

Association between self-reported bruxism and academic performance in university students.

Asociación entre bruxismo autorreportado y rendimiento académico de los estudiantes universitarios.

Cynthia Huañec-Paucar.¹
Valery Ayma-León.¹
Stefany Caballero-García.²

Affiliations:

¹Programa de Odontología, Facultad de Ciencias de la Salud, Universidad Peruana de Ciencias Aplicadas (UPC).

²Coordinación de Innovación y Evaluación, Facultad de Ciencias de la Salud, Universidad Peruana de Ciencias Aplicadas (UPC).

Corresponding author: Stefany Caballero-García. Facultad de Ciencias de la Salud, Universidad Peruana de Ciencias Aplicadas (UPC), Prolongación Primavera 2390, Monterrico, Santiago de Surco, Peru. **E-mail:** carmen.caballero@upc.edu.pe

Receipt : 08/24/2021 **Revised:** 01/07/2021
Acceptance: 08/31/2021

Cite as: Huañec-Paucar C, Ayma-León V & Caballero-García S.

Association between self-reported bruxism and academic performance in university students.

J Oral Res 2021; 10(4):1-11.

Doi:10.17126/joralres.2021.048

Abstract: Objective: To evaluate the association between self-reported bruxism and academic performance in students at a university in Lima, Peru. **Material and Methods:** A total of 203 students were evaluated in this study, between the ages of 19 and 35 years. Self-reported bruxism was measured using the Bruxism Assessment Questionnaire. Academic performance was evaluated using the Approval Index Scale. In addition, other variables were included such as employment status, socioeconomic level, stress, anxiety, among others. The association of variables were factored in using the chi-square test and the logistic regression presented the unadjusted and adjusted analysis. **Results:** The frequency of self-reported awake bruxism and sleep bruxism was 53.20% and 36.45%, respectively. Evidence revealed there was a statistically significant association between awake bruxism with stress and anxiety, and sleep bruxism with anxiety. Students with high academic performance (OR=2.36; IC del 95%:1.06-5.23) and low academic performance (OR=5.72; IC del 95%:1.28-25.57) were found to be more likely to have awake bruxism than those with medium academic performance. **Conclusion:** This study revealed a statistically significant association between self-reported awake bruxism and academic performance. However, in the future it is suggested to carry out a study with focus only on students with bruxism and with a larger sample of participants with low academic performance to confirm the association found between these variables.

Keywords: Self-reported bruxism; academic performance; stress; students.

Resumen: Objetivo: Evaluar la asociación entre bruxismo autorreportado y rendimiento académico en estudiantes de una universidad privada de Lima, Perú. **Material y Métodos:** Un total de 203 estudiantes con edades comprendidas entre 18 a 35 años fueron encuestados en esta investigación. Para la evaluación del bruxismo autoreportado se aplicó el cuestionario 'Bruxism Assessment Questionnaire' en su versión en español. Asimismo, el rendimiento académico se evaluó mediante la escala de Índice de Aprobación (IA). Además, se incluyeron otras variables como situación laboral, estrés, ansiedad, entre otros. La asociación

de variables se realizó mediante la prueba chi cuadrado y para el análisis crudo y ajustado se utilizó la regresión logística. **Resultados:** Se encontró una prevalencia de bruxismo de vigilia de 53.20% y de bruxismo de sueño de 36.45%. Se evidenció asociación estadísticamente significativa entre bruxismo de vigilia con estrés y ansiedad, y bruxismo de sueño con ansiedad. Se halló que los estudiantes con rendimiento académico alto (OR=2.36; IC del 95%:1.06-5.23) y rendimiento académico bajo (OR=5.72; IC del 95%:1.28-25.57) tienen más probabilidades de presentar bruxismo

de vigilia que aquellos con rendimiento académico medio. **Conclusiones:** En el presente estudio se halló asociación estadísticamente significativa entre bruxismo de vigilia autorreportado y rendimiento académico. No obstante, a futuro se sugiere realizar un estudio a los estudiantes con presencia de bruxismo y con un mayor tamaño muestral de participantes con rendimiento académico bajo para afirmar la asociación encontrada entre dichas variables.

Palabra Clave: *Bruxismo autorreportado; rendimiento académico; estrés; estudiantes.*

INTRODUCTION.

Bruxism is defined as a “repetitive masticatory muscle activity characterized by clenching or grinding of the teeth and/or by bracing or thrusting of the mandible”.¹ Although bruxism is not considered a disorder, it should be seen as a risk factor if the levels of muscular activity increase the negative consequences for oral health, such as attrition, dental fractures, dentin hypersensitivity, headaches, myofascial pain, temporomandibular joint pain, among others. This behavior can be classified according to its circadian manifestation into awake or sleep bruxism.²

Various studies carried out in Europe on university students show that the prevalence rate of awake and sleep bruxism in Italy was 37.9% and 31.8% respectively in 2016.³ In 2019, a prevalence of 57.9% and 44.7% was reported in a Lithuanian population.⁴ In Latin America, the rate of awake and sleep bruxism in Brazilian students corresponded to 31.5% and 21.5% in 2014.⁵ In 2016, in a population of the same locality, the prevalence was 63% and 60.8%, respectively.⁶ These data suggest that bruxism has increased progressively over the years, so it should not be considered an infrequent behavior and needs to be evaluated in greater depth.

Researchers report that there is a high prevalence of clinical consequences related to bruxism in university students. About 91.7% of students with chewing muscle pain suffer from bruxism. In addition, 84.8% of students with temporomandibular joint pain and 81.6% with dental attrition exhibit such behavior.⁷

Bruxism is known to be of multifactorial origin, which is why multiple studies have been carried out to determine the possible associated risk factors and their relationship with other medical or dental disorders. Some of the factors evaluated have been temporomandibular disorders, consumption of nicotine or alcohol, and psycho-emotional factors such as stress and anxiety, among others.^{8,9}

Several scientific reports confirm the association between bruxism and psycho-emotional factors. A study that evaluated stress by measuring salivary chromogranin A (CgA) levels reports that there is a relationship between sleep bruxism and sensitivity to psychological stress.¹⁰ It also states that participants who reported bruxism showed higher scores in the PSS-10 questionnaire.¹¹

Academic performance is a measure that allows students to determine their own academic progress and can be a predictor of their future professional performance.¹² Many studies have found an association between anxiety and perceived stress and academic performance, where the higher the stress and anxiety, the lower the performance of university students. This is possibly influenced by poor ability to concentrate, difficulty in retaining information, and psychological changes.^{13,14} In addition, academic performance would be also affected by various psychosocial factors such as anxiety, temperament, and motivation.^{15,16}

However, despite the demonstrated association between bruxism and stress, there are not enough studies including academic performance, although it

plays an important role in higher education and could be related to such behavior. For this reason, the aim of the present study is to determine the association between self-reported bruxism and academic performance in university students.

MATERIALS AND METHODS.

The present cross-sectional study was carried out on 203 undergraduate students from a private university in Lima, Peru, between the months of September and November 2019. The volunteers who agreed to participate in the study belonged to the schools of Architecture, Health Sciences, Communications, Engineering, Business, and Psychology.

Sample size was established using the proportions comparison formula (95% confidence level, 90% power, ratio 1:4 /Epidat version 3.1). A prevalence of bruxism of 68.4% and 40.7% of people with stress and without stress, respectively, were used. These data were based on a previous study carried out by Ordoñez-Plaza *et al.*,¹⁷ In this way, a final sample of 203 people was obtained. Non-probabilistic, convenience sampling was used in this study.

Students under 18 years of age, at study levels lower than the 5th year, those not enrolled in the academic semester of the March-July 2019 period, and students who did not accept to participate were excluded from the study (Figure 1). This research was approved by the Ethics Committee under code section CEI PI-076-19. Students were asked to participate and sign the informed consent voluntarily.

Data collection

Students from the different schools or faculties of the university who were in public areas within the premises were invited to participate in the study, without making distinctions with respect to their programs or majors.

Students were informed about the research and asked to sign the informed consent. The main variables of the study, such as self-reported bruxism and academic performance, and the covariates, age, gender, school, employment, sports practice, stress, anxiety, and socioeconomic level were evaluated by means of a self-administered questionnaire.

Employment was evaluated by the question: "Do you currently have a job? (Yes versus No), and sports

practice, by the question "Do you play or practice any sports professionally?" (Yes versus No).

The data collection process was carried out in an ordinary period at the university, that is, weeks which did not interfere with the scheduling of midterm and final exams, since this could have raised the levels of stress and anxiety in students.

The chi square test and Mann Whitney U test were used to assess the association between self-reported bruxism and the covariates adjusted analysis (95% CI) of self-reported bruxism and academic performance, considering a level of statistical significance of $p < 0.05$.

Self-reported bruxism

The evaluation was carried out through a self-report. This is a valid method used by many researchers to identify the presence of bruxism.¹⁸ The Bruxism Assessment Questionnaire developed by Winocur *et al.*,¹¹ in its Spanish version was used in this study. Awake bruxism was assessed by the question: 'Have you ever been conscious of clenching or grinding your teeth while being awake in the last 6 months?' (Yes versus No). Sleep bruxism was assessed using these three questions: 'Are you aware, or has anyone heard you grind your teeth frequently during sleep?', 'Are you aware that your teeth have worn out more than normal?', and 'Are you aware of any of the following symptoms upon waking?' (Yes versus No). 'Presence' was considered when there was a positive response to question 1 and/or 2, and at least one positive response to a symptom of question.³

The characteristics of bruxism were explained to the study participants through an information sheet, which was validated through an analysis of the document by a group of three experts in the area. The requirements for the experts were: having 5 years of professional experience in dentistry, having 3 years of teaching experience, and having a specialty in Oral Rehabilitation.

Academic performance

Academic performance was evaluated according to the Passing Rate (PR) scale. This is a classification proposed by Chain *et al.*,¹⁹ and used in various studies that assess academic performance in higher education students.²⁰ The students provided data on the total number of subjects or courses enrolled and passed during the 2019-1 university cycle.

The final percentage was classified as: Low (<80%), Medium (80-90%) and High (90-100%).

Stress and Anxiety

The DASS-21 (Depression Anxiety Stress Scale) questionnaire in its version adapted to Spanish and scientifically validated (Cronbach's α coefficient ≥ 0.72)²¹ was applied for evaluating stress and anxiety. The DASS-21 contains seven questions for each stress and anxiety variable. Respondents answered the questions on a scale from 0 to 3. The results were measured according to the total score, classifying them into categories of presence or absence. Regarding stress, a score of up to 13 was considered as absence, and a score greater than or equal to 14 as presence. Regarding anxiety, a score up to 4 was considered as absence, and a score greater than or equal to 5 meant presence.^{22,23}

Socioeconomic level

The questionnaire of the Peruvian Association of Market Research Companies (APEIM, for its acronym in Spanish) was applied in its 2011-2012 Modified Version developed by Vera-Romero et al. and scientifically validated. This version has excellent reliability as evidenced by its Cronbach's Alpha: 0.9017. Each item has a very similar value fluctuating from 0.9013 to 0.9048.²⁴

This instrument contains five questions that assess the educational level of the head of the household, the place or institution where the student receives medical care, the average number of inhabitants and rooms of the household, and primary material of the house. Each answer has a score.

Results were measured according to the total score and classified into High Socioeconomic Level (33 or more points), Medium (27-32 points), Upper Low (21-26 points), Low (13-20 points), and Extremely low (5-12 points).

Data analysis

The descriptive statistics of the numerical and categorical variables (median, interquartile range, absolute and relative frequencies) were calculated. The chi square test was used to assess the association between self-reported bruxism and the covariates. Likewise, logistic regression was used for the crude and adjusted analysis (95% CI) of self-reported bruxism and academic performance.

The statistical package STATA 15.0 (Statacorp, College Station, TX, US) was used for the analysis.

RESULTS.

A total of 203 students (61.08% female; median of 21 years old) participated in the study. Most of the evaluated students belonged to the School of Health Sciences (27.09%). It was found that 79.31% of the surveyed students did not have a job, and 92.61% did not play or practice sports professionally. Most of the participants had a medium socioeconomic level (39.60%).

A prevalence of 36.45% of stress and 71.92% of anxiety was observed. The prevalence of self-reported awake bruxism and sleep bruxism was 53.20% and 36.45%, respectively. In addition, it was found that 78.33% of the evaluated students had a high academic performance. (Table 1).

The prevalence of awake bruxism was higher in females than males (57.26% vs 46.84%). Similarly, it was found that sleep bruxism was significantly more prevalent in women (41.94%) than in men (27.85%) ($p=0.042$). A higher prevalence of awake bruxism was observed in students with stress (64.86%; $p=0.012$) and anxiety (57.53%; $p=0.048$). The association between sleep bruxism and stress was not statistically significant ($p=0.128$). Sleep bruxism was significantly more prevalent in students with anxiety (42.47%; $p=0.004$). No association was found between awake and sleep bruxism with age, school or faculty, employment, sports practice, and socioeconomic status. (Table 2)

In the crude analysis, it was observed that students with high academic performance are 2.36 times more likely to present awake bruxism compared to those with medium academic performance (OR=2.36; 95% CI:1.06-5.23) ($p=0.033$). Similarly, students with low academic performance are 5.72 times more likely to display this behavior (OR=5.72; 95% CI:1.28-25.57) ($p=0.022$).

In the adjusted analysis, it is observed that students with low academic performance (OR=5.40; 95% CI:1.11-26.12) ($p=0.036$) and high academic performance (OR=2.35; 95% CI:1.01-5.46) ($p=0.045$) continued to present a statistically significant association with awake bruxism. (Table 3)+

Figure 1. Study participants flowchart.

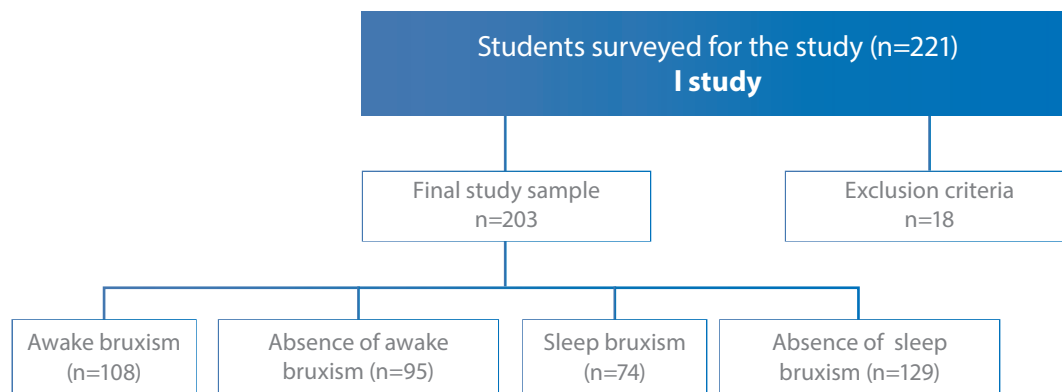


Table 1. Sociodemographic characteristics of students from a private university in Lima, Peru, (n = 203).

	Variables	n	(%)
Age (years) §		21	(22-20)
Gender	Male	79	(38.92)
	Female	124	(61.08)
School or Faculty	Architecture	3	(1.48)
	Health Sciences	55	(27.09)
	Communications	44	(21.67)
	Engineering	54	(26.60)
	Business	10	(4.93)
	Psychology	37	(18.23)
Employment	Works	42	(20.69)
	Does not work	161	(79.31)
Sports*	Practices	15	(7.39)
	Does not practice	188	(92.61)
Socioeconomic level 	High	43	(21.21)
	Medium	80	(39.60)
	Upper Low	59	(29.21)
	Low	21	(9.98)
Stress †	Presence	74	(36.45)
	Absence	129	(63.55)
Anxiety -‡	Presence	146	(71.92)
	Absence	57	(28.08)
Awake bruxism	Presence	108	(53.20)
	Absence	95	(46.80)
Sleep bruxism	Presence	74	(36.45)
	Absence	129	(63.55)
Academic performance	Low	12	(5.91)
	Medium	32	(15.76)
	High	159	(78.33)

§: Median (IQR). *: At professional level. ||: APEIM questionnaire. †: Score ≥14 (stress category) DASS21 scale. -‡: Score ≥5 (anxiety category) DASS21scale.

Table 2. Association of awake and sleep bruxism with age, gender, school or faculty, employment, sports practice, socioeconomic status, stress and anxiety (n=203).

Variables	Awake bruxism			Sleep bruxism			
	Yes n (%)	No n (%)	p-value ^{¥*} n (%)	Yes n (%)	No n (%)	p-value ^{¥*}	
Age (years)§	21(22-20)	21(22-20)	0.908~	21(22-20)	21(22-20)	0.318~	
Gender	Male	42(53.16)	0.147	22(27.85)	57(72.15)	0.042	
	Female	37(46.84)	53(42.74)	52(41.94)	72(58.06)		
School or Faculty	Architecture	1(33.33)	2(66.67)	0.847	2(66.67)	1(33.33)	0.539
	Health Sciences	23(41.82)	32(58.18)		32(58.18)	23(41.82)	
	Communications	23(52.27)	21(47.73)		28(64.64)	16(36.36)	
	Engineering	25(46.30)	29(53.70)		40(74.07)	14(25.93)	
	Business	6(60)	4(40)		6(60)	4(40)	
	Psychology	17(45.95)	20(54.05)		21(56.76)	16(43.24)	
Employment	Works	22(52.38)	20(47.62)	0.905	15(35.71)	27(64.29)	0.911
	Does not work	86 (53.42)	75(46.58)		59(36.65)	102(63.35)	
Sports*	Practices	7(46.67)	8(53.33)	0.598	6(40)	9(60)	0.767
	Does not practice	101(53.72)	87(46.28)		68(36.17)	120(63.93)	
Socioeconomic level 	High	25(58.14)	18(41.86)	0.098	18(41.86)	25(58.14)	0.453
	Medium	39(48.75)	41(51.25)		25(31.25)	55(68.75)	
	Upper Low	28(47.46)	31(52.54)		21(35.59)	38(64.41)	
	Low	16(76.19)	5(23.81)		10(47.62)	11(52.38)	
Stress †	Presence	48(64.86)	26(35.14)	0.012	32(43.24)	42(56.76)	0.128
	Absence	60(46.51)	69(53.49)		42(32.56)	87(67.44)	
Anxiety -‡	Presence	84(57.53)	62(42.47)	0.048	62(42.47)	84(57.53)	0.004
	Absence	24 (42.11)	33(57.89)		12(21.05)	45(78.05)	

§: Median (IQR). *: At professional level. ||: APEIM questionnaire. †: Score ≥14 (stress category) DASS21 scale. -‡: Score ≥5 (anxiety category) DASS21scale. p-value[¥]: Chi-square test. ~: Mann Whitney U Test.

Table 3. Logistic regression of awake and sleep bruxism with the independent variable academic performance (n=203).

	Academic performance											
	Presence n (%)	Absence n (%)	Awake bruxism Crude* OR p-value (CI95%)		Adjusted† OR p-value (CI95%)		Sleep bruxism Crude* OR p-value (CI95%)		Adjusted† OR p-value (CI95%)			
Medium	11 (34.38)	21 (65.63)	1	1	7 (21.8)	25 (78.13)	1	1				
Low	9 (75)	3 (25)	5.72 (1.28-25.57)	0.022	5.40 (1.11-26.12)	0.036	5 (41.67)	7 (58.33)	2.55 (0.61-10.56)	0.196	2.34 (0.42-9.03)	0.253
High	88 (55.35)	71 (44.65)	2.36 (1.06-5.23)	0.033	2.35 (1.01-5.46)	0.045	62 (38.99)	97 (61.01)	2.28 (0.93-5.59)	0.071	2.14 (0.72-4.73)	0.104

*: Binary logistic regression, all values correspond to OR (95% CI). Crude model only includes the exposure variable.

†: Adjusted model includes variables: age, gender, socioeconomic status, employment, sports practice, stress, anxiety.

DISCUSSION.

In the present study, bruxism was evaluated using the self-reported questionnaire developed by Winocur *et al.*¹¹ Self-reports are used by various authors to identify the presence of bruxism, as demonstrated in the study by Cavallo *et al.*³

Stress and anxiety were evaluated using the DASS-21 questionnaire (Depression Anxiety Stress Scale) translated and adapted into Spanish, which has been scientifically validated through multiple studies.^{25,26,27} The Passing Rate (PR) scale was the chosen instrument to evaluate academic performance. It has been used by authors such as Chain *et al.*,¹⁹ and Ñaupari in their studies to evaluate the probability of school success and academic performance in university students.²⁰

When evaluating self-reported awake bruxism, it was observed that the highest percentage of surveyed students (53.20%) reported the presence of such behavior. These data are similar to the ones documented in a study carried out in Saudi Arabia, where 85.29% of the university students evaluated presented self-reported awake bruxism.²⁸ However, another study shows a prevalence of only 33.7% in university students.²⁹ When evaluating self-reported sleep bruxism, it was found that the highest percentage of students (63.55%) did not report to suffer from it. This figure agrees with a Brazilian study, in which it was found that 77.8% of evaluated adolescents did not report said behavior.³⁰ This contrasts with what was found by Blanco Aguilera *et al.*,³¹ who found, through clinical examinations, a prevalence of 54.51% of patients with sleep bruxism. The difference in prevalence would be related to the multifactorial origin of bruxism, since the particular lifestyle of the population of each country could increase or reduce the factors that favor its appearance.⁴

In the present research, there was no significant association between age, school or faculty, sports practice, employment, socioeconomic status, and bruxism. The findings regarding age coincided with a study conducted in Jordan that showed the association between bruxism and vitamin D and calcium deficiency in the diet, which indicated that this behavior was not associated with the age of the participants.³²

Another study reported similar results when evaluating the level of work stress and factors asso-

ciated with sleep bruxism in crew members of the Peruvian Air Force.³³ Likewise, a study that evaluated 600 children aged 4 to 12 years in Tehran suggested that there was no correlation between bruxism and age.³⁴ There is similarity in the results, since it is not possible to clearly determine an age at which the prevalence of bruxism is higher, therefore, it could be assumed that it affects children and adults in the same way. Data about school or faculty, sports practice, and their association with bruxism in the literature is scarce, therefore, results found in this research cannot be contrasted with other studies.

Results related to employment are similar to the findings of Yağci *et al.*,³⁵ and Garrett *et al.*,³⁶ who found that there were no significant differences between bruxism and employment when evaluating a group of cases with bruxism and a group of healthy controls. Findings in terms of socioeconomic level coincide with the study carried out by Massignan *et al.*³⁷

Another Dutch study found that the prevalence of bruxism was greater in participants with a high socioeconomic level, and similarly to this study, they found no statistically significant association between these variables.³⁸ The Dutch study uses a different methodology to assess socioeconomic status since it is classified only into two groups, high and low. In addition, it uses the Dutch educational level, that is, it takes into account the specific academic challenges of the country's educational system, where a high level of education refers to secondary or higher education, while the rest is defined as low educational level and, therefore, low socioeconomic level.

One of the important findings of this study was the association between awake bruxism and gender. It was found that bruxism, in general, was more prevalent in females than males, coinciding with the studies conducted by Serra-Negra *et al.*,³⁹ and Winocur *et al.*⁴⁰ These results contrast with a study in which no significant difference was found between both genders. However, a higher prevalence of temporomandibular disorders was found in women.⁴¹ Despite the above, the literature suggests that females tend to be more sensitive to stress and anxiety than males, since they use neural resources differently when experiencing such situations. Women respond to stress by using the middle prefrontal-parietal cortices to a greater

extent, while in men there is a decrease in the use of this circuit.⁴²

The association between awake bruxism and stress and anxiety was statistically significant, coinciding with a Brazilian study, in which it was shown that awake bruxism was associated with symptoms of anxiety.⁴³ In addition, a study carried out in Lima found that 68.4% of the students who reported stress suffered from awake bruxism.¹³ Another study showed that participants with awake bruxism had significantly higher levels of trait and state anxiety.⁴⁴ These results indicate that awake bruxism would play a role in reducing stress and anxiety, since certain people who perceive situations as threatening or stressful display this behavior more frequently.⁴⁵

A statistically significant association between sleep bruxism and anxiety was found, coinciding with findings from a Finnish study, where it was concluded that anxiety would be acting as a risk factor for sleep bruxism.⁴⁶ According to Fernandez *et al.*,⁴⁷ this behavior would be related to circadian cycles and the sympathetic nervous system, which can be affected by psychological factors such as anxiety, which alter normal sleep processes and increase micro-awakenings produced by increased cardiac and respiratory activity during sleep. They occur in an average of 8 to 14 times per hour. This means that sleep bruxism would be considered a normal variation of behavior that would prepare the brain for a sudden awakening.⁴⁸

One unique finding of this study was the association between awake bruxism and academic performance. Students with a high and low academic performance were more likely to present awake bruxism than those with medium academic performance. The possible stressors in higher education are generally related to exams, and academic performance, among others. In this way, the student perceives them as challenges or threats.⁴⁹ When this happens, a series of psychosomatic processes are generated, where the limbic system acts on the hypothalamus, and the latter, on the autonomic nervous system, producing a great variety of signs and symptoms in stressful situations.⁵⁰ In this way, stress releases accumulated tensions by using the dental arches through increased masticatory muscle activity.⁵¹

Considering the data presented above, it could be concluded that students with high academic performance, due to their constant effort to obtain high grades, would present higher levels of stress and/or anxiety than those with medium academic performance. Likewise, students with low academic performance, due to the tension and concern they feel about failing courses, could develop symptoms of stress and/or anxiety.⁵² This suggests that, considering the association found, a higher prevalence of bruxism could be expected in students with high and low academic performance, since when subjected to "stressful" academic situations, they suffer from a systemic imbalance and show psychological, physical, or behavioral symptoms. These physical signs may manifest as drowsiness, migraine, digestive problems, and sometimes increased muscle activity, manifested by clenching or grinding of the teeth.⁵³

One of the limitations of the study was the access to the actual data related to academic performance. Although participants are expected to respond truthfully the self-report instrument, a strict control of their truthfulness cannot be established. For this reason, it is suggested to carry out a study collecting data directly from the student's academic record to complement the information obtained through the self-report. Another limitation was the lack of information about the number of times a participating student took the same subject or course. Therefore, it is suggested to consider an item that allows registering this information to make a more effective comparison between students in future research.

Other studies show different ways of evaluating academic performance in university students. An Australian research on medical students used information from the University Admission Test, Australian Tertiary Admission Rank, Grade Point Average (GPA), Graduate Australian Medical Students Admission Test, and Qualified Interview.⁵⁴ While another study on Iranian students considered final exam grades for the semester, in addition to a course grade obtained through midterm and final exams, and a semester assignment consisting of quizzes and academic assignments.⁵⁵ It is suggested to carry out research that includes an integrated interview and a clinical evaluation of the signs of bruxism to collect additional

data and complement it with a clinical diagnosis. However, studies show that there is a high correlation between self-reported diagnosis and clinical diagnosis of patients with bruxism (Cronbach's α coefficient: 0.9032).⁵⁶ Finally, there is a strong need to gain new knowledge about the relationship of bruxism and academic performance, since no related research has been conducted. It is important to consider that academic performance could contribute to the design of an intervention plan in the university population affected by bruxism.

CONCLUSION.

In the present study, a statistically significant association was found between self-reported awake bruxism and academic performance in university students. Students with high and low academic performance were more likely to present awake bruxism than those with medium performance. The students who suffered from stress reported a high prevalence of awake bruxism, and those with anxiety reported a high prevalence of awake and sleep bruxism, resulting in a statistically significant association in both cases. However, it is suggested to carry out further research on students with bruxism and to consider a larger sample of students with low academic performance to confirm said association.

Conflict of interests: The authors declare that they have no conflict of interests.

Ethics approval: Universidad Peruana de Ciencias Aplicadas (UPC) Ethics committee approval number CEI PI-076-19.

Funding: Self-financed.

Authors' contributions: All authors contributed to the manuscript.

Acknowledgements: None.

REFERENCES.

1. Lobbezoo F, Ahlberg J, Raphael K.G, Wetselaar P, Glaros A.G, Kato T, Santiago V, Winocur E, De Laat A, De Leeuw R, Koyano K, Lavigne G.J, Svensson P, Manfredini D. International consensus on the assessment of bruxism: Report of a work in progress. *J Oral Rehabil.* 2018; 45(11): 837-44.
2. Raphael KG, Santiago V, Lobbezoo F. Bruxism is a continuously distributed behavior, but disorder decisions are dichotomous. *J Oral Rehabil.* 2016; 43:802-3.
3. Cavallo P, Carpinelli L, Savarese G. Perceived stress and bruxism in university students. *BMC Res Notes.* 2016; 9(1):514.
4. Jokubauskas L, Baltrušaitytė A, Pileičikienė G, Žekonis G. Interrelationships between distinct circadian manifestations of possible bruxism, perceived stress, chronotype and social jetlag in a population of undergraduate students. *Chronobiol. Int.* 2019;36(11):1558-69.
5. Serra-Negra JM, Scarpelli AC, Tirsia-Costa, D., Guimarães FH, Pordeus IA, Paiva S M. Sleep Bruxism, Awake Bruxism and Sleep Quality among Brazilian Dental Students: A Cross-Sectional Study. *Brazilian Dent J.* 2014; 25(3), 241-7.
6. Tavares L, da Silva Parente Macedo L, Duarte C, de Goffredo Filho G, de Souza Tesch R. Cross-sectional study of anxiety symptoms and self-report of awake and sleep bruxism in female TMD patients. *CRANIO.* 2016;34(6):378-381.
7. Phuong NTT, Ngoc VTN, Linh LM, Duc NM, Tra NT, Anh LQ. Bruxism, Related Factors and Oral Health-Related Quality of Life Among Vietnamese Medical Students. *Int J Environ Res Public Health.* 2020;17(20):7408.
8. Nogueira Coutinho E, Pereira Rodrigues dos Santos K, Henrique Barros Ferreira E, Grailea Silva Pinto R, de Oliveira Sanchez M. Association between self-reported sleep bruxism and temporomandibular disorder in undergraduate students from Brazil. *CRANIO.* 2018;38(2):91-98.
9. Ohlmann B, Bömicke W, Habibi Y, Rammelsberg P, Schmitter M. Are there associations between sleep bruxism, chronic stress, and sleep quality? *J Dent.* 2018; 74:101-6.
10. Abekura H, Tsuboi M, Okura T, Kagawa K, Sadamori S, Akagawa Y. Association between sleep bruxism and stress sensitivity in an experimental psychological stress task. *Biomed Res J.* 2011;32(6):395-9.
11. Winocur E, Uziel N, Lisha T, Goldsmith C, Eli I. Self-reported bruxism-associations with perceived stress, motivation for control, dental anxiety and gagging. *J Oral Rehabil.* 2011;38(1):3-11
12. Gedefaw A, Tilahun T, Asefa A. Predictors of self-reported academic performance among undergraduate medical students of Hawassa University, Ethiopia. *Adv Med Educ Pract.* 2015;6: 305-15.
13. Balaji NK, Murthy PS, Kumar DN, Chaudhury S. Perceived stress, anxiety, and coping states in medical and engineering students during examinations. *Ind Psychiatry J.* 2019; 28 (1): 86-97.
14. Sohail N. Stress and academic performance among medical students. *J Coll Physicians Surg Pak.* 2013; 23(1):67-71.
15. Wijekoon CN, Amaratunge H, de Silva Y, Senanayake S, Jayawardane P, Senarath U. Emotional intelligence and academic performance of medical undergraduates: a cross-sectional study in a selected university in Sri Lanka. *BMC Medical Education,* 2017;17(1):176.
16. Masud S, Mufarrih S, Qureshi N, Khan F, Khan S, Khan M. Academic Performance in Adolescent Students: The Role of Parenting Styles and Socio-Demographic Factors – A Cross Sectional Study From Peshawar, Pakistan. *Front Psychol.* 2019; 10:2497
17. Ordóñez-Plaza M, Villavicencio-Caparó É, Alvarado-Jiménez O, Vanegas-Avecillas M. Prevalencia de bruxismo de vigilia evaluado por auto-reporte en relación con estrés, ansiedad y depresión. *Rev Estomatol Herediana.* 2016; 26(3):147-55.
18. Chatzopoulos G, Wolff L. Symptoms of temporomandibular disorder, self-reported bruxism, and the risk of implant failure: A retrospective analysis. *Cranio* 2018; 38(1):50-7.
19. Chain R, Cruz Ramírez N, Martínez Morales M, Jácome N. Examen de selección y probabilidades de éxito escolar en estudios superiores. Estudio en una universidad pública estatal mexicana. *Rev Electrónica de Investigación Educativa.* 2003; 5(1):1-17.
20. Naupari F. Evaluación del rendimiento académico de estudiantes universitarios en la modalidad presencial y virtual. *A Punt. Cienc Soc* 2014; 4(1):69-76.
21. Jun D, Johnston V, Kim J, O'Leary S. Cross-cultural adaptation and validation of the Depression, Anxiety and Stress Scale-21 (DASS-21) in the Korean working population. *Work.* 2018;59(1):93-102.
22. Gloster AT, Rhoades HM, Novy D, Klotsche J, Senior A, Kunik M, Wilson N, Stanley MA. Psychometric properties of the Depression Anxiety and Stress Scale-21 in older primary care patients. *J Affect Disord.* 2008;110(3):248-59.
23. Román F, Santibáñez P, Vinet E. Uso de las Escalas de Depresión Ansiedad Estrés (DASS-21) como Instrumento de Tamizaje en Jóvenes con Problemas Clínicos. *Acta investigación psicol.* 2016;6(1):2325-36.
24. Vera-Romero O, Vera-Romero F. Evaluación del nivel socioeconómico: presentación de una escala adaptada en una población de Lambayeque. *Rev Cuerpo Méd.* 2013; 6(1):41-4.
25. Mehrotra D, Kumar K, Kumar S, Tiwari S, Kumar V, Dwivedi R. Reliability and psychometric validity of Hindi version of Depression, Anxiety and Stress Scale-21 (DASS-21) for Hindi speaking Head Neck Cancer and Oral Potentially Malignant Disorders Patients. *J Cancer Res Ther.* 2019; 15(3):653.
26. Beaufort I, De Weert-Van Oene G, Buwalda V, De Leeuw J, Goudriaan A. The Depression, Anxiety and Stress Scale (DASS-21) as a Screener for Depression in Substance Use Disorder Inpatients: A Pilot Study. *Eur Addict Res.* 2017; 23(5):260-8.
27. Henry J, Crawford J. The short-form version of the Depression Anxiety Stress Scales (DASS-21): Construct validity and normative data in a large non-clinical sample. *Br J Clin Psychol.* 2005; 44(2):227-39.
28. Quadri M, Mahnashi A, Al Almutahhir A, Tubayqi H, Hakami A, Arishi M, Alamir A. Association of Awake Bruxism with Khat, Coffee, Tobacco, and Stress among Jazan University Students. *Int J Dent.* 2015; 2015:1-5.
29. Serra-Negra J, Dias R, Rodrigues M, Aguiar S, Auad S, Pordeus I. Self-reported awake bruxism and chronotype profile: a multicenter study on Brazilian, Portuguese and Italian dental students. *CRANIO.* 2019; 25:1-6.
30. Santos Sousa H, Moura de Lima M, Dantas N, Quaresma R, Silva de Moura M, Almeida L. Prevalence and associated factors to sleep bruxism in adolescents from Teresina, Piauí. *Rev Bras Epidemiol* 2018; 21:1-11.

31. Blanco Aguilera A, Gonzalez Lopez L, Blanco Aguilera E, De la Hoz Aizpurua J, Rodríguez Torronteras A, Segura Saint-Gerons R. Relationship between self-reported sleep bruxism and pain in patients with temporomandibular disorders. *J Oral Rehabil.* 2014;41(8):564-72.
32. Alkhatatbeh MJ, Hmoud ZL, Abdul-Razzak KK, Alem EM. Self-reported sleep bruxism is associated with vitamin D deficiency and low dietary calcium intake: a case-control study. *BMC Oral Health.* 2021;21(1):21
33. Marín M, Rodríguez Y, Gamboa E, Ríos J, Rosas J, Mayta-Tovalino F. Level of work stress and factors associated with bruxism in the military crew of the Peruvian Air Force. *Med J Armed Forces India.* 2019;75(3):297-302.
34. Seraj B, Shahrabi M, Ghadimi S, et al. The Prevalence of Bruxism and Correlated Factors in Children Referred to Dental Schools of Tehran, Based on Parent's Report. *Iran J Pediatr.* 2010;20(2):174-180.
35. Yağci İ, Taşdelen Y, Kivrak Y. Childhood Trauma, Quality of Life, Sleep Quality, Anxiety and Depression Levels in People with Bruxism. *Noro Psikiyatrs Ars.* 2020;57(2):131-5.
36. Garrett AR, Hawley JS. SSRI-associated bruxism: A systematic review of published case reports. *Neurol Clin Pract.* 2018;8(2):135-41.
37. Massignan C, de Alencar NA, Soares JP, Santana CM, Serra-Negra J, Bolan M, Cardoso M. Poor sleep quality and prevalence of probable sleep bruxism in primary and mixed dentitions: a cross-sectional study. *Sleep and Breathing.* 2019;23(3):935-41.
38. Wetselaar P, Vermaire E, Lobbezoo F, Schuller A. The prevalence of awake bruxism and sleep bruxism in the Dutch adult population. *Journal of oral rehabilitation.* 2019;46(7):617-623.
39. Serra-Negra J, Lobbezoo F, Correa-Faria P, Lombardo L, Siciliani G, Stellini E. Relationship of self-reported sleep bruxism and awake bruxism with chronotype profiles in Italian dental students. *CRANIO.* 2018;37(3):147-52.
40. Winocur E, Messer T, Eli I, et al. Awake and Sleep Bruxism Among Israeli Adolescents. *Front Neurol.* 2019;10:443.
41. Jiménez-Silva A, Peña-Durán C, Tobar-Reyes J, Frugone-Zambra R. Sleep and awake bruxism in adults and its relationship with temporomandibular disorders: A systematic review from 2003 to 2014. *Acta Odontol Scand.* 2016;75(1):36-58.
42. Seo D, Ahluwalia A, Potenza MN, Sinha R. Gender differences in neural correlates of stress-induced anxiety. *J Neurosci Res.* 2017;95(1-2):115-25.
43. Machado N, Costa Y, Quevedo H, Stuginski-Barbosa J, Valle C, Bonjardim L, Garib DG, Conti P. The association of self-reported awake bruxism with anxiety, depression, pain threshold at pressure, pain vigilance, and quality of life in patients undergoing orthodontic treatment. *J Appl Oral Sci.* 2020; 28:1-7.
44. Soto-Goñi XA, Alen F, Buiza-González L, Marcolino-Cruz D, Sánchez-Sánchez T, Ardizzone-García I, Aneiros-López F, Jiménez-Ortega L. Adaptive Stress Coping in Awake Bruxism. *Front Neurol.* 2020;11:564431.
45. Ono Y, Yamamoto T, Kubo KY, Onozuka M. Occlusion and brain function: mastication as a prevention of cognitive dysfunction. *J Oral Rehabil.* 2010; 37:624-40.
46. Ahlberg J, Rantala M, Savolainen A, Suvinen T, Nissinen M, Sarna S. Reported bruxism and stress experience. *Community Dent Oral Epidemiol.* 2002; 30:405-8.
47. Fernandez P, Delgado R, Castellanos J. Alteraciones del sueño y bruxismo. *Rev ADM.* 2018; 75 (4): 187-95
48. Lavigne G, Houry S, Abe S, Yamaguchi T, Raphael K. Bruxism physiology and pathology: an overview for clinicians. *J Oral Rehabil.* 2008;35(7):476-94.
49. Del Toro A, Gorguet Marlen, Pérez Y, Ramos D. Academic stress in first year medicine students with low school performance. *Medisan.* 2011; 15(1): 17-22.
50. Wieckiewicz M, Paradowska-Stolarz A, Wieckiewicz W. Psychosocial Aspects of Bruxism: The Most Paramount Factor Influencing Teeth Grinding. *Biomed Res Int.* 2014; 2014:1-7.
51. Raphael KG, Santiago V, Lobbezoo F. Is bruxism a disorder or a behaviour? Rethinking the international consensus on defining and grading of bruxism. *J Oral Rehabil.* 2016; 43(10): 791-8.
52. Gao Y, Hu D, Peng E, Abbey C, Ma Y, Wu C, Chang C, Hung W, Rozelle S. *Int J Environ Res Public Health.* 2020; 17(8): 2778.
53. Alfonso B, Calcines M, Monteagudo R, Nieves Z. Estrés académico. *Rev Edumecentro.* 2015; 7(2): 163-78.
54. Puddey IB, Mercer A, Carr SE. Relative progress and academic performance of graduate vs undergraduate entrants to an Australian medical school. *BMC Med Educ.* 2019;19(1):159.
55. Hayat AA, Shateri K, Amini M, Shokrpour N. Relationships between academic self-efficacy, learning-related emotions, and metacognitive learning strategies with academic performance in medical students: a structural equation model. *BMC Med Educ.* 2020;20(1):76.
56. Paesani D, Lobbezoo F, Gelos C, Guarda-Nardini L, Ahlberg J, Manfredini D. Correlation between self-reported and clinically based diagnoses of bruxism in temporomandibular disorders patients. *J Oral Rehabil.* 2013;40(11):803-9.