ADHD Symptomatology and Perceived Stress Among French College Students

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Abstract

Objective: The objective of this study was to examine the independent association between inattention and hyperactivity/ impulsivity symptoms and perceived stress among French college students. **Method:** Participants (N = 6,951) completed self-report surveys assessing ADHD symptoms, perceived stress, and sociodemographic characteristics. Multinomial logistic regression models were used to evaluate the association between ADHD symptoms and perceived stress. **Results:** Participants had a mean age of 20.8 years, and 75.6% were female. We found significant associations between increasing levels of inattention and hyperactivity/impulsivity symptoms and high level of perceived stress after adjustment for confounding variables. The association was stronger for inattention (odds ratio [OR] = 4.58, 95% confidence interval [CI] = [4.02, 5.22]) than for hyperactivity/impulsivity symptoms (OR = 1.21, 95% CI = [1.05 to 1.39]). **Conclusion:** Higher levels of inattention and hyperactivity/impulsivity were independently associated with perceived stress in French college students. This association was mainly driven by inattention. Screenings to better detect ADHD symptoms should be implemented in universities. (*J. of Att. Dis. XXXX; XX(X) XX-XX*)

Keywords

ADHD, stress, college students

Introduction

ADHD is a neurodevelopmental disorder characterized by developmentally inappropriate levels of inattention and/or hyperactivity-impulsivity Diagnostic and Statistical Manual of Mental Disorders (4th ed.; DSM-IV; American Psychiatric Association, 1994; Barkley, 2006). Although ADHD was commonly believed to be a disorder of childhood, it is now widely recognized that symptoms persist into adolescence and adulthood for the majority of children (Kessler et al., 2006; Polanczyk & Jensen, 2008). Previous studies have shown that 30% to 70% of individuals diagnosed with ADHD in childhood retain full or residual symptoms as adults (Barkley, Fischer, Smallish, & Fletcher, 2002; Biederman et al., 1996). ADHD symptoms in adults appear to be somewhat different from those in childhood. Symptoms such as hyperactivity/impulsivity often decline while symptoms of inattention persist (Biederman, Mick, & Faraone, 2000). In adulthood, ADHD is associated with several comorbid psychiatric disorders, such as substance use, disruptive behavior, and mood disorders (McGough et al., 2005; Murphy, Barkley, & Bush, 2002), and with substantial impairments in occupational, social, and economic functioning (Biederman et al., 2008; de Graaf et al., 2008; Faraone et al., 2000; Kessler et al., 2005a, 2005b).

The population of college student has been the focus of recent research regarding ADHD. Increasing numbers of individuals with an ADHD diagnosis are pursuing postsecondary education and therefore face the transition into adulthood within the challenging environment of college or university (Norwalk, Norvilitis, & MacLean, 2009; Rabiner, Anastopoulos, Costello, Hoyle, & Swartzwelder, 2008; Schwanz, Palm, & Brallier, 2007). Estimates of the prevalence of ADHD symptoms in postsecondary education students ranges from 2% to 12% depending on the criteria used (Nugent & Smart, 2014). Although it has been suggested that college students with ADHD are likely to have higher cognitive abilities and better compensatory skills than individuals with ADHD who do not attend college (Frazier, Youngstrom, Glutting, & Watkins, 2007), they have been found to struggle with social, psychological, and academic adjustment (Frazier et al., 2007; Shaw-Zirt, Popali-Lehane,

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Chaplin, & Bergman, 2005). College students with ADHD symptoms are more likely to have poor academic performance (Advokat, Lane, & Luo, 2011; Schwanz et al., 2007), poor quality of life (Greenwald-Mayes, 2002; Gudjonsson, Sigurdsson, Eyjolfsdottir, Smari, & Young, 2009), poor self-esteem (Shaw-Zirt et al., 2005), depression (Kwak, Jung, & Kim, 2015; Rabiner et al., 2008), substance use (Kwak et al., 2015; Mesman, 2015), and risky sexual behaviors (Marsh, Norvilitis, Ingersoll, & Li, 2012). ADHD symptoms have also been associated with higher perceived stress among college students (Harrison, Alexander, & Armstrong, 2013; Overbey, Snell, & Callis, 2009). For example, Overbey et al. (2009) showed that higher levels of ADHD symptoms were associated with greater stressful life experiences and the use of maladaptive coping strategies in romantic relationships among a sample of 497 college students. They reported that although only inattention was associated with less romantic satisfaction, both inattention and hyperactivity/impulsivity were associated with higher stress (Overbey et al., 2009). Similarly, Harrison et al. (2013) found in a sample of 107 college students that elevated symptoms of ADHD were associated with higher level of stress. To date, however, research is limited on the association between ADHD symptoms and perceived stress among college students and epidemiological data are lacking. Furthermore, because ADHD symptoms are manifested somewhat differently in adults than in children, it is important to understand the role of the different symptom groups. Previous studies that have explored the influence of each of inattention and hyperactivity/impulsivity symptoms separately among college students suggest that inattention may be the more critical predictor of social, academic, and emotional adjustment in college (Marsh et al., 2012; Mesman, 2015; Norvilitis, Sun, & Zhang, 2010; Norwalk et al., 2009; Overbey et al., 2009; Rabiner et al., 2008; Schwanz et al., 2007). Inattention was uniquely found to be related among college students with poor academic performance (Schwanz et al., 2007), lower career decision-making abilities (Norvilitis et al., 2010; Norwalk et al., 2009), poor romantic satisfaction (Overbey et al., 2009), depression (Rabiner et al., 2008), substance use (Mesman, 2015), and risky sexual behaviors (Marsh et al., 2012). Similarly, Combs, Canu, Broman-Fulks, Rocheleau, and Nieman (2015) found that only inattention was associated with higher perceived stress among a sample of 983 adults not in college. However, the relative contribution of inattention and hyperactivity/impulsivity symptoms to perceived stress among college students remains unclear. Therefore, this study sought to examine the independent association between ADHD symptomatology and perceived stress in a large cohort of Frenchspeaking college students. It is hypothesized that higher levels of ADHD symptoms in general and inattention symptoms in particular would be related to increased perceived stress among college students.

Method

Study Design and Participants

Participants (N = 6.951) were part of the ongoing Internet-Based Students Health Research Enterprise (i-Share) project, a prospective community-based cohort study of students of French-speaking universities and higher education institutions. The i-Share project was initiated by the Universities of Bordeaux and Versailles Saint-Quentin (France). To be eligible to participate, a student had to be officially registered at a University or higher education institute, be at least 18 years of age, able to read and understand French, and provide informed consent. Students were informed about the purpose and aims of the study by flyers, information stands at registrations, during lectures, and via social media and newsletters (www.i-Share.fr). Furthermore, a group of trained students informed their peers about the study and collected contact information to initiate the online recruitment process. Enrollment followed a two-step process. First, a formal pre-registration on the i-Share online portal was required. Then, students were allocated a personal password and could finalize the registration process and completed self-administered online questionnaires. Only students who completed the baseline questionnaire were eligible for our analyses. The baseline questionnaire asked information on the participant's mental and physical health status, personal and family medical histories, sociodemographic characteristics, and lifestyle habits. We used data available as of December 2015. The i-Share project from which this study was derived was approved by the Commission Nationale de l'Informatique et des Libertés (CNIL) [DR-2013-019].

Measures

Outcome variable: Perceived stress. Perceived stress was assessed using the short version of The Perceived Stress Scale (PSS-4; Cohen, Kamarck, & Mermelstein, 1983), a self-report questionnaire which measures the degree to which situations in one's life over the past month are appraised as stressful, that is, how unpredictable, uncontrollable, and overloaded respondents find their lives. The PSS-4 consists of four items with possible responses rated on a scale from 0 (never) to 4 (very often). The global score was obtained by summing all four items with reverse coding for scoring Items 2 and 3. Higher scores corresponded to higher perceived stress. As the PSS-4 is not a diagnostic instrument, no cutoff was available to designate individuals as "stressed," but rather, individuals were compared based on their relative stress levels. In our study, stress level was analyzed by tertiles of perceived stress that were labeled "low," "moderate," and "high." The PSS has demonstrated good reliability and validity in college student samples (Cohen et al., 1983).

Explanatory variables: Inattention and hyperactivity/impulsivity symptoms. Inattention and hyperactivity/impulsivity symptoms were ascertained using the short-form screener of the Adult ADHD Self-Report Scale Version 1.1 (ASRS; Kessler et al., 2005a), which consists of a checklist of six symptoms that are consistent with the DSM-IV criteria and correspond to the presentation of ADHD symptoms in adults (Adler et al., 2006; Kessler et al., 2005a). Each item explores how often a particular symptom of ADHD has occurred over the past 6 months, using a 5-point Likert-type scale ranging from *never* (0) to *very often* (4). Four items relate to inattention symptoms and two to hyperactivity symptoms. To be considered positive, the first three questions require a response ranging from "sometimes" to "very often" while the remaining three require an "often" or "very often" response. According to the ASRS instructions, participants who have at least four positive responses are at risk of ADHD and may consider taking part in a follow-up assessment with a clinician. Although the dichotomousscoring method is traditionally used to assess ASRS responses, the advantages of evaluating ADHD symptoms along a continuum have also been reported (Overbey et al., 2009). For the purpose of the present study, subscale scores were calculated by summing the item scores for inattention and hyperactivity. The inattention subscale score was further categorized in quartiles ("very low," "low," "high," "very high") while the hyperactivity/impulsivity subscale score was categorized in quintiles ("very low," "low," "moderate," "high," "very high"). The ASRS has demonstrated good reliability and validity in community samples and has been reported as an easy to use and cost-effective tool to assess the symptoms of ADHD in college students (Gray, Woltering, Mawjee, & Tannock, 2014).

Covariates. Variables were chosen based on the scientific literature on ADHD and stress. Participants' sociodemographic characteristics included age, sex (male/female), parental education level (<postsecondary study, > postsecondary study), parental separation (yes/no), and family economic condition in childhood (comfortable/adequate/ difficult). Participants' academic characteristics included grade level (first, second, third, fourth, or higher year of university) and type of study (sciences, social and economic sciences, literature, and humanities, other). Participants' mental health–related characteristics included previous psychiatric diagnoses including depression (yes/no), anxiety (yes/no), and ADHD (yes/no).

Statistical Method

First, we described the sample's characteristics overall and by levels of inattention and hyperactivity/impulsivity symptoms. Second, we performed multinomial logistic regressions using odds ratios (ORs) and 95% confidence intervals (CIs), to test the independent associations between levels of inattention and hyperactivity/impulsivity symptoms and perceived stress, while controlling for potential confounders. Calculated ORs had three reference categories, two for the explanatory variables (very low symptoms of inattention and very low symptoms of hyperactivity) and one for the outcome (low perceived stress). In our model, the explanatory variables and covariates (or confounder variables) were introduced sequentially. In Step 1, we entered the explanatory variables: symptoms of inattention and hyperactivity. In Step 2, we adjusted for participants' age, sex (male/female), parental education level (<postsecondary study, >postsecondary study), parental separation (yes/ no), family economic condition in childhood (comfortable/ adequate/difficult), participants' study level (first, second, third, fourth, or higher year of university), type of study (sciences, social, and economic sciences, literature, and humanities), and participants' previous psychiatric diagnoses of ADHD (yes/no), anxiety (yes/no), and depression (yes/no). All p values were two-tailed, and we considered p <.05 to be statistically significant. Statistical analyses were performed using SAS 9.3 software (SAS Institute Inc., Cary, North Carolina).

Results

Table 1 shows the characteristics of the total sample and according to levels of inattention. Students reporting a very high level of inattention were more likely to be male, to be older, and to report a very high level of perceived stress. They were also more likely to report difficult economic conditions in childhood and previous psychiatric diagnoses of depression, anxiety, and ADHD (all p < .05). In Table 2, participants with a very high level of hyperactivity symptoms were more likely to be younger and to report a very high level of perceived stress, difficult economic conditions in childhood, parents with lower educational level, and previous psychiatric diagnoses of depression, anxiety, and ADHD (all p < .05). Table 3 displays the associations between levels of inattention and hyperactivity and high levels of students' perceived stress. In the unadjusted model, we found significant associations between increasing levels of inattention and a high level of perceived stress. The association pattern of hyperactivity and a high level of perceived stress was similar but the effect sizes were lower. When adjusting for covariates, the association between levels of inattention and a high level of perceived stress remained unchanged. The adjusted odds ratios (AORs) steadily increased across the low and the very high modalities. Students with the highest level of inattention reported an AOR (95% CI) of 4.58 (4.02 to 5.22) for high perceived stress when compared with students with very low inattention who reported low perceived stress. In the adjusted model, we also found significant associations between

$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$		Inattention symptoms					χ^2 test							
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$		Very low (n = 1,871)		Lov (n = 1,	Low (n = 1,750)		High (n = 1,530)		Very high (<i>n</i> = 1,800)					
Gender 0.10 Male 411 22.0 419 23.9 394 25.8 474 26.3 Study level		n	%	n	%	n	%	n	%	þ value				
Male 411 22.0 419 23.9 394 25.8 474 26.3 Female 1,460 78.0 1,331 76.1 1,136 73.2 1,326 73.7 Study level	Gender									.010				
Female1,46078.01,3176.11,13674.21,32673.7Study level	Male	411	22.0	419	23.9	394	25.8	474	26.3					
Study level .027 First year 855 45,7 746 42.6 650 42.5 770 42.8 Second year 301 16.1 362 20.7 715 18.0 339 18.8 Third year 281 15.0 237 13.5 209 13.7 256 14.2 postsecondary education	Female	1,460	78.0	1,331	76.I	1,136	74.2	1,326	73.7					
First year 855 45.7 746 42.6 650 42.5 770 42.8 Second year 301 16.1 362 20.7 275 18.0 339 18.8 Third year 281 15.0 23.1 396 25.9 435 24.2 postsecondary education	Study level									.027				
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Third year 281 15.0 237 13.5 209 13.7 256 14.2 Fourth or more higher year of postsecondary education 434 23.2 405 23.1 396 25.9 435 24.2 Type of study 5ciences 774 41.4 639 36.5 570 37.3 584 32.4 Social and economic sciences 225 12.0 198 11.3 179 11.7 210 11.7 Literature/humanities 389 20.8 434 24.8 370 24.2 506 28.1 Other 483 25.8 479 27.4 411 26.9 500 27.8 Parents' marital status	Second year	301	16.1	362	20.7	275	18.0	339	18.8					
Fourth or more higher year of postsecondary education 434 23.2 405 23.1 396 25.9 435 24.2 Type of study	Third year	281	15.0	237	13.5	209	13.7	256	14.2					
Type of study <	Fourth or more higher year of postsecondary education	434	23.2	405	23.1	396	25.9	435	24.2					
Sciences 774 41.4 639 36.5 570 37.3 584 32.4 Social and economic sciences 225 12.0 198 11.3 179 11.7 210 11.7 Literature/humanities 389 20.8 434 24.8 370 22.5 506 28.1 Other 483 25.8 479 27.4 411 26.9 500 27.8 Parents' marital status	Type of study									<.0001				
Social and economic sciences 225 12.0 198 11.3 179 11.7 210 11.7 Literature/humanities 389 20.8 434 24.8 370 24.2 506 28.1 Other 483 25.8 479 27.4 411 26.9 500 27.8 Parents' marital status	Sciences	774	41.4	639	36.5	570	37.3	584	32.4					
Literature/humanities 389 20.8 434 24.8 370 24.2 506 28.1 Other 483 25.8 479 27.4 411 26.9 500 27.8 Parents' marital status	Social and economic sciences	225	12.0	198	11.3	179	11.7	210	11.7					
Other48325.847927.441126.950027.8Parents' marital status	Literature/humanities	389	20.8	434	24.8	370	24.2	506	28.1					
Parents' marital status .093 Not divorced 1,319 70.5 1,203 68.7 1,042 68.1 1,200 66.7 Divorced 552 29.5 547 31.3 488 31.9 600 33.3 Parents' educational attainment - - - 667 35.6 626 35.8 558 36.5 639 35.5 .943 Postgraduate studies 1,204 64.4 1,124 64.2 972 63.5 1,161 64.5 Family economic condition in childhood - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -	Other	483	25.8	479	27.4	411	26.9	500	27.8					
Not divorced1,31970.51,203 68.7 1,042 68.1 1,200 66.7 Divorced55229.5547 31.3 488 31.9 600 33.3 Parents' educational attainment <postgraduate studies<="" td="">$667$$35.6$$626$$35.8$$558$$36.5$$639$$35.5$.943>Postgraduate studies$1,204$$64.4$$1,124$$64.2$$972$$63.5$$1,161$$64.5$Family economic condition in childhoodComfortable$1,050$$56.1$$922$$52.7$$788$$51.5$$871$$48.4$Adequate$685$$36.6$$658$$37.6$$584$$38.2$$711$$39.5$Difficult$136$$7.3$$170$$9.7$$158$$10.3$$218$$12.1$Perceived stress level$51.5$$640$$36.6$$450$$29.4$$331$$18.4$Moderate$605$$32.3$$647$$37.0$$564$$36.9$$597$$33.2$High$302$$16.1$$463$$26.5$$516$$33.7$$872$$48.4$Antecedent depression diagnosed<</postgraduate>	Parents' marital status									.093				
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Parents' educational attainment Initial Procession of the second sec	Divorced	552	29.5	547	31.3	488	31.9	600	33.3					
<postgraduate studies<="" td=""> 667 35.6 626 35.8 558 36.5 639 35.5 .943 >Postgraduate studies 1,204 64.4 1,124 64.2 972 63.5 1,161 64.5 Family economic condition in childhood</postgraduate>	Parents' educational attainment													
Prograduate studies 1,204 64.4 1,124 64.2 972 63.5 1,161 64.5 Family economic condition in childhood	<postgraduate studies<="" td=""><td>667</td><td>35.6</td><td>626</td><td>35.8</td><td>558</td><td>36.5</td><td>639</td><td>35.5</td><td>.943</td></postgraduate>	667	35.6	626	35.8	558	36.5	639	35.5	.943				
Family economic condition in childhood Image Provide Pro	>Postgraduate studies	1.204	64.4	1.124	64.2	972	63.5	1.161	64.5					
Comfortable 1,050 56.1 922 52.7 788 51.5 871 48.4 Adequate 685 36.6 658 37.6 584 38.2 711 39.5 Difficult 136 7.3 170 9.7 158 10.3 218 12.1 Perceived stress level	Family economic condition in childhood	.,	•	.,	•			.,	•	<.0001				
Adequate $h, G2$ $h, G2$ $h, G4$	Comfortable	1.050	56.1	922	52.7	788	51.5	871	48.4					
Difficult 136 7.3 170 9.7 158 10.3 218 12.1 Perceived stress level <td>Adequate</td> <td>685</td> <td>36.6</td> <td>658</td> <td>37.6</td> <td>584</td> <td>38.2</td> <td>711</td> <td>39.5</td> <td></td>	Adequate	685	36.6	658	37.6	584	38.2	711	39.5					
Perceived stress level	Difficult	136	7.3	170	9.7	158	10.3	218	12.1					
Low 964 51.5 640 36.6 450 29.4 331 18.4 Moderate 605 32.3 647 37.0 564 36.9 597 33.2 High 302 16.1 463 26.5 516 33.7 872 48.4 Antecedent depression diagnosed	Perceived stress level									<.0001				
Moderate 605 32.3 647 37.0 564 36.9 597 33.2 High 302 16.1 463 26.5 516 33.7 872 48.4 Antecedent depression diagnosed	Low	964	51.5	640	36.6	450	29.4	331	18.4					
High 302 16.1 463 26.5 516 33.7 872 48.4 Antecedent depression diagnosed	Moderate	605	32.3	647	37.0	564	36.9	597	33.2					
Antecedent depression diagnosed 1,698 90.8 1,553 88.7 1,342 87.7 1,478 82.1 No 1,698 90.8 1,553 88.7 1,342 87.7 1,478 82.1 Yes 173 9.2 197 11.3 188 12.3 322 17.9 Antecedent anxiety diagnosed	High	302	16 1	463	26.5	516	33.7	872	48.4					
No 1,698 90.8 1,553 88.7 1,342 87.7 1,478 82.1 Yes 173 9.2 197 11.3 188 12.3 322 17.9 Antecedent anxiety diagnosed <	Antecedent depression diagnosed	002	10.1	100	20.0	510	00.7	0/2	10.1	< 000 l				
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Antecedent anxiety diagnosed 1,639 87.6 1,535 87.7 1,305 85.3 1,459 81.1 Yes 232 12.4 215 12.3 225 14.7 341 18.9 Antecedent ADHD diagnosed 0.0001 No 1,848 98.8 1,731 98.9 1,507 98.5 1,749 97.2 Yes 23 1.2 19 1.1 23 1.5 51 2.8 Are (continuous) 20.7 2.9 20.7 2.6 20.9 2.4 0.004	Yes	1,070	9.2	1,333	113	1,3 12	123	322	179					
No 1,639 87.6 1,535 87.7 1,305 85.3 1,459 81.1 Yes 232 12.4 215 12.3 225 14.7 341 18.9 Antecedent ADHD diagnosed 0.0001 No 1,848 98.8 1,731 98.9 1,507 98.5 1,749 97.2 Yes 23 1.2 19 1.1 23 1.5 51 2.8 Are (continuous) M + SD 20.7 2.9 20.7 2.6 20.9 2.4 0.004	Antecedent anxiety diagnosed	175	7.2	177	11.5	100	12.5	522	17.7	<0.0001				
Yes 232 12.4 215 12.3 225 14.7 341 18.9 Antecedent ADHD diagnosed 0.0001 No 1,848 98.8 1,731 98.9 1,507 98.5 1,749 97.2 Yes 23 1.2 19 1.1 23 1.5 51 2.8	No	1 639	87.6	1 5 3 5	877	1 305	85.3	1 459	811	-0.0001				
Antecedent ADHD diagnosed 1,848 98.8 1,731 98.9 1,507 98.5 1,749 97.2 Yes 23 1.2 19 1.1 23 1.5 51 2.8	Yes	232	12.4	215	123	225	147	341	18.9					
No I,848 98.8 I,731 98.9 I,507 98.5 I,749 97.2 Yes 23 I.2 I9 I.1 23 I.5 51 2.8 Are (continuous) M + SD 20.7 2.9 20.7 2.6 20.8 2.0 2.4 0.004	Antecedent ADHD diagnosed	232	1 4. 1	215	12.5	223	1 1.7	511	10.7	0 000 1				
Yes 23 1.2 19 1.1 23 1.5 51 2.8 Are (continuous) $M + SD$ 20.7 2.9 20.7 2.4 20.8 2.9 20.4	No	1 848	98.8	1 731	98 9	1 507	98 5	1 749	97.2	0.0001				
Are (continuous) $M + SD$ 20.7 2.9 20.7 2.4 20.8 2.9 20.9 2.4 0.004	Yes	י, זר	10.0	1,751	11	י,507 רכ	15	51	28					
	Age (continuous) M + SD	20.7	29	20.7	2.6	20.8	29	20.9	2.0	0 004				

Table I. Characteristics of the Study Population According to Levels of Inattention Symptoms: i-Share cohort (N = 6,951).

increasing levels of hyperactivity and high perceived stress. Hyperactivity modalities became significant starting at the high level (i.e., the fourth quintile) compared with the moderate modality which was significant in the unadjusted model (i.e., the third quintile). The effect sizes were lower in comparison with those for inattention. Students with the highest level of hyperactivity reported an AOR (95% CI) of 1.21 [1.05, 1.39] for high perceived stress when compared with students with very low hyperactivity who reported low perceived stress.

Discussion

Higher levels of inattention and hyperactivity/impulsivity were independently associated with greater perceived stress in this large, cross-sectional study of college students. The

	Hyperactivity/impulsivity					χ^2 test					
	Very low (<i>n</i> = 1,261)		Lc (n = 1	Low Mode (n = 1,009) (n = 1		erate ,382)	Hi (n = 1	High (n = 1,407)		Very high (n = 1,892)	
	n	%	n	%	n	%	n	%	n	%	p value
Gender											.222
Male	329	26. I	236	23.4	329	23.8	322	22.9	482	25.5	
Female	932	73.9	773	76.6	1,053	76.2	1,085	77.1	1,410	74.5	
Study level											<.0001
First year	462	36.6	427	42.3	607	43.9	628	44.6	897	47.4	
Second year	208	16.5	174	17.2	273	19.8	288	20.5	334	17.7	
Third year	209	16.6	128	12.7	176	12.7	185	13.1	285	15.1	
Fourth or more higher year of postsecondary education	382	30.3	280	27.8	326	23.6	306	21.7	376	19.9	
Type of study											.048
Sciences	459	36.4	352	34.9	534	38.6	516	36.7	706	37.3	
Social and economic sciences	147	11.7	146	14.5	147	10.6	173	12.3	199	10.5	
Literature/humanities	297	23.6	264	26.2	342	24.7	349	24.8	447	23.6	
Other	358	28.4	247	24.5	359	26.0	369	26.2	540	28.5	
Parents' marital status											.621
Not divorced	862	68.4	706	70.0	950	68.7	973	69.2	1.273	67.3	
Divorced	399	31.6	303	30.0	432	31.3	434	30.8	619	32.7	
Parents' educational attainment											.026
<postgraduate studies<="" td=""><td>410</td><td>32.5</td><td>343</td><td>34.0</td><td>510</td><td>36.9</td><td>517</td><td>36.7</td><td>710</td><td>37.5</td><td></td></postgraduate>	410	32.5	343	34.0	510	36.9	517	36.7	710	37.5	
>Postgraduate studies	85 I	67.5	666	66.0	872	63.1	890	63.3	1.182	62.5	
Family economic condition in childhood									,		<.0001
Comfortable	716	56.8	555	55.0	716	51.8	717	51.0	927	49.0	
Adequate	447	35.4	364	36.1	543	39.3	547	38.9	737	39.0	
Difficult	98	7.8	90	8.9	123	8.9	143	10.2	228	12.1	
Perceived stress level											<.0001
Low	535	42.4	383	38.0	465	33.6	444	31.6	558	29.5	
Moderate	419	33.2	344	34.1	520	37.6	479	34.0	65 I	34.4	
High	307	24.3	282	27.9	397	28.7	484	34.4	683	36. I	
Antecedent depression diagnosed											<.0001
No	1,133	89.8	912	90.4	1,233	89.2	1,195	84.9	1,598	84.5	
Yes	128	10.2	97	9.6	149	10.8	212	15.1	294	15.5	
Antecedent anxiety diagnosed											<.0001
No	1,147	91.0	894	88.6	1,189	86.0	1,200	85.3	1,508	79.7	
Yes	114	9.0	115	11.4	193	14.0	207	14.7	384	20.3	
Antecedent ADHD diagnosed											<.0001
No	1,258	99.8	1,001	99.2	1,365	98.8	1,399	99.4	1,812	95.8	
Yes	3	0.2	8	0.8	17	1.2	8	0.6	80	4.2	
Age (continuous) M ± SD	21.3	3.3	20.8	2.8	20.8	2.9	20.6	2.7	20.5	2.2	<.0001

Table 2. Characteristics of the Study Population According to the Levels of Hyperactivity/Impulsivity Symptoms: i-Share cohort (N = 6,951).

association was stronger between stress and inattention than for hyperactivity/impulsivity. The findings remained statistically significant after adjusting for a range of potential confounders. Our results are in line with previous research on college students which demonstrated associations between ADHD symptoms and perceived stress (Harrison et al., 2013; Overbey et al., 2009). However, in contrast with these few studies whose sample sizes were moderate, our present research was conducted in a large population of college students. The finding that inattention was strongly associated with higher perceived stress in comparison with hyperactivity/impulsivity is also in line with the results of Combs et al. (2015) who considered the independent associations of the two primary ADHD symptom clusters to stress among a

		Unadjusted			Adjusted			
	OR	95% CI	þ value	OR	95% CI	þ value		
Inattention								
Very low	r	reference			reference			
Low	1.80	[1.59, 2.04]	<.0001	1.85	[1.63, 2.10]	<.0001		
High	2.49	[2.19, 2.83]	<.0001	2.59	[2.27, 2.95]	<.0001		
Very high	4.56	[4.02, 5.18]	<.0001	4.58	[4.02, 5.22]	<.0001		
Hyperactivity/imp	oulsivity							
Very low	r	eference			reference			
Low	1.11	[0.95, 1.30]	.1768	[1.07, 0.91]	1.25	.4167		
Moderate	1.21	[1.05, 1.40]	.0086	[1.13, 0.97]	1.31	.1078		
High	1.39	[1.21, 1.61]	<.0001	[1.24, 1.07]	1.43	.0044		
Very high	1.41	[1.23, 1.61]	<.0001	[1.21, 1.05]	1.40	.0068		

Table 3. Associations Betw	een ADHD Symptoms an	d High Perceived Stress:	i-Share cohort $(N = 6,951)$
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Note. Results for multinomial logistic regression models with high perceived stress as dependent variable. Calculated ORs had three reference categories, two for the explanatory variables (very low symptoms of inattention and very low symptoms of hyperactivity) and one for the outcome (low perceived stress). Adjusted for age, sex, parental education level, parental separation, family economic condition in childhood, study level, type of study, previous psychiatric diagnosis of ADHD, anxiety, and depression. OR = odds ratio; CI = confidence interval.

community sample of adults. In addition, our results complement previous research among college-aged students that identified that inattention symptom, and not hyperactiveimpulsive symptoms, were associated with poor academic concerns (Norvilitis et al., 2010; Norwalk et al., 2009; Schwanz et al., 2007), poor romantic satisfaction (Overbey et al., 2009), depression (Rabiner et al., 2008), substance use (Mesman, 2015), and risky sexual behaviors (Marsh et al., 2012). Taken together, these results suggest that inattention may be the more critical predictor of social, academic, and emotional adjustment in college. Our findings may reflect the fact that inattentive symptoms of ADHD are more likely to persist into adulthood, whereas hyperactive/impulsive symptoms tend to dissipate over time (Barkley, 2006; Biederman et al., 2000). The strengths of the study are the large community sample of college students, the standardized assessment of perceived stress, inattention and hyperactivity/impulsivity symptoms, the adjustment for a large range of confounders, and the homogeneous nature of our cohort that may reduce confounding. Several limitations should be considered when interpreting the present findings. First, the correlational nature of the data does not allow one to make causal inferences about the relationship between ADHD symptoms and perceived stress. Additional research is needed to examine the relationship between inattention and hyperactivity/symptoms and perceived stress in a longitudinal manner to further explore this issue. Second, this cross-sectional study was based on self-reported information provided by students which may have led to reporting bias. However, self-report measures have been frequently used to confirm ADHD symptomatology in college-aged students, and it has been shown that adults were reliable reporters of current ADHD symptoms (Murphy & Schachar, 2000). In addition, the PSS has demonstrated good reliability and validity in college

student samples (Cohen et al., 1983). Third, students were invited to participate in the study and participants were studying at the Universities of Bordeaux, Versailles, and Nice. Therefore, generalizability to other settings may be limited. Fourth, we did not have information on the presence of current diagnoses of depression and anxiety that may influence an individual's level of perceived stress. However, our study controlled for previous psychiatric diagnosis of depression and anxiety. It would also have been of value to control for concentration deficit disorder (i.e., sluggish cognitive tempo) as it that has been associated to higher levels of perceived stress in adults and to the inattentive form of ADHD (Barkley, 2011; Combs et al., 2015; Milich, Balentine, & Lynam, 2001). Future investigations might also examine whether a third variable, such as negative core beliefs (Miklósi, Máté, Somogyi, & Szabó, 2016), may mediate the relationship between ADHD and stress among college students. Indeed, Miklósi et al. (2016) found, in a sample of 204 nonclinical adults, that more severe ADHD symptoms were associated with higher levels of perceived stress both directly and indirectly through stronger maladaptive schemata. Last, this study was designed to examine attention and hyperactivity/ impulsivity problems independent of a clinical diagnosis of ADHD. Furthermore, due to the Internet-based nature of this survey, both stress and ADHD symptom assessments were based on relatively brief measurement tools. Therefore, generalizability to clinical samples may be limited. Future research would benefit from examining these issues in a clinically diagnosed group. However, the presence of greater stress among the students with subclinical symptoms of ADHD speaks to the robustness of the effect. Despite the limitations, this study is one of very few that addresses whether the different types of subclinical ADHD symptoms are independently related to perceived stress among college

students. Our results suggest that increasing levels of ADHD symptoms are associated with increasing level of perceived stress among college students. Inattentive symptoms appear to be more closely related to perceived stress than are hyperactivity/impulsivity symptoms. These findings highlight the importance for universities to implement screenings to better detect ADHD symptoms among college students so that adequate support may be given and that students may be referred to health professionals. In addition, these findings suggest that targeting students with inattentive symptoms may be particularly important for intervention. Interventions such as mindfulness that have been reported to reduce stress and increase attention among college students should be encouraged among this population (Bamber & Schneider, 2016). Similarly, future research among college students should examine and evaluate the impact of a stress management training program tailored to the needs of adults with ADHD among college students as this type of program has previously been shown to be effective at reducing stress symptoms (Langer, Greiner, Koydemir, & Schütz, 2013).

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Authors' Note

The authors assert that all procedures contributing to this work comply with the ethical standards laid down in the 1964 Declaration of Helsinki and its later amendments. All participants gave their informed consent prior to their inclusion in the study.

Declaration of Conflicting Interests

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