CONFIRMATORY FACTOR ANALYSIS OF PARENTS’ AND TEACHERS’ RATINGS OF DSM-IV SYMPTOMS OF ATTENTION DEFICIT HYPERACTIVITY DISORDER IN A SPANISH SAMPLE

JUAN ANTONIO AMADOR-CAMPOS, MARIA FORNS-SANTACANA

Departament de Personalitat, Avaluació i Tractament Psicològics
Facultat de Psicologia, Universitat de Barcelona

BERNARDÍ MARTORELL-BALANZÓ
Hospital de Sant Pau, Servei de Psiquiatria

JOAN GUÀRDIA-OLMOS AND MARIBEL PERÓ-CEBOLLERO

Departament de Metodologia de les Ciències del Comportament
Facultat de Psicologia, Universitat de Barcelona

Summary.—Confirmatory factor analysis examined the factor structure of DSM-IV Attention Deficit Hyperactivity Disorder symptoms and analyzed the differences in informants’ ratings of ADHD symptoms by children’s age and sex. A sample of 1,018 Spanish school children, 574 girls and 444 boys, ages 4 to 12 years, was rated by teachers and parents. Confirmatory factor analysis showed a similar fit for the three-factor model of Inattention, Hyperactivity, and Impulsivity (teachers: CFI = .976, RMR = .041, % of total variance = 83.2; parents: CFI = .969, RMR = .037, % of total variance = 82.7) and for the two-factor model of Inattention and Hyperactivity-Impulsivity (teachers: CFI = .958, RMR = .044, % of total variance = 79.3; parents: CFI = .961, RMR = .038, % of total variance, 79.9). The two-factor model was selected as a parsimonious representation of the teachers’ and parents’ ratings of ADHD symptoms. Analyses of variance indicated significant differences in teachers’ and parents’ mean ratings across sex and school grades of children.

Attention deficit hyperactivity disorder (ADHD) is a common psychological disorder in childhood and adolescence and is believed to affect between 3% and 6% of all school children (American Psychiatric Association, 1994, 2000). Reports of prevalence rates depend on the type of assessment used (interviews, rating scales, or observation) and the informants: teachers (Pineda, Ardila, Rosselli, Arias, Henao, Gomez, Mejia, & Miranda, 1999; Nolan, Gadow, & Sprafkin, 2001), parents (Gimpel & Kuhn, 2000), or both (Gomez, Harvey, Quick, Scharer, & Harris, 1999; Amador, Forns, & Martorell, 2001; Gadow, Sprafkin, & Nolan, 2001).

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2Address enquiries to Juan Antonio Amador-Campos, Departament de Personalitat, Avaluació i Tractament Psicològics, Facultat de Psicologia, Universitat de Barcelona or e-mail (jamador@ub.edu).
The diagnostic criteria for ADHD in the Diagnostic and Statistical Manual of Mental Disorders (DSM) have undergone several changes in the last thirty years. Although the main characteristics of inattention, hyperactivity, and impulsivity have been maintained, the specific symptoms and their groupings have been modified. In the DSM-III (American Psychiatric Association, 1980), three separate dimensions were proposed: inattention, hyperactivity, and impulsivity, which were then listed in a single dimension in the DSM-III–R (American Psychiatric Association, 1987). However, the DSM-IV and the DSM-IV–TR (American Psychiatric Association, 1994, 2000) differentiate between only two categories of symptoms: inattention and hyperactivity-impulsivity.

Since the DSM-IV is widely used in various countries, and the diagnosis of ADHD has been recognized in different cultures in the United States (American Psychiatric Association, 1994) and elsewhere, for example, Australia (Graetz, Sawyer, Hazell, Arney, & Baghurst, 2001), Brazil (Rohde, Biederman, Busnello, Zimmermann, Schmitz, Martins, & Tramontina, 1999), Columbia (Pineda, et al., 1999), Germany (Baumgaertel, Wolraich, & Dietrich, 1995), and Spain (Amador, et al., 2001), the consistency of the ADHD factor structure needs to be confirmed. Cross-cultural investigations are important to test whether the dimensions and symptom groupings proposed in the DSM-IV are valid in different geographical locations, and whether the core features of the disorder are culturally equivalent. Confirmatory factor analysis appears to be well suited to testing symptom structures and the underlying dimensions.

Pillow, Pelham, Hoza, Molina, and Stulz (1998) analyzed the factor structure of DSM-III and DSM-III–R symptoms of ADHD, oppositional defiant disorder, and conduct disorder using confirmatory factor analysis in a sample of 282 boys, ages 5 to 15, referred for treatment at an ADHD clinic. They examined three models. The first placed all ADHD symptoms in a unitary construct as in the DSM-III–R; the second placed inattention symptoms in one factor, and hyperactivity and impulsivity symptoms combined in another factor (as in the DSM-IV); and the third had inattention, hyperactivity, and impulsivity symptoms in three separate factors, as in the DSM-III. The results showed that the three-factor model fit the data best, but the two-factor model was more parsimonious when other behaviors strongly associated with impulsivity were accounted for. Burns, Walsh, Patterson, Holte, Sommers-Flanagan, and Parker (1997) reported similar results for both community and clinically referred children.

Previous research has been based on rating scales composed of items taken from the lists of symptoms in the DSM-IV (American Psychiatric Association, 1994). Table 1 summarizes the results of 10 studies with confirmatory factor analysis of ADHD symptoms proposed by the DSM-IV, conducted since 1997.
| Authors          | Sample/Population                  | Raters        | Confirmatory Factor Analysis Model (r Between Factors)                                  |
|------------------|-----------------------------------|---------------|-----------------------------------------------------------------------------------------|
| DuPaul, et al. (1997) | 4,009 (4 to 19 yr.)/American      | Teachers      | Two factors: Hyperactivity-Impulsivity and Inattention (r = .94)                        |
| DuPaul, et al. (1998) | 4,666 (4 to 20 yr.)/American      | Parents       | Two factors: Hyperactivity-Impulsivity and Inattention (r = .92)                        |
| Gomez, et al. (1999) | 1,275 (5 to 11 yr.)/Australian    | Parents, Teachers | Three factors: I. Inattention; II. Hyperactivity; III. Impulsivity (Parents: r_{II} = .77, r_{III} = .64, r_{I} = .84; Teachers: r_{II} = .73, r_{III} = .57, r_{I} = .86) |
| Beiser, et al. (2000) | 2,044 (1,555 Native, 489 non-Native)/U.S. and Canada; Grades 2 (1,510) and 4 (534) | Teachers, Parents | Two factors: Attention-deficit and Hyperactivity-Impulsivity (Teachers: non-Native r = .75; Native, r = .68; Parents non-Native r = .89, Native r = .87) |
| Collet, et al. (2000) | Sample 1: 624 (Grades K–12)/American; Sample 2: 572 (Grades K–5)/American | Parents       | Two factors: Inattention and Hyperactivity-Impulsivity (r = .84)                        |
| Burns, et al. (2001) | 833 (Parents) and 742 not in treatment, 91 in treatment | Parents, Guardians | Two factors: Inattention and Hyperactivity-Impulsivity (r = .68 for No Treatment and Treatment) |
| Molina, et al. (2001) | Study 1: 247 (11 to 16 yr.)/American | Teachers      | Study 1: Two factors: Inattention and Hyperactivity-Impulsivity (r = .85)               |
|                  | Study 2: 224 (13 to 18 yr.)/American† | Teachers      | Study 2: Two factors: Inattention and Hyperactivity-Impulsivity (r = .77)               |
| Gomez, et al. (2003) | 1,475 (average age 8.3 yr., SD=1.8)/Australian | Parents, Teachers | Two factors: Inattention and Hyperactivity-Impulsivity.  
Australian sample (Parents r = .76, Teachers r = .69)  
Brazilian sample (Parents r = .73, Teachers r = .67) |
| Wolraich, et al. (2003) | 19,542 in four locations (see next row) | Teachers      | Two factors: Inattention and Hyperactivity-Impulsivity (r = .87)                        |
|                  | 1,077 (Grades 1 to 4)/Germany; 1,283 (Grades 1 to 4)/Spain; 11,092 (K–5)/suburban United States; 6,090 (K–4)/urban United States | | |
| Span, et al. (2002) | Study 1: 262 (17 to 39 yr.)/American | Self-report | Study 1: Three factors: I. Inattention; II. Hyperactivity; III. Impulsivity (r_{II} = .64, r_{III} = .47, r_{I} = .52) |
|                  | Study 2: 237 (17 to 55 yr.)/American | | Study 2: Three factors: I. Inattention; II. Hyperactivity; III. Impulsivity (r_{II} = .75, r_{III} = .38, r_{I} = .49) |

*Sample not in treatment average age = 8.3, SD = 3.7; sample in treatment for ADHD average age = 10.3, SD = 2.9.
†132 with childhood history of ADHD and 92 without history of ADHD.
The findings of these studies support the grouping of symptoms in the DSM-IV for the diagnosis of ADHD in different cultures, but they also indicate the possible effect of differences in reporting results of structural model testing (Gomez, et al., 1999; Burns, Boe, Walsh, Sommers-Flanagan, & Teegarden, 2001; Wolraich, Lambert, Baumgaertel, García-Tornel, Feurer, Bickman, & Doffing, 2003). Furthermore, these factor analyses are based on samples of a broad range of ages. Teachers and parents provided ratings for kindergarten-age children to 20-yr.-olds. Self-reports were obtained for people from 17 to 55 years of age.

Several studies point out that symptoms of ADHD change during the developmental process and vary in frequency according to age and sex. In community populations, parents and teachers consider that younger children present more symptoms corresponding to hyperactivity and impulsivity than inattention (Amador, et al., 2001). Younger children also received higher ratings on hyperactivity-impulsivity symptoms than older age groups (Gomez, et al., 1999; Pineda, et al., 1999). Inattention symptoms were highest in 6- to 12- and 14-yr.-olds and lowest in the 4- to 5- and 14- to 18-yr.-old groups (DuPaul, Anastopoulos, Power, Reid, Ikeda, & McGoey, 1998; Pineda, et al., 1999). Boys have higher scores for ADHD symptoms than girls (DuPaul, Power, Anastopoulos, Reid, McGoey, & Ikeda, 1997; DuPaul, et al., 1998; Gomez, et al., 1999; Amador, et al., 2001; Molina, Smith, & Pelham, 2001), but another study (Rohde, Barbosa, Polanczyk, Eizirik, Rasmussen, Neuman, & Todd, 2001) yielded no significant differences according to age or sex on the hyperactivity-impulsivity and inattention factors.

One of the criteria required for a diagnosis of ADHD is that some impairment from the symptoms must be present in two or more settings (for example, at school or at work, and at home). This means that data must be obtained from different informants, generally parents and teachers. However, the ratings of symptom frequency vary according to the identity of the informant. For instance, teachers tend to report more inattention and hyperactivity-impulsivity symptoms than parents (Gomez, et al., 1999; Amador, et al., 2001).

In summary, the preschool period is characterized by hyperactivity-impulsivity, primary school by both inattention and hyperactivity-impulsivity, and adolescence by inattention (Applegate, Lahey, Hart, Biederman, Hynd, Barkley, Ollendick, Frick, Greenhill, McBurnett, Newcorn, Kerdyk, Garfinkel, Waldman, & Shaffer, 1997; Barkley & Biederman, 1997). Some experts (for example, Barkley, 1997) have suggested that hyperactive-impulsive symptoms appear first, whereas inattention symptoms arise later in the developmental course and increase during compulsory school years.

No known Spanish studies have given analysis of the factor structure of DSM-IV ADHD symptoms. The present study assessed parents’ and teach-
ers’ ratings on a scale prepared with the 18 ADHD symptoms from the DSM-IV. The main aim was to evaluate the factor structure of ADHD symptoms, using confirmatory factor analysis and to validate the cross-cultural consistency of the ADHD symptoms factor structure.

**Method**

**Participants**

The sample comprised 1,018 school children, 444 boys and 574 girls from 48 classes in six partially state-funded schools in the city of Barcelona, Spain. The schools were selected randomly from all the state-funded schools of the 10 districts of the city of Barcelona. One school was selected from each district, although four declined to participate. From each school, eight classes were selected, one for each grade (first and second preschool, and first, second, third, fourth, fifth, and sixth grade elementary school). The sample was accidental, and the socioeconomic status was in the medium range according to the Hollingshead index (1975). The age range was from 4 to 12 yr. (48 to 148 mo.; \( M = 98.5, SD = 27.6 \) mo.; \( M = 98.6, SD = 28.11 \) mo., for boys and girls, respectively). Two hundred and thirty-four were preschool children: 122 first year preschool, 60 girls and 62 boys, and 112 second year preschool, 77 girls and 35 boys. Seven hundred and eighty-four were in elementary school: 124 in first grade, 72 girls and 52 boys; 135 in second grade, 66 girls and 69 boys; 129 in third grade, 77 girls and 52 boys; 112 in fourth grade, 56 girls and 56 boys; 161 in fifth grade, 95 girls and 66 boys, and 123 in sixth grade, 71 girls and 52 boys.

Questionnaires were initially sent to the parents and teachers of 1,200 children, and 1,018 were returned. Of the 1,018 questionnaires returned, 896 (74.6%) were completed by teachers and 775 (64.6%) by parents. Of the parents’ ratings, 51.2% were completed by the child’s mother, 18.3% by the father, and 30.5% by both parents. Both teachers and parents completed the questionnaires in 653 cases (54.4%). Two hundred and forty-three questionnaires were completed only by teachers and 122 only by parents. For these two groups of children, the differences were nonsignificant for sex \( (\chi^2 = 3.57, p = .06) \) but statistically significant for age \( (t_{65} = 11.69, p < .001) \). Children with only parents’ ratings were older than those with only teachers’ ratings (\( M: 122.73 \) mo. for only parents’ ratings and 92.53 mo. for only teachers’ ratings).

**Measure**

A bilingual Spanish-Catalan questionnaire was prepared consisting of the 18 items from the ADHD symptom list in the DSM-IV. The wording of the items was the same as the description of the symptoms in the DSM-IV, with one exception: the term “often” was omitted. The first nine items covered inattention symptoms, and the others referred to hyperactivity and im-
Pulsivity. For each item, parents and teachers selected the answer that best described the frequency of the behavior being rated. The frequency of each type of behavior or symptom was scored on a 4-point Likert scale, anchored by 0: Not true at all, never, seldom and 3: Very much true, very often, very frequent. Table 2 shows Cronbach alphas for the whole scale and for the two models evaluated in the confirmatory factor analysis. Alpha values are indicative of adequate internal consistency.

**Table 2**

**Cronbach Alpha for Whole Scale and for Two and Three Factors Evaluated by Confirmatory Factor Analysis**

|                          | Children Rated by Teachers and Parents | Children Rated by Teachers or Parents |
|--------------------------|----------------------------------------|---------------------------------------|
|                          | (n = 653)                              | (n = 653)                             |
| Whole Scale              | .956                                   | .889                                  |
| Two Factors              |                                        |                                       |
| Inattention              | .848                                   | .949                                  |
| Hyperactivity-Impulsivity| .951                                   | .952                                  |
| Three Factors            |                                        |                                       |
| Inattention              | .948                                   | .949                                  |
| Hyperactivity            | .927                                   | .928                                  |
| Impulsivity              | .934                                   | .934                                  |

**Procedure**

The school staff and parents’ associations approved the research protocol. Parents and teachers received the questionnaire in a closed envelope, with a letter informing them of the aims of the research and requesting their voluntary and unpaid collaboration in a developmental study of certain behaviors in their children. The informants were not explicitly told that the contents of the questionnaire referred to ADHD symptoms. Parents and teachers were requested to evaluate the items according to the habitual behavior of their children or pupils during the last 6 mo. To ensure that teachers were sufficiently familiar with their students, data were collected in the second semester.

**Statistical Analyses**

Two different models were tested. Model 1 had two factors: Inattention which was comprised of the nine inattention symptoms of DSM-IV ADHD, and Hyperactivity-Impulsivity which consisted of the nine hyperactivity-impulsivity symptoms. Model 2 had three: Inattention with nine symptoms, Hyperactivity with six symptoms, and Impulsivity with three symptoms. To confirm the two- and three-factor structures, each model underwent confirmatory factor analysis with the program EQS (Version 5.7; Bentler, 1995).
Given the nature of the items the elliptic robust least square method (ERLS) was chosen for parameter estimation, with a Likert format and biased distribution (Bentler & Dijkstra, 1985). Separate analyses were conducted for parents and teachers. The analyses were performed for the total sample as well as for subjects about whom information had been obtained from both parents and teachers. Factor scores were then obtained for each subject from the coefficients provided by the measurement equations from the two factors confirmatory factor analysis, Inattention and Hyperactivity-Impulsivity.

The $2 \times 4$ factor analyses of variance were used to examine whether there were differences in sex and school sequence. The analysis was carried out using the Statistical Package for the Social Sciences–Windows Version 11.0, and assessed teachers and parents separately. Specific group differences were examined with Scheffé post hoc contrasts, using a $p$ value of .05.

**RESULTS**

Two different confirmatory factor models were evaluated: one with two factors of Inattention and Hyperactivity-Impulsivity and one with three factors (Inattention, Hyperactivity, and Impulsivity). These two models were analyzed using the sample of teachers and parents separately. Moreover, in both cases a difference was made between the analyses of the total sample and of the subjects for whom data were available from both parents and teachers. The matrices of factor coefficients are shown in Tables 3 and 4, together with the errors for the four factor analyses.

**TABLE 3**

| Factor and Item                      | Teachers     |                | Parents      |                |
|-------------------------------------|--------------|----------------|--------------|----------------|
|                                     | $n=896$      | $n=653$        | $n=775$      | $n=653$        |
|                                     | C  E         | C  E           | C  E         | C  E           |
| Inattention                         |              |                |              |                |
| 1. Fails to pay close attention     | .847 .532    | .842 .539      | .725 .689    | .738 .675      |
| 2. Difficulty sustaining attention  | .757 .654    | .763 .647      | .566 .825    | .550 .835      |
| 3. Does not seem to listen          | .785 .620    | .798 .603      | .545 .839    | .571 .821      |
| 4. Does not follow instructions     | .894 .448    | .892 .453      | .668 .744    | .672 .740      |
| 5. Difficulty organizing tasks      | .844 .537    | .834 .552      | .559 .829    | .542 .841      |
| 6. Avoids tasks                     | .819 .574    | .811 .585      | .697 .717    | .674 .739      |
| 7. Loses things                     | .747 .665    | .724 .690      | .524 .852    | .505 .863      |
| 8. Easily distracted                | .853 .522    | .843 .538      | .756 .655    | .761 .649      |
| 9. Forgetful                        | .864 .504    | .857 .515      | .685 .729    | .670 .742      |

(continued on next page)

\(^{1}\)Preschool: children ages 4 to 6; Primary school: Initial first and second grades, children ages 6 to 8; Middle grades: third and fourth grades, children ages 8 to 10; and Upper grades: fifth and sixth grades, children ages 10 to 12.
TABLE 3 (Cont’d)
Two-factor Model: Standardized Solution Model With Confirmatory Factor Analysis, Elliptical Robust Least Squares Method

| Factor and Item          | Teachers | Parents |
|--------------------------|----------|---------|
|                          | $n = 896$ | $n = 653$ | $n = 775$ | $n = 653$ |
|                          | C  | E  | C  | E  | C  | E  | C  | E  |
| **Hyperactivity-Impulsivity** | | | | | | | | |
| 10. Fidgets              | .846 | .533 | .846 | .533 | .677 | .736 | .681 | .732 |
| 11. Leaves seat          | .863 | .505 | .866 | .501 | .709 | .705 | .720 | .694 |
| 12. Runs about or climbs | .848 | .530 | .842 | .540 | .742 | .670 | .739 | .673 |
| 13. Difficulty playing   | .688 | .726 | .690 | .724 | .466 | .885 | .473 | .881 |
| 14. “On the go”          | .887 | .462 | .889 | .458 | .691 | .723 | .693 | .720 |
| 15. Talks excessively    | .786 | .618 | .784 | .620 | .575 | .818 | .564 | .826 |
| 16. Blurts out answers   | .829 | .559 | .829 | .560 | .628 | .778 | .624 | .781 |
| 17. Difficulty waiting   | .856 | .516 | .848 | .530 | .627 | .779 | .617 | .787 |
| 18. Interrupts           | .869 | .494 | .866 | .500 | .631 | .776 | .621 | .784 |
| % variance accounted for | 79.3 | 79.1 | 79.9 | 79.2 | | | | |

Note.—C = Coefficients, E = Errors.

TABLE 4
Three-factor Model: Standardized Solution Model With Confirmatory Factor Analysis, Elliptical Robust Least Squares Method

| Factor and Item          | Teachers | Parents |
|--------------------------|----------|---------|
|                          | $n = 896$ | $n = 653$ | $n = 775$ | $n = 653$ |
|                          | C  | E  | C  | E  | C  | E  | C  | E  |
| **Inattention**          | | | | | | | | |
| 1. Fails to pay close attention | .847 | .532 | .842 | .540 | .725 | .689 | .738 | .675 |
| 2. Difficulty sustaining attention | .757 | .653 | .763 | .647 | .564 | .825 | .548 | .836 |
| 3. Does not seem to listen | .785 | .620 | .798 | .603 | .545 | .839 | .572 | .821 |
| 4. Does not follow instructions | .894 | .449 | .891 | .453 | .669 | .743 | .674 | .739 |
| 5. Difficulty organizing tasks | .844 | .537 | .834 | .552 | .558 | .830 | .541 | .841 |
| 6. Avoids tasks          | .819 | .574 | .811 | .585 | .697 | .717 | .674 | .739 |
| 7. Loses things          | .747 | .665 | .724 | .690 | .524 | .852 | .505 | .863 |
| 8. Easily distracted     | .853 | .523 | .843 | .538 | .756 | .654 | .761 | .649 |
| 9. Forgetful             | .864 | .504 | .857 | .515 | .685 | .728 | .670 | .742 |
| **Hyperactivity**        | | | | | | | | |
| 10. Fidgets              | .869 | .495 | .870 | .492 | .708 | .706 | .715 | .700 |
| 11. Leaves seat          | .885 | .465 | .889 | .457 | .733 | .681 | .744 | .668 |
| 12. Runs about or climbs | .872 | .490 | .868 | .497 | .764 | .645 | .764 | .645 |
| 13. Difficulty playing   | .695 | .719 | .701 | .713 | .460 | .888 | .463 | .886 |
| 14. “On the go”          | .906 | .423 | .907 | .420 | .703 | .711 | .707 | .707 |
| 15. Talks excessively    | .760 | .650 | .751 | .661 | .553 | .833 | .539 | .842 |
| **Impulsivity**          | | | | | | | | |
| 16. Blurts out answers   | .897 | .442 | .898 | .440 | .684 | .729 | .690 | .724 |
| 17. Difficulty waiting   | .930 | .367 | .927 | .376 | .695 | .719 | .690 | .724 |
| 18. Interrupts           | .901 | .434 | .903 | .430 | .704 | .710 | .697 | .717 |
| % variance accounted for | 83.2 | 80.1 | 82.7 | 80.6 | | | | |

Note.—C = Coefficients, E = Errors.
The values for the coefficients and for the errors were practically the same for teachers and parents, either considering the sample as a whole or considering the set of subjects for whom data were available from both sets of informants. Further, the coefficients obtained were very similar in the two- and three-factor models, but the errors were slightly lower for Hyperactivity and Impulsivity in the three-factor model. This pattern appeared in both the teachers' and the parents' samples. Table 5 shows the indices of adjustment for the four confirmatory factor analyses.

| Fit Index | Teachers | Parents |
|-----------|----------|---------|
|           | Two-factor | Three-factor | Two-factor | Three-factor |
|           | n = 896 | n = 653 | n = 896 | n = 653 | n = 775 | n = 653 | n = 775 | n = 653 |
| $\chi^2$ | 1285.48 | 1028.60 | 785.07 | 630.35 | 545.54 | 479.59 | 459.48 | 391.19 |
| df | 134 | 134 | 132 | 132 | 134 | 134 | 132 | 132 |
| $p$ | <.001 | <.001 | <.001 | <.001 | <.001 | <.001 | <.001 | <.001 |
| BBNFI | .953 | .947 | .971 | .967 | .949 | .945 | .957 | .956 |
| BBNNFI | .952 | .946 | .972 | .970 | .955 | .954 | .964 | .965 |
| CFI | .958 | .953 | .976 | .974 | .961 | .960 | .969 | .970 |
| GFI | .795 | .775 | .864 | .849 | .909 | .906 | .922 | .922 |
| AGFI | .738 | .713 | .823 | .804 | .883 | .879 | .899 | .898 |
| RMR | .044 | .045 | .041 | .042 | .038 | .040 | .037 | .037 |

Note.—$\chi^2$: chi square, df: degrees of freedom, BBNFI: Bentler-Bonett normed fit index, BBNNFI: Bentler-Bonett nonnormed fit index, CFI: comparative fit index, GFI: LISREL GFI fit index, AGFI: LISREL AGFI fit index, RMR: root mean squared residual. Values >0.9 of CFI indicate a good fit of the model as do values of RMR <0.05.

Both models present good adjustment of the indices for parents' and teachers' ratings. However, the indices were slightly better in the three-factor structure, especially for teachers. The correlation matrix between factors, both for parents and teachers, indicates a moderate-to-high correlation for both models. In the three-factor model, the correlations were higher between the Hyperactivity and Impulsivity factors (see Table 6).

| Factorial Solution | Correlation | Teachers | Parents |
|--------------------|-------------|----------|---------|
|                    | n = 896 | n = 653 | n = 775 | n = 653 |
| Two-factor          | F1 – F2 | .61* | .61* | .59* | .58* |
| Three-factor        | F1 – F3 | .53* | .52* | .57* | .58* |
|                    | F2 – F3 | .87* | .86* | .82* | .81* |

Note.—Two-factor solution: F1 is Inattention and F2 is Hyperactivity-Impulsivity; Three-factor solution: F1 is Inattention, F2 is Hyperactivity, and F3 is Impulsivity. *p <.01.
Since the differences between the models for the adjustment indices and the error estimation of the coefficients were slight, for the sake of plausibility we decided to use the two-factor model for the analysis of variance subsequent analyses. Since the adjustment indices and the coefficients and errors for teachers and for parents were very similar in the total sample and in the set of subjects for which information was available from both sets of informants, the subsequent analyses of variance were done for the total sample of 896 teachers’ ratings and 775 parents’ ratings. The scores on the two factors were thus obtained for teachers and for parents from the coefficients provided by the measurement equations obtained in the two factors of confirmatory factor analysis, Inattention and Hyperactivity-Impulsivity.

Tables 7 and 8 summarize the analyses of variance carried out for the teachers’ and parents’ samples, respectively.

**TABLE 7**

| Factor and Source of Variation | \( F \) | \( df \) | \( p \) | \( \eta^2 \) | Contrast          | \( M \)  | \( p \) |
|--------------------------------|--------|--------|--------|--------|-------------------|--------|--------|
| Inattention                    |        |        |        |        |                   |        |        |
| Sex                            | 33.09  | 1,888  | <.001  | .036   | boys > girls      | 6.10 > 4.20 | <.001  |
|                                |        |        |        |        | I > preschool     | 5.62 > 3.35 | <.001  |
| School Grade                   | 12.39  | 3,888  | <.001  | .040   | M > preschool     | 5.60 > 3.35 | <.001  |
|                                |        |        |        |        | U > preschool     | 5.67 > 3.35 | <.001  |
| Hyperactivity-Impulsivity      |        |        |        |        |                   |        |        |
| Sex                            | 53.21  | 1,888  | <.001  | .057   | boys > girls      | 4.70 > 2.58 |        |
|                                |        |        |        |        | I > preschool     | 4.55 > 2.65 | <.001  |
|                                |        |        |        |        | I > U             | 4.53 > 3.39 | .05    |

*Note.*—\( F \): Snedecor \( F \); \( df \): degrees of freedom; \( p \): significance level; \( \eta^2 \): effect size; contrast: significant \textit{a posteriori} comparisons; Grades: I = Initial, M = Middle, U = Upper.

For the teachers’ sample (Table 7), there were statistically significant differences between the two factors for the sources of variation by sex (Inattention: \( F_{1,888} = 33.09, \ p < .001 \); Hyperactivity-Impulsivity: \( F_{1,888} = 53.21, \ p < .001 \)) and by school grades (Inattention: \( F_{3,888} = 12.30, \ p < .001 \); Hyperactivity-Impulsivity: \( F_{3,888} = 7.30, \ p < .001 \), but none for their interaction). For the two factors, boys scored higher than girls. As for the school grades, the two factors presented different patterns; on the Inattention factor, the preschool group scored lower than the other grade groups, and on the Hyperactivity-Impulsivity factor, the children in the initial grades scored the highest. In any case, both for sex and for school grades, the effect sizes were very low (ranging from .024 to .057).

Similarly, for the parents’ sample (Table 8), the interaction between sex and school grades was not statistically significant in any analysis. The source
The source of variation for school grades was statistically significant for Inattention \((F_{1,767} = 5.26, p = .001)\) and Hyperactivity-Impulsivity \((F_{1,767} = 6.43, p < .001)\). Preschoolers' ratings on Inattention were lower than the groups in the middle and upper grades. This result was already observed when the informants were the teachers, although for the sample of parents no significant differences were obtained between the preschoolers and children in the initial grades. For the Hyperactivity-Impulsivity factor, the pattern was different from that observed in the teachers: the upper grade group had lower scores than the preschoolers and the initial grades. However, for the source of variation for school grades the effect size was very low.

**DISCUSSION**

Several recent studies have used confirmatory factor analysis to evaluate the organization of parents', teachers', and self-report ratings of DSM-IV ADHD symptoms. These studies indicated that the grouping of ADHD symptoms into two clusters, inattention and hyperactivity-impulsivity, provides a parsimonious model for the organization of parents' and teachers' ratings in community samples of different ages and from different countries. Other studies have shown that the symptoms of ADHD group into three factors: inattention, hyperactivity, and impulsivity. The present study compared the two-dimension model proposed by the DSM-IV with the three-dimension model proposed in the DSM-III. Confirmatory factor analysis indicated
that both models represented the data adequately, but that the three-factor model fitted the data slightly better for parents' and teachers' ratings. However, since the differences between the models were slight for the adjustment indices and the error estimation of the coefficients and since the correlation between Hyperactivity and Impulsivity in the three-factor model was high, we consider the two-factor model as a more parsimonious representation of the teachers' and parents' evaluations of the ADHD symptoms. Our findings, taken together with the results of previous factor analytic studies carried out in Australia, Brazil, Canada, Columbia, Germany, and the United States, support the construct validity of the DSM-IV dimensions of inattention and hyperactivity-impulsivity and suggest that there are more cross-cultural similarities than differences in the organization of DSM-IV ADHD symptoms rated by teachers and parents.

Parents' and teachers' ratings for boys were higher than for girls on these two factors, as other authors have also reported (for example, Brito, Pinto, & Lins, 1995; Gomez, et al., 1999; Pineda, et al., 1999). However, when the variable school grade is taken into account, the patterns of scores rated by parents and teachers are different (Amador, et al., 2001). According to the rating by teachers, there is an increase in inattention and hyperactivity-impulsivity behavior from preschool to the initial grades. Inattention problems tend to persist throughout the school years, whereas hyperactivity-impulsivity problems tend to decrease slightly. For parents' ratings, there is a moderate increase in inattention problems from preschool to middle and upper grades, but a decrease in hyperactivity-impulsivity symptoms throughout the school grades. This decrease is significantly larger in the upper grades.

In summary, this is the first study in a Spanish population to analyze the structure and organization of ADHD symptoms in a community sample with information from both parents and teachers. The results support the grouping of the 18 ADHD symptoms into two factors, as proposed by the DSM-IV, and confirm the cross-cultural value of this grouping. Studies of this type, performed in different contexts and with diverse populations, have reproduced the two-factor structure proposed by the DSM-IV, thereby providing support for the validity of the diagnostic subtypes.

Finally, sex introduces important differences in teachers' and parents' ratings of the symptoms. Overall, boys were rated higher than girls. The differences according to school grade also depended on the identity of the raters.

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