

Stress, Psychopathological Symptoms and Risk of Clicking in College Students: A Case-Control Study

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Abstract. *Introduction:* scientific evidence suggests that stress and psychological symptoms play an important role on diseases. The aim of this study was to investigate clicking in individuals with stress and different psychopathological symptoms. *Methods:* we compared 30 college students who experienced clicking with 60 healthy control volunteers. The participants received the PSS-10 and SCL-90-R Spanish versions. Odds ratio (OR) and 95% CI were calculated to determine the risk for these variables for the presence of clicking using logistic regression. *Results:* stress was weakly associated with the occurrence of clicking (OR = 1.35, 95% CI: 0.46-3.95, $p = 0.57$). Being an individual with stress and depression (OR = 2.92, 95% CI: 0.61-14.0, $p = 0.16$) and anxiety (OR = 2.80, 95% CI: 0.69-11.31, $p = 0.13$) may increase the risk for clicking. In addition, depression (OR = 7.00, 95% CI: 0.66-74.28, $p = 0.07$) and anxiety (OR = 4.90, 95% CI: 0.78-30.80, $p = 0.07$) adjusted by pain symptoms seem to be important variables for some subjects. The risk for clicking in students with anxiety-depression comorbidity and stress was higher (OR = 2.11, 95% CI: 0.40-11.15, $p = 0.37$). Moreover, there was a different risk when this comorbidity, stress and pain symptom were present (OR = 4.30, 95% CI: 0.35-51.90, $p = 0.21$). *Conclusion:* depression, anxiety, stress and pain may be predictors for development of TMD such as clicking. In this sense, the measurement of those conditions in these patients should be a priority.

Keywords: anxiety, comorbidity, depression, psychological stress, temporomandibular joint disorders.



Estrés, síntomas psicopatológicos y riesgo de *clicking* en estudiantes universitarios: un estudio de casos y controles

Resumen. *Introducción:* la evidencia científica sugiere que el estrés y los síntomas psicológicos desempeñan un papel importante en las enfermedades. El objetivo del estudio fue investigar el *clicking* en individuos con estrés y diferentes síntomas psicopatológicos. *Métodos:* se compararon 30 estudiantes universitarios que experimentaron *clicking* con 60 voluntarios sanos como controles. Los participantes recibieron el PSS-10 y SCL-90-R en versiones españolas. Se calcularon los *odds ratios* (OR) e IC al 95% para determinar el riesgo de estas variables para la presencia de *clicking* mediante regresión logística. *Resultados:* el estrés fue débilmente asociado con la ocurrencia de *clicking* (OR = 1,35, IC al 95%: 0,46-3,95, $p = 0,57$). Ser un individuo con estrés y depresión (OR = 2,92, IC al 95%: 0,61-14,0, $p = 0,16$) y ansiedad (OR = 2,80, IC al 95%: 0,69-11,31, $p = 0,13$) pudieran aumentar el riesgo de presentar *clicking*. Además, la depresión (OR = 7,00, IC al 95%: 0,66-74,28, $p = 0,07$) y la ansiedad (OR = 4,90, IC al 95%: 0,78-30,80, $p = 0,07$) ajustadas por síntomas de dolor parecen importantes para unos sujetos. El riesgo de *clicking* en estudiantes con comorbilidad de depresión y ansiedad y estrés fue más alto (OR = 2,11, IC al 95%: 0,40-11,15, $p = 0,37$). Por otra parte, existió un riesgo diferente cuando esta comorbilidad, estrés y el síntoma de dolor estuvieron presentes (OR = 4,30, IC al 95%: 0,35-51,90, $p = 0,21$). *Conclusión:* la depresión, la ansiedad, el estrés y el dolor pudieran ser factores predictivos para el desarrollo de TDM como el *clicking*. En este sentido, la medición de esas condiciones debe ser una prioridad en estos pacientes.

Palabras clave: ansiedad, comorbilidad, depresión, estrés psicológico, trastornos de la articulación temporomandibular.

Estresse, sintomas psicopatológicos e risco de D-ATM (Disfunção da Articulação Temporomandibular) em estudantes universitários: um estudo de casos e controles

Resumo. *Introdução:* a evidencia científica sugere que o estresse e os sintomas psicológicos desempenham um papel importante nas doenças. O escopo do estudo foi investigar a D-ATM em indivíduos com estresse e diferentes sintomas psicopatológicos. *Métodos:* foram contrastados 30 estudantes universitários que experimentaram D-ATM com 60 voluntários saudáveis como grupo de controle. Os participantes receberam o PSS-10 e SCL-90-R em versões espanholas. Foram calculados as OR (razão de possibilidades) e IC a 95% para determinar o risco destas variáveis para a presença de D-ATM mediante regressão logística. *Resultados:* o estresse foi levemente associado com ocorrência de D-ATM (OR = 1,35, IC a 95%: 0,46-3,95, $p = 0,57$). Ser um indivíduo com estresse e depressão (OR = 2,92, IC a 95%: 0,61-14,0, $p = 0,16$) e ansiedade (OR = 2,80, IC a 95%: 0,69-11,31, $p = 0,13$) pudesse aumentar o risco de apresentar D-ATM. Além disso, a depressão (OR = 7,00, IC a 95%: 0,66-74,28, $p = 0,07$) e ansiedade (OR = 4,90, IC a 95%: 0,78-30,80, $p = 0,07$) ajustadas por sintomas de dor parecem importantes para alguns sujeitos. O risco de D-ATM em estudantes com comorbilidade de depressão e ansiedade e estresse foi maior (OR = 2,11, IC a 95%: 0,40-11,15, $p = 0,37$). Por sua vez, houve um risco diferente quando essa comorbilidade, estresse e o sintoma de dor estiveram presentes (OR = 4,30, IC a 95%: 0,35-51,90, $p = 0,21$). *Conclusão:* a depressão, ansiedade estresse e dor poderiam ser fatores preditivos para o desenvolvimento de estalidos por D-ATM. Nesse sentido, a medição dessas condições deve ser prioritária nestes pacientes.

Palavras-chave: ansiedade, comorbilidade, depressão, estresse psicológico, disfunções da articulação temporomandibular.



Introduction¹

The temporomandibular joint (TMJ) is the articulation of the mandibular condyle with the glenoid fossa of the temporal bone. The TMJ is unique in the body, as the two joints must always move simultaneously. Temporomandibular joint disorder (TMD) refers to different clinical conditions affecting the TMJ [1]. They are characterized by pain in the area of the jaw or adjacent tissues, functional limitations of the mandible to make normal movements, or clicking in the TMJ during deviations in mandibular range of motion. TMJ sounds such as clicking have long been associated with the diagnosis of TMD [2]. It refers to a distinct snapping, cracking sound linked to irregular jaw movement.

Clicking may also be related to pain and locking, symptoms interfering with mastication and speech. Suggestion has been put forth that the lateral pterygoid muscle pulls the disc forward and out of place with respect to the condyle [3]. Furthermore, clicking may be diagnosed in dysfunctions as disc displacement with reduction and being an indicator of degenerative TMJ changes or joint effusions [4]. Articular noises seem to vary and depend on the sort of population. In this sense, self-reported prevalence of articular noises has been estimated by Choi et al. [5] in a 19-year-old Korean men sample (14.3%); Egermark et al. [6] in a 17-25 year-old Swedish group (8%); and Uhac et al. [7] evaluated 100 individuals in Croatia and found 28% showed articular noises such as clicking.

Body of evidence states TMD are the result of multifactorial causes; however, there is evidence psychosocial factors are of importance in the understanding of TMD [8]. Vasconcelos et al. [9] showed subjects free of psychological stress have less condyle and disk disarrangements, and Rantala et al. [10] revealed a fluctuating interaction among myofascial pain, disk displacement with reduction, and somatization in non-patients. In this sense, stress is defined as the perception of discrepancy between environmental demands (stressors) and individual capacities to fulfill these demands [11], and has long been associated with different types of diseases. Regarding psychopathological symptoms, it is quite clear that individual variability exists. They have

been summarized according to Symptom Check List (SCL-90-R) in nine subscales: anxiety, hostility, somatization, obsessive-compulsive, depression, paranoid ideation, interpersonal sensitivity, psychoticism, and phobic anxiety. These subscales may predict most of the outcomes that truly matter in life, among them, health [12] and mortality.

Even though studies have indicated the role of psychological factors in the etiology of TMD, the issue of whether they have an impact on the presence of clicking still is poorly explained. Our interest in studying if stress and psychopathological symptoms increase the risk of articular noises is because individuals with noises, orofacial pain, or mandibular movement problems seem to have a thicker anterior band and intermediate zone than the discs of healthy subjects. This is of clinical interest since morphological changes in the disc are important signs of TMJ pathology and/or TMJ dysfunction [13]. Given that clicking may be indicative of potential damage in the TMJ, we hypothesized those variables and their interaction might influence the presence or absence of clicking. In this sense, the aim of this study is to investigate the dynamic among clicking, stress and psychopathological symptoms in a group of college students in Pasto, Nariño, Colombia.

Methods

Study design and participants

A case-control study was designed for a cohort of one hundred seventy three 20-year-old college students during the period between February and November 2010, from Universidad Cooperativa de Colombia, Pasto, Universidad Mariana, Institución Universitaria CESMAG, and Universidad de Nariño located in Pasto, Nariño, Colombia. The study and particular procedures were approved by the Ethics Committee of Health Sciences at Universidad Cooperativa de Colombia, Pasto (Act No. CE001-09). In this cohort, 77 were men and 96 women. Eligible cases included those with vertical opening or closing clicking as a sign of dysfunction, with or without pain (individuals with clicking do not necessarily suffer or experience pain) in the lateral pole (outside ear) or posterior attachment (inside ear), not receiving orthodontic treatment, and not suffering from other systemic disease or trauma. The clicking

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was evaluated through Research Diagnosis Criteria for Temporomandibular Disorders (RDC/TMD) [14]. In addition, a questionnaire was used to record sociodemographic data such as sex and socioeconomic status according to government of Colombia parameters (1-2 stratum = low class, 3-4 stratum = middle class and 5-6 stratum = high class), as well as stress and psychopathological symptoms. Finally, 30 subjects were considered the case group. The control group consisted of 60 healthy students of the same cohort without a sign of clicking selected through a computer random list. With this respect, eligible control subjects were matched according to sex and approached until two control cases were individually recruited for each case student.

Measurement of stress and psychopathological symptoms

The students were asked to complete a simple evaluation scale, a well-documented perceived stress test (PSS-10) in a Spanish version [15]. We measured psychological symptoms through the Symptom Checklist 90-Revised (SCL-90-R), which is a self-report instrument designed to reflect the psychological symptoms seen in psychiatric and medical patients. For this study, a SCL-90-Revised scale in Spanish version [16] was used.

Statistical analysis

To express the distribution of the sample, a descriptive analysis was made in this research. Clicking, stress and psychological symptoms variables were reported as frequencies or means \pm standard deviations (SD). This analysis was also performed to compare college students with clicking and those without this sign. To determine the risk of stress and psychological symptoms for the presence of clicking, odds ratios (OR) and 95% CI were calculated. SPSS 17.0 (SPSS Inc., Chicago, IL, USA) was used for the analysis.

Results

Socio-demographic data of study subjects

In this study we analyzed 90 20-year-old college students with and without clicking. Of the 90 subjects, 33 (36.7%) were male and 57 (63.3%) were

female. Regarding socioeconomic status, no student belonged to high class (table 1).

Table 1. Sociodemographic data of 20-year-old college students (clicking group) and healthy individuals (control group) from Pasto, Nariño, Colombia

Sociodemographic data	Clicking group	Control group	Total
	n (%)	n (%)	f (%)
Sex			
Men	11 (36.7)	22 (36.7)	33 (36.7)
Women	19 (63.3)	38 (63.3)	57 (63.3)
Socioeconomic status			
Low	11 (36.7)	31 (51.7)	42 (46.7)
Middle	19 (63.3)	29 (48.3)	48 (53.3)
Career fields			
Health sciences	18 (60)	25 (41.6)	43 (47.8)
Social sciences	6 (20)	22 (36.7)	28 (31.1)
Human sciences	3 (10)	4 (6.7)	7 (7.8)
Engineering	0	8 (13.3)	8 (8.9)
Linguistics & Arts	2 (6.7)	1 (1.7)	3 (3.3)
Agricultural sciences	1 (3.3)	0	1 (1.1)

Source: Compiled by Authors

Clicking. The female/male ratio was 1.7:1. Sixteen (53.3%) students had clicking in left open and 7 (23.3%) showed right and left close reproducibility. Six similar cases and percentages (20%) were found in the reciprocal clinical characteristic, both right and left. According to opening, the mean of maximum unassisted opening was 42.5 mm \pm 7.5. Forty-four subjects (48.9%) showed pain symptom in the TMJ. There were 30 (33.3%) students with pain at lateral pole (outside ear), and 25 (27.8%) at right posterior attachment (inside ear). Fifteen cases (50%) and 29 controls (48.3%) had pain symptom.

Stress. The mean of PSS-10 score was 17.4 \pm 6.0. Regarding sex, PSS-10 mean of female students ($n = 57$) was 18.6 \pm 5.7 while for male students ($n = 33$) was 15.2 \pm 5.9. With respect to socioeconomic status, similar means were found in low class (17.5 \pm 6.0) and middle class (17.3 \pm 6.0). The clicking group (18.67 \pm 5.61) had higher stress scores than control group (16.8 \pm 6.1). Of the 90 college students, 18 (20%) had stress. Using bivariate analysis, the female students reported higher percentage of

stress (72.2%) than their male counterparts (27.8%). The female/male ratio was 2.6/1. Seven (38.9%) college students with stress had clicking.

Psychopathological symptoms. Analysis on SCL-90-R scale data of relevant demographics indicated that 12 women (21.1%) had paranoid ideation and 11 (19.3%) somatization, while 5 men (15.2%) showed obsessive-compulsive and 5 (15.2%) interpersonal sensitivity. Nine low class subjects (21.4%) had higher scores of interpersonal sensitivity and 8 (19%) somatization; however, 8 middle class individuals (16.7%) showed obsessive-compulsive and 7 (14.6%) interpersonal sensitivity.

Primary findings related to risk factors showed that perceived stress was weakly associated with the occurrence of clicking (OR = 1.35, 95% CI: 0.46-3.95, $p = 0.57$). According to the SCL-90-R, scales such as interpersonal sensitivity (OR = 1.72, 95% CI: 0.57-5.20, $p = 0.33$) and anxiety (OR = 1.30, 95% CI: 0.38-4.38, $p = 0.67$) increased the presence of clicking; however, depression was not associated with clicking (OR = 1.16, 95% CI: 0.31-4.33, $p = 0.82$). An analysis of interaction among clicking, stress and psychopathological symptoms showed being an individual with stress and higher scores on depression and anxiety scales may increase the risk of clicking (table 2).

Table 2. OR for clicking, stress perceived and psychopathological symptoms

Stress & psychopathological symptoms	Clicking		
	OR	95% CI	<i>p</i>
+ Somatization	1.55	0.32-7.44	0.57
+ Stress			
+ Obsessive-compulsive	1.51	0.43-5.24	0.51
+ Stress			
+ Interpersonal sensitivity	1.38	0.35-5.33	0.63
+ Stress			
+ Depression	2.92	0.61 –14.01	0.16
+ Stress			
+ Anxiety	2.80	0.69 –11.31	0.13
+ Stress			
+ Hostility	1.38	0.35-5.33	0.63
+ Stress			
+ Phobic anxiety	0.78	0.14–4.30	0.78
+ Stress			
+ Paranoid ideation	1.38	0.35-5.33	0.63
+ Stress			
+ Psychoticism	1.38	0.35-5.33	0.63
+ Stress			

Source: Compiled by Authors

Table 3 shows the interaction among those variables and the presence of pain symptom. Although the differences found were statistically

Table 3. OR for clicking, stress, psychopathological symptoms adjusted by pain symptom

Stress & psychopathological symptoms	Clicking					
	Pain symptom			No pain symptom		
	OR	95% CI	<i>p</i>	OR	95% CI	<i>p</i>
+ Somatization	2.07	0.26 –16.43	0.48	1.03	0.08 – 12.41	0.97
+ Stress						
+ Obsessive-compulsive	2.27	0.47 – 10.78	0.29	0.66	0.06 – 7.00	0.73
+ Stress						
+ Interpersonal sensitivity	2.27	0.47 – 10.78	0.29	N/A		
+ Stress						
+ Depression	7.00	0.66 –74.28	0.07	1.03	0.08 –12.41	0.97
+ Stress						
+ Anxiety	4.90	0.78 –30.80	0.07	1.03	0.08 –12.41	0.97
+ Stress						
+ Hostility	2.16	0.38 –12.34	0.37	0.66	0.06 –7.00	0.73
+ Stress						
+ Phobic anxiety	1.33	0.19–8.99	0.76	N/A		
+ Stress						
+ Paranoid ideation	1.56	0.30–8.11	0.59	1.03	0.08 – 12.41	0.97
+ Stress						
+ Psychoticism	1.56	0.30 –5.33	0.59	1.03	0.08 –12.41	0.97
+ Stress						

Source: Compiled by Authors

insignificant, depression (OR = 7.00, 95% CI: 0.66-74.28, $p = 0.07$) and anxiety (OR = 4.90, 95% CI: 0.78-30.80, $p = 0.07$) adjusted by pain symptom seem to be important variables for some subjects. Since depression and anxiety have high rates of comorbidity, a new risk was obtained. Anxiety-depression comorbidity was not associated with clicking (OR = 1.00, 95% CI: 0.23-4.31, $p = 1.00$). However, the risk of clicking in students with this comorbidity and stress increased (OR = 2.11, 95% CI: 0.40-11.15, $p = 0.37$). Moreover, there was a different risk when this comorbidity, stress and pain symptom were present (OR = 4.30, 95% CI: 0.35-51.90, $p = 0.21$).

Discussion

This epidemiologic study provides information of interaction between stress and psychopathological symptoms, and shows it may be relevant to target these factors for reducing the prevalence of clicking in the population. The possibility of an increased risk of clicking by a breakdown in the balance of the patient's stressors adaptive capacity should be assessed in each and every patient through comprehensive evaluation of various contributing factors, among them, psychological symptoms. Even though there was absence of statistically significant associations in the obtained outcomes, depression, anxiety and stress may vary clinically the risk of clicking as they do in other diseases [17].

In this study, depression was weakly associated with clicking (OR = 1.16, 95% CI: 0.31-4.33, $p = 0.82$). However, depression and stress together varied the clinical risk of clicking (OR = 2.92, 95% CI: 0.61-14.0, $p = 0.16$) in comparison to other symptoms. The chronic stress paradigm is considered to have greater aetiological relevance and face validity in mimicking depression than other animal models, and therefore has become one of the most broadly used pre-clinical paradigms of this disorder [18]. Stress has also been associated with muscle tension and stiffness, which may be related to clicking. When we adjusted the presence of clicking, stress and depression by pain, an OR = 7.00, 95% CI: 0.66-74.28, $p = 0.07$ was observed. Pain is depressing, and depression causes and intensifies pain. Subjects with chronic pain have three times the average risk of developing psychiatric symptoms

and depressed patients have three times of developing chronic pain [19]. Depression has contributed to the progression of chronic TMD pain and disability, and therefore should be considered an important factor when evaluating and developing treatment plans for patients with TMD [20].

Anxiety is an uncomfortable feeling of fear, uneasiness, and worry. The source of these symptoms is not always known. However, the function of human anxiety response, and homologues in other species, is to prepare the individual to detect and deal with threats [21]. Our outcomes show anxiety was slightly associated with clicking (OR = 1.30, 95% CI: 0.38-4.38, $p = 0.67$); however, Velly et al. states anxiety (OR = 2.40, 95% CI: 1.01-5.73) was positively related to disc displacement as one diagnosis related to clicking [22]. In this study, there was an augmented risk of clicking when individuals had stress and anxiety simultaneously (OR = 2.80, 95% CI: 0.69-11.31). Stress is an external stimulus that signals danger, often by causing pain. Fear is the short-term response such stress produce in men, women or lab rats. Anxiety has many of the same symptoms as fear, but it is a feeling that lingers long after the stress has lifted and the threat has passed [23]. This risk was higher when those variables were adjusted by pain (OR = 4.90, 95% CI: 0.78-30.80, $p = 0.07$). Anxiety may contribute to muscle tension that can exacerbate pain [24] and pulls the disc forward and out of place with respect to the condyle. Stress and anxiety together play an important role in triggering and perpetuating parafunction (bruxism), which is associated to both pain and disc position and mobility [25].

Anxiety-depression comorbidity and stress interacted (OR = 2.11, 95% CI: 0.40-11.15, $p = 0.37$) and, when they were adjusted by pain symptom, we observed an OR = 4.30, 95% CI: 0.35-51.90, $p = 0.21$. As a result, it would be important to employ scales as DASS-21, which assesses depression, anxiety and stress to determine the association between these conditions and clicking. In-deep knowledge of these topics can contribute to a better understanding of TMD, thus promoting a higher response capacity of counseling to population. In this sense, dental professionals could consider educational actions such as mental health promotion to minimize the risk of clicking.

We conclude pain symptom may be an important variable that should be analyzed under other perspectives. Pain in TMD such as clicking may

have different origins, some of them associated with depression and anxiety and other as a result of clenching/grinding (OR = 4.9, 95% CI: 3.0-7.8), which have also been related to disc displacement (OR = 2.5, 95% CI: 1.4-4.3) [26]. Pain may be an important indicator of both depression and anxiety, and oral parafunctions. The handling of patients who suffer from physical pain and have these psychological symptoms may be challenging because of the complex aspects of pain under these conditions. Furthermore, new questions may arise with respect to the role of depression and anxiety in subjects with oral parafunctions and the risk of clicking.

There are limitations to the present study. The time for recruiting individuals was relatively short, since college students from different programs have varied schedules and activities that made the examination difficult. For this reason, the representation of our study population might be weakened. Future studies are needed to confirm all findings we obtained in this research.

Conclusion

Depression, anxiety, stress and pain may become predictors for development of TMD such as clicking. In this sense, the measurement of those conditions in patients should be a priority.

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