

Chronic Stress and Its Association with Psychological, Behavioral and Physiological Variables of Mexican College Students

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Received 28 October 2015; accepted 14 December 2015; published 17 December 2015

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Abstract

Chronic Stress in an academic environment is considered to be the physiological, emotional, cognitive and behavioral reaction to scholastic events. The objective of this study was to identify chronic stress and its association with psychological, behavioral and physiological variables of Mexican students at a public university. A representative random sample of 527 students in 2012 was assessed. The *Stress Symptoms Inventory* and the Rossi classification were used and a multiple regression analysis was carried out. Results showed that 35.3% of students displayed high levels of chronic stress; 44.8% medium levels and 19.9% low levels, and the variables of working, digestion problems, nail-biting, feeling depressed, isolation from others, are predictors of chronic stress. Early detection of the variables associated with chronic stress in students would facilitate the implementation of educational programs aimed at developing students' ability to cope with stressful situations.

Keywords

Stress, Students, Psychophysiological Disorders, Behavioral Symptoms, Universities

1. Introduction

Chronic stress is a physical, psychological and behavioral response stemming from a lack of control over situations perceived as threatening. Students often experience stress, which may lead to negative repercussions to their health as well as their academic performance. Its origin may be associated with different causes threatening

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the adaptive balance by reducing their coping abilities. Therefore, students are a vulnerable group with regards to stress-related diseases (Park, Edmondson, & Lee, 2012).

Chronic stress is currently considered a trigger of alterations to the emotional state, of difficulties in interpersonal relations or of physical health. Some of the manifestations are identified in physiological reactions (or physiological unrelated to organic diseases), psychological (cognitive or emotional) and behavioral (attitude or behavior towards society) considered non-adaptive (Berrio & Mazo, 2011; Costarelli & Patsai, 2012; Diaz 2010).

High chronic stress levels in students may give rise to violence, toxic substance addiction, demotivation, boredom, difficulties in relations with schoolmates and in some cases school drop-out among others. Byrd and McKinney (2012) mention that moderate stress is good for learning and for immune responses but on the other hand, high chronic stress levels weaken the organism due to the fact that cortisol levels rise and may create mental or physical health problems (Jayakumar & Sulthan, 2013; Arzate, 2011).

Some studies also associate stress with life events and with school activities such as academic overload and work (Surujal, Zyl, & Nolan, 2013). Psychological manifestations that have been reported are dissatisfaction or anxiety, social isolation and sleep-related (Furutani, Tanaka, & Agari, 2011; Gulewtsch, Enck, Schwille-Kiuntke, Weimer, & Schlarb, 2013; Palmer, 2013). Physiological manifestations are mobility problems, visceral sensitivity and gastrointestinal functions (e.g. Cobo-Cuenca, Rodriguez, Sanchez, Vivo, Carbonell, & Castellanos, 2012; Gulewitsch et al., 2013; Jayakumar & Sulthan, 2013; Park et al., 2012).

Public university students in Mexico face several obstacles in developing their professional education, one of which is linked to high poverty levels in Mexico (Arzate, 2011). Some of them have to work in addition to studying and complete their academic load in different schedules (morning and afternoon) besides professional practices outside their school schedules. This may create an overload of activities that entails high chronic stress levels.

This study is based on the transactional theory of the *social cognitive* approach that conceives psychological stress as a particular relation between students and their environment that is viewed as threatening or overwhelms their coping resources and can jeopardize their wellbeing and academic performance (Gonzalez & Landero, 2008).

Therefore, the purpose of this study was to identify chronic stress and its association with psychological, behavioral and physiological variables in Mexican students at a public university.

2. Method

2.1. Participants

A cross-sectional analytical study was made during the 2012 school year of undergrad students majoring in physical culture and sports at a public university in Guadalajara, Mexico. A simple random sample was made of the recorded population (976) of which 63% were men and 37% women. The size was determined with an expected prevalence of 64.5% (Marty, Lavin, Figueroa, Larrain de la C, & Cruz, 2005) and a minimum acceptable frequency of 70%, an accuracy level of 99% (Lwanga & Lameshow, 1991) requiring a sample size of 527 students who were interviewed individually. The college students were selected with the random number technique, proportionate according to gender and semester at college. The list of students enrolled in the 2012 schoolyear enabled a search of those chosen to answer the survey voluntarily and who gave their informed consent. The research protocol and the informed consent form were reviewed and approved with reference number IISO/CI/11/2012-2013 pursuant to the 2008 Declaration of Helsinki regarding the ethics of research with human beings.

2.2. Instruments

Stress Symptoms Inventory (SSI)

This inventory, created and validated by Lipp and Guevara (1994), contains a list of 41 Psychophysiological Symptoms characteristic of chronic stress, based on the three-phase model developed by Selye (alarm, resistance and exhaustion). Dominguez adapted it in Mexico in 1998 with a content validation that reports an internal Cronbach alpha consistency of .94, indicative of an acceptable degree of reliability. The classification into high,

medium and low levels of chronic stress was based on the average and standard deviation (SD). A *high level* was considered to greater than two and three SD; the *medium level* was less than one SD, and a *low level* less than two and three SD (Pozos-Radillo, Torres, Aguilera, Acosta, & Gonzalez, 2008).

A questionnaire was used to gather information about psychological, behavioral and physiological variables based on the classification established by Rossi (2001): physiological variables mean those implying a physical reaction (nail-biting, muscle tremors, headache, insomnia, chronic fatigue, digestion problems and drowsiness); psychological variables are those involving cognitive or emotional functions (restlessness, anxiety, mental block, feeling depressed, despair and memory problems); and behavioral variables are those having to do with the person's behavior (arguing, isolation from others, classroom absenteeism, eating more or less and listlessness towards performing academic work). To assess the participants, they were asked whether they had had any of these symptoms during the past six months. The questionnaire offered four multiple choices for an answer (1 = *never* to 2 = *always*).

The variables of gender, college semester, if they worked and age (in 5-year intervals) were also analyzed as predictive variables.

2.3. Procedure

The Pearson correlation analysis was applied as a prerequisite for the multiple regression analysis, with chronic stress as the response variable and psychological, behavioral, physiological, age, college semester and work variables as the predictive variables, considering a model with a significance level of $p > .05$.

The analysis of variables is ordered in the equation in terms of the percentage of explained variance.

Then a hierarchical multiple regression analysis was applied to determine the predictive value of the physiological, psychological and behavioral variables with regard to chronic stress in which the Introduder method was used. An increased prediction value of the variable listed in fifth place was obtained with this procedure, once the effect of the fourth, third, second and first ones were controlled.

The data were tabulated and processed with the Statistical Package for Social Sciences (SPSS), Version 15 for Windows XP, under the university's license.

3. Results and Findings

527 students at a public university were interviewed: 311 (59%) females and 216 (41%) male. The age range was between 18 and 33 years old, the average age was 21.07 (± 1.80 years), 243 (46%) of them worked and academic levels ranged from first to eighth semester, as seen in **Table 1**.

The descriptive analysis of the physiological, psychological and behavioral variables showed that the most frequent ones were: the physiological variable, digestion problems with 56% (294); the psychological variable, restlessness with 39% (204), the behavioral variables, isolation from others with 66% (348); their distribution is shown in **Table 1**.

Predictive value of SSI in association with physiological, psychological and behavioral variables as well as age, college semester and work.

The correlations of Stress Symptoms Inventory (SSI) scores with the variables of this study showed moderate to strong positive correlations (Pearson $r > .30$). The symptom with a strong correlation was isolation from others ($r = .76$; $p < .01$). The variables with a moderate correlation were: nail-biting ($r = .36$; $p < .01$), working ($r = .51$; $p < .01$), digestion problems ($r = .52$; $p < .01$), and feeling depressed ($r = .64$; $p < .01$) (**Table 2**).

Variables showing a low or inverse correlation (Pearson $r < .30$) were not taken into consideration in this study. Those with a low correlation were: eating more or less; classroom absenteeism; drowsiness; arguing; restlessness; chronic fatigue; listlessness towards performing academic work; anxiety; despair; muscle tremors; memory problems; mental block and concentration problems. Those with an inverse correlation were: college semester; age; gender; insomnia and migraines.

The correlation coefficients obtained in the stepwise regression for chronic stress scored with the ISE of each of the variables: psychological, behavioral, physiological, gender, age, academic year and work, that met the prediction criteria and had significance value, revealed that working, digestion problems, isolation from others, nail-biting and feeling depressed were predictors of chronic stress ($R^2 = .67$) $F = 14.9$, $p < .05$).

The variable isolated from the others was the first one entered into the model and made up 20% of the SSI prediction with $F = 9.8$ ($p < .01$). Nevertheless, when the variables of working, digestion problems, nail-biting

Table 1. Distribution of chronic stress according to psychological, behavioral, physiological, gender, age, college semester and work variables of students at a public university in Guadalajara, Mexico 2012 N = 527.

LEVELS	CHRONIC STRESS							
	HIGH		MEDIUM		LOW		TOTAL	
	FX	%	FX	%	FX	%	FX	%
PSYCHOLOGICAL								
Restlessness	78	5.1	88	16.7	38	7.2	204	38.7
Concentration Problems	66	12.5	74	14.0	28	5.3	168	31.9
Mental block	78	14.8	77	14.6	31	5.9	186	32.3
Feeling depressed	84	15.9	76	14.4	32	6.1	192	36.4
Anxiety	73	13.8	79	14.9	36	6.8	188	25.6
Despair	64	12.1	79	14.9	25	4.7	168	31.9
Memory problems	83	15.7	78	14.8	31	5.9	192	36.4
PHYSIOLOGICAL								
Nail-biting	101	19.2	94	17.8	49	9.3	244	46.3
Muscle tremors	73	13.8	98	18.6	42	8.0	213	40.4
Migraines	53	10.0	75	14.2	37	7.0	165	31.3
Insomnia	90	17.1	94	17.8	60	11.4	244	46.3
Chronic fatigue	89	16.9	99	18.8	28	5.3	216	41.4
Digestion problems	118	22.4	117	22.2	59	11.2	294	55.8
Drowsiness	58	11.0	69	13.1	25	4.7	152	28.8
BEHAVIORAL								
Arguing	71	13.5	87	16.5	30	5.7	188	35.7
Isolation from othe	131	24.8	177	33.5	40	7.6	348	66.0
rs Classroom absenteeism	82	15.5	94	17.8	26	4.9	202	38.3
Eating less or more	25	4.7	32	6.1	7	1.4	64	12.1
Listlessness towards working	80	15.2	86	16.3	43	8.1	209	39.6
GENDER								
Female	121	22.9	129	24.5	61	11.6	311	59.0
Male	65	12.3	107	20.3	44	8.3	216	41.0
AGE								
18 - 23	80	12.2	93	17.6	39	7.4	212	40.2
21 - 23	85	16.1	127	24.1	58	11.0	270	51.2
24 - 29	21	4.0	16	3.0	6	1.1	43	8.1
30 y+	0	0.0	0	0.0	2	0.4	2	0.4
COLLEGE SEMESTER								
First	4	0.7	6	1.1	4	0.7	14	2.6
Second	15	2.8	17	3.2	4	0.7	36	6.8
Third	37	7.0	45	8.5	22	4.2	104	19.7
Fourth	33	6.3	33	6.3	19	3.6	85	16.1
Fifth	32	6.1	40	7.6	10	1.9	82	15.5
Sixth	21	4.0	34	6.4	13	2.5	68	12.9
Seventh	18	3.4	30	5.7	22	4.2	70	13.3
Eighth	26	4.9	31	5.9	11	2.1	68	12.9
WORK								
Yes	115	21.8	121	23.0	48	9.1	284	53.9
No	71	13.5	115	21.8	57	10.8	243	46.1

Note: SSI questionnaire = chronic stress.

Table 2. Correlation matrix of scores obtained by college students for chronic stress and psychological, behavioral, physiological and work variables of students at a public university in Guadalajara, Mexico 2012.

	SSI	Digestion problems	Feeling depressed	Working	Isolation from others	Nail-biting
SSI	---					
Digestion problems	0.52*	---				
Feeling depressed	0.64**	0.30**	---			
Working	0.51**	0.70**	0.39**	---		
Isolation from others	0.76**	0.45**	0.06**	0.38**	---	
Nail-biting	0.36**	0.52**	0.65**	0.85**	0.58**	---

Note: SSI = chronic stress * $p < .05$; ** $p < .01$.

and feeling depressed were introduced, the predictive model remained at 67% of the variance. The regressive equation was composed as follows: $SSI = .24 (\text{working}) + .31 (\text{digestion problems}) + .48 (\text{isolation from others}) + .68 (\text{nail-biting}) + .83 (\text{feeling depressed}) + .088$. The other variables with low or inverse correlations were excluded from the model, significantly increasing the explained ISE percentage (**Table 3**).

Further to these analyses, different contrasts were made in connection with the assumptions of independence, normality and homoscedasticity. We should point out in this regard that the data does not show multicollinearity between the predictive variables, as was expected. The average statistical values of “Tolerance” for the psychological, behavioral, physiological and work variables was .97 with no value below .94. The proximity of these values to the maximum value (range of 0 - 1) indicated the independence of the contributions of predictive variables above the chronic stress values, thereby indicating that the residual variance was constant and residuals were distributed normally. The average VIF value = 1.02 with no value below 1.00 showed that there is no problem with multicollinearity.

4. Discussion

The study showed the existence of a meaningful association between some psychological, behavioral, physiological, and work variables and chronic stress. Associated physiological variables were: digestive problems and nail-biting. Behavioral variables were only associated with isolation from others while the only association found with psychological variables was feeling depressed. A positive correlation occurred, indicating a dependence between these variables and chronic stress; i.e., when one of them increases, the other one also increases at a constant proportion. We should mention that this is the first predictive report identifying the existence of an association between chronic stress and psychological, behavioral and physiological symptoms in college students at a public university in Guadalajara, Mexico.

The resulting regression model of this investigation contributes to the transactional theory of the *social cognitive* approach that underscores the interaction of stress variables based on cognitive processes that develop around a stressful situation as the internal representation of particular and problematic assessments between students and their academic environment.

Previous studies have shown that chronic stress is present in college students associated with anxiety, academic overload and dissatisfaction (Furutani et al., 2011; Gulewitsch et al., 2013 and Palmer, 2013) as well as with social isolation, insomnia, nail-biting and gastrointestinal problems (e.g. Chen et al., 2013; Cobo-Cuenca et al., 2012; Jayakumar & Sulthan, 2013; Mounsey, Vandehey, & Diekhoff, 2013; Park et al., 2012). The results of these investigations agree with those presented here but differ in “feeling depressed” and “working”. These differences may be due to the variation of study designs, the variables and due to the different situations they are associated with, such as anxiety, heart rate, academic stress, coping, beliefs and students’ inclination to have low academic performance, as well as the different curricula taught at the educational institution where students enrolled (Mounsey et al., 2013; Pettit & DeBarr, 2011; Reang & Bhattacharjya, 2013; Surujlal et al., 2013).

With regards to the variable “working while studying”, some studies mention that while working may be positive for some college students, for others it may have negative effect due to the double load (Ablanedo-Rosas, Blevins, Gao, Teng, & White, 2011; Reang & Bhattacharjya, 2013).

Table 3. Hierarchical multiple regression analysis of each of the psychological, behavioral, physiological, and work variables of students at a public university in Guadalajara, Mexico 2012.

REGRESSION MODEL	Beta	ET	(p)	R ²	F	n
Constant	0.08			0.67	14.9	
Working	0.24	1.79	<.01			284
PHYSIOLOGICAL VARIABLES						
Digestion problems	0.31	1.19	<.01			294
PSYCHOLOGICAL VARIABLES						
Isolation from others	0.48	1.90	<.01			370
BEHAVIORAL VARIABLES						
Nail-biting	0.68	2.19	<.05			244
Feeling depressed	0.83	3.20	<.05			192

Note: SSI questionnaire = chronic stress. * $p < .05$; ** $p < .01$.

Ablanedo-Rosas et al. (2011) found that some students who work are under pressure and have financial problems, which may cause low academic performance. Another negative aspect related to work and school schedules is that students have to make adjustments to meet both demands. This could create problems at work and/or at school, leading to increased anxiety or a state of depression (Chen et al., 2013; McGowan & Kagee, 2013).

Our study also detected that there is more presence of medium chronic stress levels, a situation that should be considered alarming because SSI is based on manifest symptoms and a lack of timely intervention to reduce them to low levels could evolve into high chronic stress levels at any time.

It also observed that despite the fact that the gender variable failed to show a meaningful association according to the multiple regression analysis, women displayed higher levels of chronic stress as well as more psychological, behavioral and physiological symptoms than men. Therefore close attention must be paid to this population. Other studies have found that the female gender is at greater risk for stress (e.g., Pozos-Radillo et al., 2008; Reang & Bhattacharjya, 2013). The difference between the results of some authors and those of this work lies in the fact that the association was more specific regarding psychological, behavioral and physiological variables as well as chronic stress.

Among the strengths of this study are the sample size, which is large and representative. 54% of the total population of students studying at a public university towards a bachelor's degree in one area were interviewed; this is a greater inclusion of students in comparison with other studies dealing with stress (Reang & Bhattacharjya, 2013; Gulewitsch et al., 2013; Cobo-Cuenca et al., 2012). Furthermore, it is important to mention the limitations of this study, mainly the existence of other factors that might have influenced chronic stress at the time the questionnaires were applied such as social, economic and cultural characteristics that were not considered in this study.

5. Conclusion

College students, with chronic stress and who work tend to bite their nails and show isolation from others, have digestion problems and feel depressed unlike students without chronic stress and who do not work.

When the different psychological, behavioral and physiological variables interact among themselves, they create a vicious circle in that thoughts, emotions and behavior can become increasingly more negative and less adaptive. This may trigger negative emotional states that result in inadequate behavior, and said behavior at the same time may have a negative influence on the academic environment, thus creating more stress. So an accurate and timely identification of stressors may help understand the stress. We further recommend implementing educational programs aimed at preventing stress and its negative effects and that develop students' ability to cope with stressful situations; we further recommend including academic performance and social, economic and cultural characteristics in future studies.

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