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Abstract

Little research has examined the structure and prevalence of attention-deficit/hyperactivity disorder (ADHD) symptoms in university students, including whether symptom structure conforms to the bidimensional (i.e., inattention and hyperactivity-impulsivity) conceptualization of the *Diagnostic and Statistical Manual of Mental Disorders (DSM-IV; American Psychiatric Association, 1994)* and whether self-reported symptoms vary across gender and country. A sample of 1,209 university students from three countries (Italy, New Zealand, and the United States) completed a 24-item self-report measure (the Young Adult Rating Scale) tapping ADHD symptomatology. Factor analyses within the U.S. and New Zealand samples supported a bidimensional symptom structure, whereas weaker support for this conceptualization was provided by the Italian sample. Participants did not vary significantly by gender in symptom report; however, Italian students reported significantly more inattention and hyperactivity-impulsivity symptoms than students from the United States, and students from New Zealand reported more inattention symptoms than students from the United States. The prevalence of self-reported ADHD symptoms beyond *DSM-IV* thresholds for diagnosis ranged from 0% (Italian women) to 8.1% (New Zealand men). The implications of these results for the use of *DSM-IV* criteria in identifying university students with ADHD are discussed.

Attention-deficit/hyperactivity disorder (ADHD; see Note 1) is characterized by developmentally inappropriate levels of inattention, impulsivity, and motor activity (American Psychiatric Association, 1994). ADHD generally begins early in life (i.e., before age 7) and is unremitting in most individuals throughout their lifespan (Barkley, 1998). Furthermore, symptoms of this disorder are frequently associated with conduct problems and academic underachievement (American Psychiatric Association, 1994). In fact, 20% to 30% of children and adolescents with ADHD also have one or more learning disabilities (Semrud-Clikeman et al., 1992). Thus, individuals with ADHD are more likely than their typical counterparts to be diagnosed with learning disabilities and to receive services for academic problems.

University students diagnosed with ADHD constitute a significant and

growing population eligible for services under Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act (ADA) of 1990 (Latham, 1995; Richard, 1995). Furthermore, university students with ADHD appear to be at higher-than-average risk for academic impairment and underachievement relative to their counterparts without ADHD (Heiligenstein, Guenther, Levy, Savino, & Fulwiler, 1999). The majority of research on ADHD, however, has been conducted with school-age children, and the state of knowledge and practice regarding university students with ADHD has lagged significantly behind that with younger children. At the university level, we lack basic epidemiological information regarding the symptomatology of ADHD at this developmental stage as well as empirically validated assessment methods for diagnosis and treatment evaluation. Such informa-

tion is important to appropriate service delivery for any disorder.

ADHD is currently conceptualized as a developmental disorder for which it needs to be determined whether the individual is displaying symptoms of ADHD to a developmentally inappropriate extent (American Psychiatric Association, 1994). Thus, to accurately diagnose ADHD in university students, information on the typical parameters of the symptom domains of ADHD (i.e., inattention and impulsivity-hyperactivity) in this population is required before we can assert that an individual displays these behaviors to a developmentally inappropriate extent.

The criteria for ADHD used by the *Diagnostic and Statistical Manual of Mental Disorders (DSM-IV; American Psychiatric Association, 1994)* were established via reviews of the existing literature on the factor analysis of symptoms and via new factor and di-

agnostic utility analyses of data from the *DSM-IV* field trials for the disruptive behavior disorders (Lahey et al., 1994). The samples for the *DSM-IV* field trials for ADHD consisted of children and adolescents ages 4 to 17 from 11 sites across the United States (Lahey et al., 1994). These sources of information consistently suggested that two separate dimensions of symptoms—inattention and motor hyperactivity-impulsivity—constitute ADHD in children and adolescents. However, the *DSM-IV* bidimensional structure of ADHD symptoms in postsecondary students and adults remains to be empirically evaluated.

In adulthood, the diagnosis of ADHD relies heavily on symptom self-report of the adult client (Dulcan & Work Group on Quality Issues, 1997; Jackson & Farrugia, 1997). As more individuals with ADHD are able to attend university or are identified as needing accommodations or services in postsecondary institutions, the nature of this disorder in the university population requires greater scrutiny. In light of this, it is important to empirically examine self-reported symptoms of ADHD in university students. As is the case with other issues in the area of ADHD in young adulthood, little research has directly examined this issue.

Two recent studies have reported on the prevalence of self-reported attentional difficulties in general samples of university students (Heiligenstein, Conyers, Berns, & Smith, 1998; Weyandt, Linterman, & Rice, 1995). Using symptom cutoff thresholds based on standard deviation units, Weyandt et al. (1995) found prevalence rates for self-reported attentional difficulties of 7% to 8% with a cut-point of 1.5 standard deviations above the mean of the total scores on the measures used and 4% with a 2.0 *SD* cut-point in their sample of 770 university students in the Pacific Northwest. Including only those items in the analyses that corresponded to *DSM-IV* criteria, results indicated that 6.8% and 4.7% of participant ratings were respectively 1.5 *SD*

and 2 *SD* above the mean on the measures used (Weyandt et al., 1995).

Heiligenstein et al. (1998) examined self-reported attentional difficulties using a *DSM-IV*-based rating scale in a sample of 448 students at a midwestern university. They reported prevalence rates based on symptom counts, with symptom presence operationally defined as endorsement of *often* or *very often* for an item. Using the *DSM-IV* criteria for ADHD, they calculated the prevalence for the three subtypes of ADHD as well as the overall prevalence of an ADHD diagnosis. Heiligenstein et al. reported an overall prevalence of self-reported ADHD of 4%, with the majority (56%) of participants meeting criteria for ADHD, predominantly inattentive type, and the remainder equally distributed between those meeting criteria for hyperactive-impulsive and combined types (22%).

Noting a negative correlation between age and hyperactivity and total item scores, Heiligenstein et al. (1998) further examined the impact of an age-adjusted threshold. They calculated symptom counts of 1.5 standard deviations above the mean for each of the inattention and hyperactive-impulsive symptom lists. Based on this calculation, they evaluated a 4-symptom, age-adjusted cutoff. This modified cut-point yielded an 11% prevalence rate of self-reported ADHD, with approximately equal percentages of students meeting the criteria for each of the subtypes of ADHD. Heiligenstein et al. concluded that the current *DSM-IV* criteria threshold is too high when applied to university students.

The present study expanded on the preliminary work by Weyandt et al. (1995) and Heiligenstein et al. (1998) by obtaining samples from a range of universities from across the United States and abroad. In this way, a sufficiently large sample size was obtained to permit factor analyses to test the appropriateness of the *DSM-IV* conceptualization of the bidimensional structure of ADHD symptomatology for this population. Moreover, by including

cross-national samples, the extent to which this factor structure generalizes cross-nationally could be examined. The latter is important because conceptualization and understanding of this disorder can vary across countries and cultures. U.S. samples were drawn from three universities located in three different regions of the United States (Mid-Atlantic, Midwest, and Pacific Northwest). The cross-national samples were drawn from universities in New Zealand and Italy—nations that differ historically in their professional views of ADHD (O'Leary, Vivian, & Cornoldi, 1984). The practice of psychology in general, and the conceptualization of ADHD in particular, in New Zealand is influenced by both British (e.g., International Classification of Diseases hyperkinetic syndrome) and U.S. (e.g., *DSM-IV*) systems. This is reflected in a number of publications on ADHD by New Zealand authors that have appeared in U.S. professional journals (e.g., McGee et al., 1990; Reeves, Werry, Elkind, & Zametkin, 1987; Werry, Elkind, & Reeves, 1987). In Italy, ADHD is discussed much less frequently in professional circles, and empirical investigation of ADHD in *children* in Italy is a relatively recent phenomenon.

The *Practice Parameters for the Assessment and Treatment of Children, Adolescents, and Adults with Attention-Deficit/Hyperactivity Disorder* recommend that the *DSM-IV* criteria for ADHD be used in the identification of adults with the disorder (Dulcan & Work Group on Quality Issues, 1997). At this stage, this assertion remains to be empirically evaluated. The present study began to address this issue by evaluating the robustness of the bidimensional conceptualization contained in the *DSM-IV* criteria with this young adult university student sample. Furthermore, the degree to which self-reported inattention and hyperactivity-impulsivity symptoms varied as a function of gender and country was examined. Studies investigating parent and teacher ratings of ADHD symptoms in the

child population consistently obtain gender differences, with boys being reported to exhibit more symptoms than girls (e.g., Bauermeister et al., 1995; DuPaul et al., 1997; Schaughency, McGee, Raja, Feehan, & Siva, 1994). On the other hand, gender differences were not found for self-report ratings of ADHD symptoms in a community-based sample of adolescents in New Zealand (Schaughency et al., 1994). The degree to which a gender difference is present for self-reported symptoms among university students has not been examined. The prevalence of self-reported ADHD based on *DSM-IV* criteria was also investigated as a step toward examining the typical parameters of these symptoms in the general population of university students and determining whether an age-adjusted threshold is indicated. If the *DSM-IV* criteria are applicable to university students, we would expect factor analysis to support a 2-factor solution tapping into separate dimensions of inattention and hyperactivity-impulsivity. Also, we would expect men to report more ADHD symptoms than women with no differences in symptom reports across countries. Although we lack prevalence data for ADHD in postsecondary settings, the generally accepted prevalence rate for ADHD is 3% to 5% of the general population (American Psychiatric Association, 1994). Given the association between ADHD and academic underachievement, some writers in the field have predicted a somewhat lowered prevalence rate in university settings and have estimated that 1% to 3% of the university population has ADHD (Javorsky & Gussin, 1994; Richard, 1995). Because this was an exploratory investigation, no specific hypotheses were postulated.

Method

Participants

A total of 1,209 university students from three countries (Italy, New Zealand, and the United States) participated in the study. The Italian sample

was composed of 197 students (170 women and 27 men) who ranged in age from 18 to 35 years old ($M = 21.6$; $SD = 3.0$) and who attended the Università di Padova. The Italian participants were all White, and their median Hollingshead index (based on parental occupation; Hollingshead, 1975) was 40.0 (i.e., representative of middle class socioeconomic status). The New Zealand sample was composed of 213 students (175 women and 37 men) who ranged in age from 17 to 51 years old ($M = 19.4$; $SD = 4.0$) and who attended the University of Otago. The New Zealand sample was predominantly White ($n = 182$) but also included participants of Asian ($n = 11$), Maori ($n = 16$), and other ($n = 4$) ethnic backgrounds. The median Hollingshead index for this sample was 70.0 (i.e., representative of upper middle class to upper class socioeconomic status). Finally, the U.S. sample was composed of 799 students (391 women and 407 men) who ranged in age from 17 to 49 years old ($M = 21.3$; $SD = 4.9$) and who attended Central Washington State University ($n = 444$), Grand Valley State University ($n = 189$), or Lehigh University ($n = 166$). The majority of U.S. students were White ($n = 695$), but the U.S. sample also included participants of Hispanic ($n = 30$), Asian ($n = 25$), African American ($n = 14$), Native American ($n = 8$), and other ($n = 22$) ethnic backgrounds. The median Hollingshead index was 52.0 (i.e., representative of middle class socioeconomic status).

Separate 2 (Gender) \times 3 (Country) analyses of variance revealed significant main effects of country on age, $F(2, 1,198) = 11.2, p < .001$, and parental occupation, $F(2, 1,151) = 31.77, p < .001$. There were no gender or Gender \times Country interaction effects on these variables. Students in New Zealand were significantly younger than students from the United States and Italy. Also, parental occupation status was lower for students from Italy than for students from the other two countries. The percentages of Whites, $\chi^2(12) = 119.5, p < .001$, and women, $\chi^2(2) = 142.6, p < .001$, were significantly

higher in the Italian and New Zealand samples than in the U.S. sample.

Procedure

U.S. participants were recruited from undergraduate psychology classes at each university. Participants from New Zealand were volunteers from among first-year psychology students at the University of Otago. Italian participants were volunteer second-year students from one of three psychology classes at the Università di Padova. Students from the United States and New Zealand provided written consent to participate prior to completing the self-report protocol. Italian students were asked to complete the questionnaire during a class period, and they were free to decline participation without any penalty (i.e., their participation was considered their consent). Participants were asked to provide demographic information about themselves (i.e., age, ethnicity, gender, academic class, and current grade point average) and their parents (i.e., occupation). Next, each participant completed a 24-item questionnaire that included questions derived from the *DSM-IV* criteria for ADHD (see Note 2). Questionnaires were completed on an independent basis and returned to one of the investigators.

Dependent Measure

A 24-item questionnaire, the Young Adult Rating Scale (YARS), was constructed by the investigators and included 17 items derived directly from the *DSM-IV* ADHD symptom list (i.e., 9 inattention and 8 hyperactivity-impulsivity symptoms). An additional 7 items were included to address potential difficulties (e.g., problems remembering what was just read) that university students could encounter in association with ADHD symptoms. All items were completed on a 4-point Likert scale ranging from 0 (*never or rarely*) to 3 (*very often*). Students were asked to respond to these items regarding their behavior over the past

6 months (i.e., in accordance with *DSM-IV* guidelines). Total scores on this measure can range between 0 and 72. A coefficient alpha of .86 was obtained with the present sample, indicating adequate internal consistency for the YARS. Furthermore, Schaughency et al. (1998) found that YARS ratings were significantly related to grade point average in a sample of college students and that students with clinically diagnosed ADHD provided significantly higher YARS ratings than did students without this disorder.

Data Analyses

Several analyses were conducted separately for the three participant samples. First, a principal axis factor analysis was conducted to determine the factor structure of the YARS. Scree plots were examined, and the number of factors to retain was determined. A second factor analysis was then conducted constraining the solution to the determined number of factors using oblique rotation methods, because it was assumed that the factors would be correlated.

Another set of analyses was conducted to examine differences in self-reported ADHD symptomatology between countries and genders using multivariate analyses of covariance followed by univariate analyses of covariance. For these analyses, a symptom was considered *present* for items scored as 2 (*often*) or 3 (*very often*), as was done by Heiligenstein et al. (1998). The 17 items whose content directly reflected *DSM-IV* criteria for ADHD were used to construct inattention (9 items) and hyperactivity-impulsivity (8 items) scores. Age and parent occupation were used as covariates owing to differences in the means of these variables across countries.

The final set of analyses examined the prevalence of self-reported ADHD symptomatology by converting item scores to symptom scores as described in the preceding paragraph, determining the number of symptoms for inattention and hyperactivity-impulsivity

domains, and calculating the percentage of participants who reported symptom totals beyond the *DSM-IV* thresholds for the inattentive, hyperactive-impulsive, and combined types of ADHD. In keeping with analyses conducted by Heiligenstein et al. (1998), we also examined prevalence rates using an age-adjusted symptom cutoff criterion of three symptoms in the two ADHD domains (inattention and hyperactivity-impulsivity).

Results

Factor Analyses

For the U.S. sample, six factors with eigenvalues > 1.0 were obtained; however, examination of the scree plot and the percentage of variance accounted for indicated that two factors should be retained. Together, these factors accounted for 34.8% of the variance. The factor analysis was conducted again with a forced 2-factor solution followed by oblique rotation. Factor 1 (labeled *inattention*) contained 12 items with factor loadings $> .35$, whereas Factor 2 (labeled *hyperactivity-impulsivity*) consisted of 7 items with factor loadings $> .35$ (see Table 1). The two factors were correlated to a moderate degree ($r = .63$). Five items did not load on either factor.

Similar results were obtained for the New Zealand sample (see Table 1). Specifically, seven factors with eigenvalues > 1.0 were obtained; however, the scree plot indicated a sharp drop after two factors. Thus, we retained 2 factors that accounted for 33% of the variance. The factor analysis was conducted again with a forced two-factor solution followed by oblique rotation. Factor 1 also appeared to represent inattention and included 15 items with factor loadings $> .35$. It should be noted that in contrast to the U.S. sample, Factor 1 also included 2 items related to hyperactivity (i.e., *difficulty staying in seat* and *feel restless*). Factor 2 contained 5 items related to hyperactivity-impulsivity with factor loadings $> .35$. The correlation between

the two factors was .30. Four items did not load on either factor.

Factor analytic results for the Italian sample deviated somewhat from findings obtained in the United States and New Zealand. The initial principal axis factor analysis resulted in nine factors with eigenvalues > 1.0 with no clear dropoff on the scree plot after two factors. To facilitate comparison with the other two samples, however, we conducted a second factor analysis with a forced 2-factor solution followed by oblique rotation. These two factors accounted for only 23.1% of the variance and were negatively correlated ($r = -.16$). Factor 1 included 9 items with factor loadings $> .35$. As was the case for the other countries, Factor 1 appeared to reflect attention problems, although 2 items were related to hyperactivity (i.e., *feel restless* and *difficulty engaging in fun activities quietly*). Factor 2 contained only 3 items with loadings $> .35$ that appeared related to impulsivity. Twelve items (i.e., 50% of the 24 items) did not load on either factor. Furthermore, four factors would need to be retained to account for the same amount of variance (36.5%) as two factors in the other two samples.

Group Differences in Self-Reported ADHD Symptoms

Means and standard deviations (unadjusted) for the number of inattention and hyperactivity-impulsivity symptoms reported are presented by gender and country in Table 2. To explore whether self-reported ADHD symptoms varied across gender or country, a 2 (Gender) \times 3 (Country) multivariate analysis of covariance was conducted using the number of inattention symptoms and the number of hyperactivity-impulsivity symptoms as dependent variables. Age and parental occupation were used as covariates owing to differences across countries on these variables. It should be noted, however, that the within-cell relationships between the covariates and dependent measures were equivalent across factors. A significant main

TABLE 1
Factor Structure for Self-Report of ADHD Symptoms Across Countries

Item	Inattention			Hyperactivity–Impulsivity		
	U.S.	Italy	N.Z.	U.S.	Italy	N.Z.
Fail to give close attention	.430	.180	.441	.002	–.208	.024
Avoid work that requires effort	.658	.293	.587	–.005	.024	–.255
Can't remember what just read	.565	.386	.496	–.002	–.170	.162
Feel frustrated about school	.477	.365	.486	–.001	.131	.073
Lose things necessary for tasks	.503	.339	.604	.006	–.206	.100
Forgetful in daily activities	.449	.528	.400	.191	–.096	.201
Make decisions based on short-term goals	.410	.059	.309	.009	–.152	.195
Make careless mistakes	.552	.355	.486	.004	–.275	.205
Studying is difficult	.743	.497	.741	–.125	–.085	–.267
Difficulty sustaining attention to tasks	.587	.485	.693	.139	–.073	–.097
Don't follow through on instructions	.617	.179	.580	–.003	.223	–.081
Fail to finish work	.668	.345	.488	–.133	.211	–.085
Difficulty sustaining attention to fun activities	.267	.436	.475	.190	.062	–.002
Don't listen when spoken to	.282	.130	.514	.268	–.006	.043
Difficulty staying in seat	.239	.263	.472	.310	–.101	.169
Feel restless	.276	.446	.443	.310	–.050	.179
Difficulty engaging in fun activities quietly	.008	.412	.328	.430	.230	.101
Feel "on the go"	–.005	–.044	–.199	.381	.042	.469
Talk excessively	–.006	–.051	.114	.544	.467	.570
Blurt out answers before questions completed	–.002	.189	.007	.627	.650	.436
Difficulty waiting turn	–.008	.106	.198	.750	.621	.458
Fidget with hands or feet	.105	.242	.210	.372	–.219	.261
Interrupt or intrude on others	–.003	.019	.223	.577	–.315	.365

Note. U.S. = United States; N.Z. = New Zealand. Factor loadings > .35 are in boldface type. Only 23 items are included in this table because one item did not load on either factor for any group.

TABLE 2
Number of ADHD Symptoms Reported by Gender and Country

Dimension by gender	United States		Italy		New Zealand	
	M	SD	M	SD	M	SD
Men						
Inattention	0.95	1.36	1.23	1.58	1.54	1.68
Hyperactivity–Impulsivity	1.51	1.53	1.96	1.53	1.92	1.77
Total ADHD	19.39	9.07	20.67	9.51	23.57	10.55
Women						
Inattention	0.75	1.31	1.22	1.22	1.22	1.38
Hyperactivity–Impulsivity	1.52	1.57	2.00	1.41	1.72	1.43
Total ADHD	18.43	9.27	20.72	6.83	21.33	8.34

effect for country was obtained, Wilks' lambda = .98, $F(4, 2,228) = 5.44$, $p < .001$, multivariate effect size = .01. The main effect for gender and the Gender \times Country interaction were both nonsignificant.

Univariate 2×3 analyses of covariance were conducted for each of the dependent measures. A significant main effect for country was found for inattention symptoms, $F(2, 1,115) = 9.70$, $p < .001$, $\eta^2 = .02$, and for hyperactivity–impulsivity symptoms, $F(2, 1,115) = 4.14$, $p < .05$, $\eta^2 = .007$. Scheffé post hoc comparison tests using adjusted means

indicated that Italian students reported significantly more inattention and hyperactivity-impulsivity symptoms than students from the United States (all p s < .05). Furthermore, students from New Zealand reported more inattention symptoms than did students from the United States (p < .05). There were no significant differences on either of the scores between students from Italy and New Zealand. Also, none of the univariate analyses revealed a significant main effect for gender or a Gender \times Country interaction.

Prevalence of Self-Reported ADHD Symptoms

The percentages of university students who self-reported significant symptoms of one of the three subtypes of ADHD as a function of country and gender are displayed in Table 3. For these analyses, a symptom was considered *present* for items scored as 2 (*often*) or 3 (*very often*). Using *DSM-IV* criteria, participants were identified as having the inattentive subtype if six or more inattention symptoms (i.e., scored 2 or 3) were reported with less than six hyperactivity-impulsivity symptoms. In similar fashion, participants were identified as having the hyperactive-impulsive subtype if six or more hyperactivity-impulsivity symptoms were reported along with fewer than six inattention symptoms. Finally, individuals who reported six or more symptoms for both inattention and hy-

peractivity-impulsivity were identified as having the combined type of ADHD. Although we did not have sufficient data to determine whether individual students experienced functional impairment in association with ADHD symptoms (as is required by *DSM-IV* criteria), it should be noted that the correlation between self-reported grade point average (GPA) and the total YARS score was statistically significant ($r = -.11, p < .001$). This negative correlation indicated that higher levels of self-reported ADHD symptoms were associated with lower GPA.

There were a number of differences in subtype prevalence across countries for both men and women (see Table 3). A total of 2.9% of men from the U.S. sample were identified as having one of the three ADHD subtypes, with most (2%) of these individuals categorized in the hyperactive-impulsive subtype. In contrast, a higher percentage of men from Italy (7.4%) and New Zealand (8.1%) reported significant ADHD symptoms. Similar to men from the United States, the majority of Italian and New Zealand men were identified as hyperactive-impulsive. A very low percentage of students across all three countries were classified as having the combined type of ADHD. In fact, no men in either Italy or New Zealand reported significant symptoms of both inattention and hyperactivity-impulsivity.

In contrast to the findings for men, a greater percentage (3.9%) of women

from the United States were classified as having ADHD than women from either Italy (0%) or New Zealand (1.7%; see Table 3). The vast majority (2.3%) of U.S. women and all of the New Zealand women were categorized in the hyperactive-impulsive subtype.

In keeping with analyses conducted by Heiligenstein et al. (1998), we also examined prevalence rates using an age-adjusted symptom cutoff criterion of at least three symptoms in the two ADHD domains (inattention and hyperactivity-impulsivity). A pattern across countries was obtained for men that was similar to the one found using the *DSM-IV* cutoff criteria (see Table 4). Specifically, the preponderance of men in all three countries were identified as having the hyperactive-impulsive subtype, and more men in New Zealand (29.7%) and Italy (37.3%) were classified as having ADHD than in the United States (27.4%). In similar fashion, using age-adjusted criteria resulted in more women from New Zealand (37.4%) and Italy (43.1%) being identified as having ADHD than women from the United States (24.6%). This pattern of results for women is the opposite of what was obtained using the more stringent *DSM-IV* criteria. As was the case for men, the majority of women were identified with the hyperactive-impulsive subtype.

Discussion

A primary purpose of this study was to explore the appropriateness of *DSM-IV* criteria for ADHD with post-secondary students and to determine whether the bidimensional conceptualization of ADHD applies to this population. Based on factor analysis of the YARS by country, findings from the United States and New Zealand support a bidimensional model, with inattention and hyperactivity-impulsivity emerging as two distinct factors. The first factor appears to be measuring difficulty completing tasks, difficulty sustaining attention, forgetfulness, and organizational skills. The second factor

TABLE 3
Percentages of Self-Reported ADHD Subtypes by Gender and Country Using *DSM-IV* Criteria

ADHD subtype	United States	Italy	New Zealand
Men			
Inattentive	0.7	3.7	2.7
Hyperactive-Impulsive	2.0	3.7	5.4
Combined	0.2	0	0
Women			
Inattentive	0.8	0	0
Hyperactive-Impulsive	2.3	0	1.7
Combined	0.8	0	0

TABLE 4
Percentages of Self-Reported ADHD Subtypes by Gender and Country
Using Age-Adjusted Diagnostic Criteria

ADHD subtype	United States	Italy	New Zealand
Men			
Inattentive	6.0	7.7	8.1
Hyperactive-Impulsive	14.0	18.5	10.8
Combined	7.4	11.1	10.8
Women			
Inattentive	3.9	9.0	9.8
Hyperactive-Impulsive	13.8	25.8	18.4
Combined	6.9	8.3	9.2

appears to encompass difficulties with self-control, such as impulsivity, excessive talking, and interrupting others. These results are consistent with previous literature (e.g., Bauermeister et al., 1995; DuPaul et al., 1997) and *DSM-IV* conceptualizations of ADHD.

However, findings from the Italian sample were somewhat inconsistent with this model, with fewer items loading on these factors, and 50% of the items not loading on any factor. Given the relative paucity of ADHD research in Italy, it is difficult to interpret these findings from an empirical perspective; however, several factors could have accounted for these differences. One possibility is that difficulties of hyperactivity and inattention are not generally discussed in Italy with regard to childhood developmental problems. This lack of discussion may mean that questions about ADHD symptoms presented unfamiliar ideas or had different connotations for Italian participants. There may also be differences in the acceptability of these behaviors across countries because knowledge of this disorder in Italy may be limited. Because of differences in novelty or acceptability, Italian participants may have encountered difficulties discriminating among items, which could have contributed to the lack of a clear factor structure. It should be noted, however, that items loading on the first factor (e.g., *avoid work that requires effort*, and *fail to finish work*) for the U.S. and New

Zealand samples appear to be very concrete and unambiguous.

Another possible reason for the differences in factor structure across countries is that respondents could have been using different comparison groups when making judgements about symptoms, because the demographics of students who attended universities across the three countries differed markedly. A related issue that could contribute to cross-national differences in factor structure is that less than 50% of psychology students enrolled in this Italian university are expected to finish all 5 years of university. This high dropout rate may be related to different admission criteria of Italian relative to U.S. and New Zealand universities and, therefore, result in a different population. However, it is unclear how different acceptance criteria could affect these factor structures, which have typically been supported across different ages and groups in the United States. Clearly, more research is needed to explore these possibilities.

A secondary purpose of the present study was to explore the differential prevalence of self-reported ADHD symptoms in university students by gender and country. In contrast to earlier findings from parent and teacher ratings of ADHD symptoms in children and adolescents (e.g., Bauermeister et al., 1995; DuPaul et al., 1997; Schaughency et al., 1994), no significant gender differences were obtained for self-

reported inattention or hyperactivity-impulsivity symptoms. Murphy and Barkley (1996) found that men with ADHD outnumbered women with this disorder on a 1.8:1 to 2.6:1 ratio in a community-based sample of adults. It is possible that these gender differences in ADHD symptomatology are absent among higher achieving students who are able to attend postsecondary institutions. The lack of gender differences in our sample of university students may also be due to the use of self-report data in contrast to the parent and teacher ratings of symptoms typically obtained with children and adolescents. The latter explanation is supported in part by the results of Schaughency et al. (1994) who found gender differences in parent reports of ADHD symptoms for a community-based sample of adolescents in New Zealand but no differences in self-reports of symptoms between genders. It is also possible that women in general are more likely to report ADHD symptoms, as has been found for self-report of depressive symptoms (Compas, 1997).

Students from New Zealand and Italy reported significantly more inattention symptoms than did U.S. students. Furthermore, Italian students reported significantly more hyperactivity-impulsivity symptoms than U.S. students. These findings were somewhat unexpected given the assumption that ADHD is diagnosed more frequently in the United States than in the other two countries. Cross-national differences in self-reported symptomatology may have been due to variations in age (e.g., students in New Zealand were significantly younger than students in Italy and the U.S.) or socioeconomic status (e.g., parents of Italian students had a lower socioeconomic status than parents of students from the other two countries). It should be noted that although cross-national differences were statistically significant, the country variable accounted for minimal variance (i.e., 0.7% to 2%) in self-reported inattention and hyperactivity-impulsivity symptoms. Thus, the vari-

ation in symptom self-report was primarily accounted for by factors other than gender and country (e.g., impairment in academic or social functioning).

Despite the minimal variance accounted for by gender and country, the percentages of participants meeting *DSM-IV* criteria cut-points for self-reported ADHD symptoms differed to some degree across these variables. For example, 2.9% of men from the U.S. sample reported significant ADHD symptoms, whereas 7.4% of men from Italy and 8.1% of men from New Zealand reported ADHD symptoms. Women from the United States reported slightly higher rates (3.9%), whereas 1.7% of women from New Zealand and no women from Italy reported significant ADHD symptoms. Overall, the U.S. findings are fairly consistent with those of Heiligenstein et al. (1998), Murphy and Barkley (1996), and Weyandt et al. (1995), who found approximately 4% to 5% prevalence rates for all ADHD subtypes in adult and university student samples. The prevalence rates from Italy and New Zealand are higher than the expected 3% to 5% as reported by the *DSM-IV*, although similarly high rates have been reported in child and adolescent studies. Pineda et al. (1999), for example, investigated the prevalence of parent-reported ADHD symptoms in children and adolescents ages 4 to 17 living in Colombia and found that 19.8% of the boys and 12.3% of the girls met *DSM-IV* criteria for ADHD. Similarly high percentages have been reported in India by Bhatia, Nigam, Bohr, and Malik (1991), who found that 29.2% of children ages 11 to 12 met *DSM-III* criteria for all ADHD subtypes based on parent reports, and in Germany (e.g., Baumgaertel, Wolraich, & Dierrich, 1995) the percentage of children with *DSM-III-R* ADHD varied from 9.6% (age 5) to 17.8% (age 17) based on teacher reports.

The most common of the three subtypes of ADHD across country and gender was the hyperactive-impulsive type. Using *DSM-IV* thresholds, 2%

of men and 2.3% of women from the United States, 3.7% of men from Italy and no women, and 5.4% of men and 1.7% of women from New Zealand were categorized as having the hyperactive-impulsive ADHD subtype. Less than 1% of U.S. men and women were categorized as having the inattentive or combined ADHD subtypes. Similarly, none of the men and women from Italy or New Zealand met *DSM-IV* thresholds for inattentive or combined subtypes. The U.S. findings are similar to those reported by Murphy and Barkley (1996), who found that the hyperactive-impulsive subtype was the most common type of ADHD, followed by the inattentive subtype. Heiligenstein et al. (1998), however, found that the inattentive subtype was most prevalent among university students. With children and adolescents, Pineda et al. (1999) found that the hyperactive-impulsive type was more frequent in both boys and girls, whereas the combined type was the least frequent and was absent in adolescents between 12 and 18 years of age. The lower percentage of individuals with combined type ADHD in our university samples may be due to the more significant impairment typically associated with this subtype relative to the inattentive and hyperactive-impulsive subtypes (for a review, see Barkley, 1998). Because of this more severe impairment, individuals with combined type ADHD may have difficulty gaining acceptance to university, especially in New Zealand, where regulations do not require schools to provide accommodations and services for students with this disorder.

It is important to note that the present study explored the prevalence of *self-reported* ADHD symptoms and was not diagnostic in nature. Obviously, the presence of ADHD symptoms alone is insufficient for a diagnosis of ADHD, and in this study limited information was available concerning the level of functional impairment experienced by the participants and the developmental history of the participants (as is required by *DSM-IV* criteria). Although grade point average (GPA) was found

to correlate negatively with YARS ratings, the magnitude of this correlation was quite small. Furthermore, GPA alone is an inadequate index of impairment, especially because in the present study it was based on self-report. Murphy and Gordon (1998), for example, have recommended that academic records, test histories, performance reviews, and similar data be used to establish impairment for adults being diagnosed with ADHD. Overall, the present cross-national findings taken together with findings from previous research (e.g., Bhatia et al., 1991; Pineda et al., 1999) underscore the importance of obtaining information from a variety of sources and suggest that reliance on a single indicator (e.g., rating scale) may result in higher-than-expected percentages of ADHD.

Given the literature suggesting that hyperactivity symptoms decrease with age (e.g., Barkley, 1998; Heiligenstein et al., 1998; Hill & Schroener, 1996; Schaughency et al., 1994), the percentage of students meeting *DSM-IV* thresholds for the hyperactive-impulsive subtype was somewhat surprising. Also unexpected were the relatively high percentages of U.S. and New Zealand women who met the criteria for the hyperactive-impulsive subtype (2.3% and 1.7%, respectively) and the low percentage who met the thresholds for the inattentive subtype (0.8% and 0%). Previous studies (e.g., Gaub & Carlson, 1997) have consistently reported that the inattentive subtype is more commonly found in women than in men. This finding, in conjunction with the low percentage of students across all three countries meeting criteria for the inattentive and combined subtypes, appears consistent with Heiligenstein et al.'s (1998) assertion that *DSM-IV* thresholds are too high (at least with respect to inattention symptoms) when applied to university students. When the thresholds for each subtype were lowered to three (rather than six) symptoms, very high rates of identification were obtained for all three countries. Thus, future research is needed to document symptomatic

thresholds that are developmentally appropriate, related to functional impairment, and not subject to serious overestimation of diagnostic prevalence. Such research would provide a better understanding of the age-related changes associated with ADHD symptoms and the relevance of these changes to diagnostic criteria for ADHD in university students and other adults.

Limitations

Relative to the literature concerning ADHD in children, little information is available concerning the prevalence and the nature of this disorder in young adults such as university students. The present study takes a critical step in helping to better understand the presence of ADHD symptoms in the university student population in the United States and in other cultures. Preliminary findings suggest that the prevalence rate of ADHD symptoms in university students varies from 2.9% to 8.1%, with the highest ratings reported in New Zealand. The present study was based on self-report, however, and future research is needed to explore the validity of self-reported symptoms within this population. Although self-report ratings are the primary data used for diagnosis and evaluation of treatment response in adults, further examination of symptom prevalence using multiple assessment methods is warranted.

Another limitation of this study concerns the lack of sufficient data to establish functional impairment (although GPA was found to correlate negatively with self-report ADHD ratings) or childhood history of symptoms (as is required for *DSM-IV* diagnosis of ADHD). Furthermore, participants were not asked whether they were currently coping with any life-disrupting events (e.g., death of a loved one or breakup of a long-term relationship) that may have led to higher symptom reports. Clearly, future studies with university samples need to go beyond self-reported symptom counts to examine prevalence.

There was also a great deal of variability across individuals in self-report ratings, thereby possibly deleteriously affecting statistical analyses. It is important to note, however, that this heterogeneity is not atypical for ratings of ADHD symptoms (e.g., DuPaul et al., 1997), and careful replication across samples is required to support the external validity of findings.

Another possible limitation of this study is that although cross-national samples were obtained, the data were collected from only five universities, and the degree to which these samples are representative of the overall university student population is questionable. Given that the New Zealand sample was composed entirely of first-year university students—some of whom may not continue successfully in university—the degree to which the data represent a typical sample of New Zealand university students is limited.

The Italian and New Zealand samples consisted primarily of women, whereas a more equitable gender ratio was present for the U.S. sample. The degree to which gender imbalance across samples affected the results of this study cannot be determined, but it is possible that symptom reports for men in these countries were skewed due to a relatively small sample size. Finally, the results provide tentative support for the bidimensional conceptualization of ADHD among university students in the United States and New Zealand; however, given the findings from the Italian sample, the support for this model in other cultures is equivocal.

Conclusions

These results provide initial evidence that a percentage of university students in the United States, New Zealand, and Italy report clinically significant levels of ADHD symptomatology. Furthermore, the *DSM-IV* conceptualization of this disorder has some basis of support in this population. The overall findings raise questions concerning the applicability of *DSM-IV* thresholds

to the university student population. Future research is needed to further explore the psychometric properties of the YARS, the validity of self-report and its relation to functional impairment, the prevalence of ADHD symptoms in other cultures and university student populations, and the appropriateness of *DSM-IV* criteria for diagnosing university students with this disorder.

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NOTES

1. The terminology and diagnostic criteria that have been used to define and describe this group of disorders have changed over the years. The most recent Diagnostic and Statistical Manual of Mental Disorders (American Psychiatric Association, 1994) uses the term attention-deficit/hyperactivity disorder and includes subtypes of the disorder that involve attentional difficulties in the absence of hyperactivity-impulsivity (predominantly inattentive type) as well as those involving hyperactivity-impulsivity (predominantly

hyperactive-impulsive type and combined type). Because current terminology encompasses this range of attentional disorders, the term ADHD will be used to refer to this group of disorders in general. However, because differing diagnostic criteria and terminology may identify somewhat different groups for research, when reviewing research the diagnostic criteria and terminology used by the study authors will be used.

2. A copy of the questionnaire is available from the first author upon request.

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