farré and Narbona Scale                  | 6–12              | 6 (5–7.2)                                  |
| Rohde et al 1999a      | Parents or adolescents/school           | DSM-IV (full diagnoses)                  | 12–14             | 5.8 (3.2–10.6)                             |
| Vasconcelos et al 2003 | Teachers and parents/just 1 school      | DSM-IV                                   | 6–15              | 17.1                                       |

ADHD, Attention-Deficit/Hyperactivity Disorder; HD, Hyperkinetic Disorder.

<sup>a</sup>Some studies did not present the 95% CI.

ture on Health Science). References were searched using the following words: (Attention-Deficit/Hyperactivity Disorder or Attention-Deficit or Hyperkinetic Disorder or inattention or hyperactivity) and (Brazil or Brazilian). Only papers presenting research or relevant clinical findings on ADHD prevalence, etiology, symptomatology construct, and treatment were reviewed. We extensively checked all references from the papers found through this process. All articles published in Portuguese, English, and Spanish were reviewed. In addition, we contacted research centers in the country where ADHD children might be seen asking for any kind of new data relevant for the topic of this revision. This review strategy determined 298 abstracts to be reviewed; 25 presented nonduplicated research or clinical findings on ADHD prevalence, etiology, symptomatology construct, or treatment; 13 of these (52%) came from the same research center.

## Prevalence

We were able to find only 7 studies reporting prevalence rates of ADHD/HD in Brazil (Barbosa 1995; Cury and Golfeto 2003; Fleitlich-Bilyk 2002; Guardiola et al 2000; Poeta et al in press; Rohde et al 1999a; Vasconcelos et al 2003). All of these papers assessed ADHD in nonreferred samples (including studies not representative of the population assessed) and 4 of them (57%) used either DSM or ICD criteria (see Table 1).

As extensively reported in the international literature (see Faraone et al 2003), there is a huge variability in the prevalence of ADHD across these Brazilian studies (1.5%–18%), reflecting a completely diverse methodology among them (different diagnostic criteria, age ranged assessed, information sources, origin of the samples, and impairment definition). As verified in other cultures, prevalence rates of ADHD were higher in Brazilian studies using screening instruments than those found when formal criteria (either DSM-IV or ICD-10) were used. If we reduce variability among studies concentrating analyses only in the three studies that assessed representative school samples and used DSM/ICD criteria for ADHD (Fleitlich-Bilyk 2002; Guardiola et al 2000; Rohde et al 1999), very interesting findings emerge.

In a study with a representative sample of 484 randomly selected first elementary grade students from schools in the city of Porto Alegre, Guardiola et al (2000) were able to find an ADHD prevalence of 18%, using only teachers' report on criterion A of DSM-IV. The prevalence of ADHD found in this study using just criterion A of DSM-IV gathered from a scale (no definition of impairment, no clinical assessment, symptoms assessed just in one setting) was very similar to those from studies in developed

countries that used comparable methodology, such as 17.8% in Germany (Baumgaertel et al 1995) and 18.9% in the United States (Carlson et al 1997).

In a two-stage study with a representative sample of 1013 randomly selected students (aged 12–14 years old) from state schools in the city of Porto Alegre, Rohde et al (1999) found an ADHD prevalence of 5.8% (95% CI = 3.2–10.6) using full DSM-IV criteria gathered through clinical assessment of both parents and adolescents by an experienced child psychiatrist in the second stage of the study. Again, this prevalence is very similar to those reported in other cultures when similar methodology was applied. For example, Graetz et al (2001) found a prevalence of DSM-IV ADHD in Australia of 6.8% (95% CI = 6–7.7) in an one-stage community study with 6 to 17 year-old subjects.

Recently, a very well designed study was conducted to assess the prevalence of psychiatric disorders in children and adolescents from 7 to 14 years of age in a median sized city and its surrounding rural areas in the state of São Paulo, Brazil. A sample comprising 1251 subjects was evaluated using the Development and Well-Being Assessment (DAWBA) (Goodman et al 2000) that allows diagnoses of child mental disorders according to the ICD-10 criteria. The weighted prevalence rate for hyperkinetic disorder was 1.5% (95% CI = .6–2.5) (Fleitlich-Bilyk 2002). Not surprisingly, the prevalence rate of Hyperkinetic Disorder was low in that study, since the diagnosis was based on ICD-10 criteria. The ICD-10 provides more restrictive criteria for ADHD, since symptoms must be present in all three dimensions (inattention, hyperactivity, impulsivity), it requires that full criteria for the disorder must be met in each of two or more settings in which the child is observed and the diagnosis is excluded in the presence of Anxiety/Depression Disorders (World Health Organization 1994). In England, Goodman et al (2000) found a prevalence of Hyperkinetic disorder of 1.4% in a very similar study. In fact, Santosh (2002) documented that applying ICD-10 criteria for Hyperkinetic disorder in the sample of the MTA study (MTA 1999) in which children were diagnosed using DSM-IV criteria resulted in reduction of the diagnosis in of the sample. In other words, only 145 subjects of the 579 ADHD children from the MTA study received the diagnosis Hyperkinetic disorder according to the ICD-10 criteria. This is a very similar reduction in the prevalence rate to the one observed comparing the Brazilian studies that employed full DSM-IV (5.8%) and ICD-10 criteria (1.5%) (Fleitlich-Bilyk 2002; Rohde et al 1999a).

In conclusion, Brazilian studies do not support significant differences in the prevalence of ADHD compared to those found

in other countries when the variability in the methodology of the studies is reduced.

## ADHD Symptomatology

### ADHD Construct

Few Brazilian investigations assessed the structure of ADHD symptomatology in nonreferred representative populations (Brito et al 1995; Moura 2002; Rasmussen et al 2002; Rohde et al 2001).

Brito et al (1995) assessed a sample of 2,082 children (mean age 11.2 years) from a public school using a 14-item teacher rating scale based on the DSM-III-R diagnostic criteria for ADHD. Two factors, Hyperactivity-Impulsivity and Inattention, were extracted from the data, and the factor structure was stable. Moura (2002) used a dimensional approach to evaluate the internal validity of the DSM-IV symptoms of ADHD and Oppositional Defiant Disorder (ODD) in a sample of 530 Brazilian children between the ages of 7 and 14 years. Confirmatory factor analysis supported a bi-dimensional construct for ADHD (hyperactivity/impulsivity and inattention) and a model of organization that separated ADHD from ODD. Rohde et al (2001) also documented a bi-dimensional construct for DSM-IV ADHD criteria using an exploratory factor analytic approach (principal components analysis) in a sample of 1013 Brazilian students aged 12 to 14 year-old from 64 state schools. The two factors presented eigenvalues higher than 1 (hyperactivity/impulsivity = 4.81; inattention = 1.3). While the first factor (hyperactivity/impulsivity) accounted for 27% of the variance of the ADHD symptom profiles, the second (inattention) accounted for only 7% of the variance in the symptom profiles. The interfactor correlation was .45. Rasmussen et al (2002) compared a male sub sample from that study ( $n = 483$ ) with a male sub-sample ( $n = 497$ ) from the Missouri twin study (Hudziak et al 2000) demonstrating a similar two-factor solution (hyperactivity/impulsivity symptoms and inattentive symptoms) in both samples when factor analysis was applied. The eigenvalues of the two factors in the Missouri male sub-sample were: inattention = 5.2; hyperactivity/impulsivity = 1.4. The first factor accounted for 29.2 % of the variance of the ADHD symptom profiles, and the second for 7.8 % of the variance in the symptom profiles. The interfactor correlation was .48 (Rasmussen et al 2002).

Taken together, these findings in three different samples are quite consistent suggesting a bi-dimensional construct for ADHD symptoms in Brazilian nonreferred samples. More important, these findings are in agreement with several investigations performed in other cultures (for an extensive review, see Bird 2002; Wolraich et al 2003).

### Impact of Information Source in the Profile of ADHD Symptoms

There is a substantial disagreement among different information sources (parents, children/adolescents, teachers) for ADHD diagnosis. Even so, parents seem to be the best information source for the disorder, even in adolescent samples, since children and adolescents tend to underreport symptoms and teachers tend to have their contact with students limited to few class periods (especially in adolescents) (see Cantwell et al 1997).

In a study with the same sample aforementioned (191 Brazilian young adolescents), we were able to demonstrate low agreement between parents and adolescents ( $k = .45$ ) for the DSM-IV ADHD diagnosis, as reported in the literature. Moreover, parents were the best information source; 87% of the ADHD cases were

detected using solely parents as information source (Rohde et al 1999b).

Recently, two studies using modern statistical approaches assessed the impact of information source on ADHD symptomatology in children from Brazil and other countries. Gomez et al (2003) used confirmatory factor analysis to model a multitrait-multisource design to evaluate the construct validity of ADHD rating scales in samples composed by elementary school children from Brazil ( $n = 285$ ) and Australia ( $n = 1,475$ ). The 2 trait factors were the ADHD inattention and hyperactivity/impulsivity dimensions. The 2 source factors were parents and teachers. Similar results occurred in both studies; most of the ADHD symptoms contained more source than trait variance. In other words, information sources determined a high impact on the variability of the symptoms. In addition, Rasmussen et al (2002) used latent class analyses (LCA) to compare self-reports on ADHD symptoms between a male sample of Brazilian adolescents ( $n = 483$ ) and a male sample from Missouri ( $n = 497$ ). Results from LCA in both samples suggested that adolescents' report on their own symptoms is markedly different from the type of information that parents provide about ADHD symptoms in their offspring. In this study, if adolescents endorse any ADHD symptom, they tend to report combined type problems.

Taken together, these findings suggest that the impact of information source on the profile of ADHD symptoms is similar when comparing Brazilian samples with samples from developed countries.

### ADHD Types

Investigations assessing the prevalence of ADHD types in Brazilian samples documented similar rates to those found in the United States (referred samples: combined type = 62.5%; inattentive type = 26.3%; hyperactive/impulsive type = 11.2%; nonreferred sample: combined type = 52%; inattentive type = 34.8%; hyperactive/impulsive type = 13%) (Rohde et al 1999a; Rohde 2002). Studies in the United States and some European countries have been consistent in documenting differences between ADHD types, although the exact nature of the differences varies across studies (see Faraone et al 1998; Gadow et al 2000).

Two investigations assessed the issue of ADHD subtype in samples from Brazil. Brito et al (1999) evaluated a nonclinical sample of Brazilian children (mean age 9.4 years) documenting differences among ADHD subtypes and controls in academic and neuropsychological performance. In addition, Schmitz et al (2002) examined neuropsychological performance in untreated Brazilian ADHD adolescents ( $n = 30$ ) and nonADHD subjects ( $n = 60$ ). While adolescents with the predominantly inattentive subtype and the combined subtype differed from controls in some neuropsychological measures, subjects with the predominantly hyperactive-impulsive type did not differ significantly from controls in any measure assessed. Findings from these studies support the diagnostic distinction among ADHD subtypes proposed by DSM-IV in a different culture.

### Comorbidity

Several investigations with referred and nonreferred samples, especially in the United States, have demonstrated that ADHD is a highly comorbid disorder (Angold et al 1999).

Some investigations in Brazil assessed the issue of ADHD comorbidity. Rohde et al (1999a) documented a high rate of comorbidity with Disruptive Behavior Disorder (47.8%) in a school sample of young adolescents, similar to those found in samples in the United States. Smokers were also overrepresented in the

ADHD group than in nonADHD group in that study (17% vs. 5%) ( $p = .04$ ). In a recent study, Souza et al (2004) compared ADHD clinical samples from two different geographical areas in Brazil demonstrating a quite similar profile of comorbidities between them (even using different instruments for the diagnosis of DSM-IV disorders). More important, the profile of ADHD comorbidity found in both samples resembles those described in clinical samples in the United States. For instance, in the MTA study the three main ADHD comorbidities were ODD (40%), Anxiety Disorders (34%), and Conduct Disorders (14%) (MTA Cooperative Group 1999). The same pattern was detected in both Brazilian ADHD clinical samples (ODD = 39.1% and 51.3%; Anxiety Disorders = 24.2% and 30.8%; Conduct Disorder = 13.7% and 17.9%). Major depression and/or Dysthymia were found in approximately 10% of the subjects in both Brazilian samples.

Taken together, these findings again suggest more similarities than differences in the pattern of ADHD comorbidity between samples from Brazil and the United States.

### Family and Molecular Genetics Data

ADHD is a complex heterogeneous behavior disorder with a strong role for genetic factors in its etiology (Smalley et al 1997). Family studies in the United States documented that about one quarter of children presenting ADHD will have an ADHD parent (Faraone 1997). Consistent with these findings, Roman et al (2001) documented a high parental ADHD diagnosis in Brazilian probands (31% full diagnosis; 39% including subthreshold cases).

The mode of ADHD transmission is unclear, but it is likely to be due to many genes, each one with small effect (Smalley et al 1997). Several lines of investigations support the role of dopaminergic and noradrenergic systems in the pathophysiology of the disorder (Biederman and Spencer 1999; Swanson et al 2000). Our group detected some suggestive signs for the role of dopaminergic genes in ADHD in a Brazilian sample. An excess of the DRD4 7-repeat allele was observed when both ADHD probands and their parents were compared with an ethnically matched sample from the general population. In addition, an interaction effect of DRD4 7-repeat allele plus the homozygosity for the DAT1 10-repeat on scores of ADHD hyperactivity was observed (Roman et al 2001). In two subsequent studies, the group was able to detect signs suggesting the role for some noradrenergic genes ( $\text{D}\beta\text{H}$  and ADRA2A) in the disorder (Roman et al 2002a, 2003).

In addition, our group was able to replicate previous findings from a study in the United States in an emerging new area, the pharmacogenomics of ADHD. In a pioneer study, Winsberg and Comings (1999) found that homozygosity of the 10-repeat allele at DAT1 gene was associated with a poor response to methylphenidate (MPH) in 30 African-American children with ADHD. In a blind naturalistic study, 50 Brazilian male ADHD youths were treated with MPH. Subjects without 10/10 genotype demonstrated an improvement in the core symptoms of the disorder with methylphenidate significantly higher than subjects with 10/10 genotype. In addition, the group without this genotype had significantly higher increase in global functioning than the other group (Roman et al 2002b).

In a complex behavior disorder, where the vulnerability is associated to many genes, exact replication of findings across different small size samples is not expected. However, these initial findings suggesting a role for dopaminergic and noradrenergic genes in Brazilian ADHD families are consistent with

previous results in other cultures (see for example Faraone et al 2001). Despite the similarities, it is important to note that ADHD genetic studies in Brazil come from only one lab. Thus, the issue whether these findings might be generalized to the rest of Brazil needs further research.

### Data on Impairment

Studies in the United States have consistently documented a huge variety of impairments associated with the disorder. For instance, the rate of grade retention was significantly higher in ADHD subjects than in non-ADHD controls, especially in the subgroup with ADHD and impaired executive functions (see Biederman et al 2004). In the only study addressing school impairments associated with ADHD in Brazil, we found that the proportion of ADHD adolescents with more than one grade repetition (87%) was significantly higher than the proportion of non-ADHD youths in this category (30%;  $p < .001$ ). The proportion of ADHD adolescents who were expelled from school (17%) was also significantly higher than the proportion of non-ADHD youths with school expulsion (2%;  $p < .01$ ). It is important to note that these findings occurred in the context of none significant difference between the two groups in age, sex, ethnicity, IQ, and family income (Rohde et al 1999a).

### Treatment Findings

Several studies clearly documented the efficacy of stimulant medication in reducing core symptoms of ADHD in school age children from developed countries, as well as improving function in a number of domains (see, for example: MTA 1999).

In the only clinical trial conducted in Brazilian ADHD children and adolescents, the group that received methylphenidate had a significantly greater decrease in Abbreviated Conners Rating Scale (ABRS) scores and a significantly higher increase in CGAS scores than the placebo group ( $p < .01$ ). The MPH group showed also a significantly higher proportion of patients with a robust improvement (decrement of at least 50% in the ABRS score after the intervention) than the placebo group ( $p < .01$ ). The MPH effect size for the ABRS was 1.05 (95% CI = .73–1.37) (Szobot et al 2004).

### Conclusions

It is well-established that there are significant differences in the demands of environment (e.g., at home and at school) according to cultural aspects. Also, the expectation and tolerance for certain behaviors vary in different cultural groups (Livingston 1999). Thus, standards for normal and deviant behaviors are culturally determined (Reid 1995). Although criteria for ADHD are operationally defined in both the DSM and the ICD, some degree of subjectivity remains. The request that symptoms must occur frequently to be considered positive and that their intensities need to be maladaptive and inconsistent with children or adolescents' developmental level, is clearly subjective and culturally influenced (Bird 2002; Rohde 2002). Thus, clinicians and researchers should be familiar to both standards for normal and deviant behaviors, and conceptualization of the disorder in children's culture to perform evaluations culturally tuned.

Even cautiously considering the aspects mentioned above, a strong case for the cross-cultural validity of ADHD appears when data from all these Brazilian studies are taken together. Data from studies on ADHD prevalence, symptom construct, etiology, and treatment findings seem to strongly suggest that ADHD is not

best conceptualized as a cultural construct. Instead of this, findings in a different culture support the notion of a stable disorder across different cultures with important neurobiological correlates.

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