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ASSOCIAÇÃO ENTRE BRUXISMO DO SONO E SINTOMAS DE ESTRESSE EM ADULTOS: UMA REVISÃO SISTEMÁTICA COM META-ANÁLISE

Florianópolis
2020

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Dissertação submetida ao Programa de Pós-Graduação em Odontologia da Universidade Federal de Santa Catarina para obtenção do Grau de Mestre em Odontologia.

Orientadora: Profª. Drª. Graziela De Luca Canto

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ASSOCIAÇÃO ENTRE BRUXISMO DO SONO E SINTOMAS DE ESTRESSE EM ADULTOS: UMA REVISÃO SISTEMÁTICA COM META-ANÁLISE

O presente trabalho em nível de mestrado foi avaliado e aprovado por banca examinadora composta pelos seguintes membros.

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Certificamos que esta é a **versão original e final** do trabalho de conclusão que foi julgado adequado para obtenção do título de mestre em Odontologia.

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Profª. Graziela De Luca Canto, Drª
Orientadora

Florianópolis, 2020.

Este trabalho é dedicado aos meus pais.

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APRESENTAÇÃO

A autora é mestranda na linha de pesquisa de Reabilitação Oral, da área de Clínicas Odontológicas, do Programa de Pós-Graduação em Odontologia (PPGO) na Universidade Federal de Santa Catarina (UFSC). Graduou-se em Odontologia na mesma universidade no primeiro semestre de 2018.

Durante a graduação e mestrado, foi membro do Centro Brasileiro de Pesquisas Baseadas em Evidências (COBE), atuando ativamente na equipe, tendo sido monitora, bem como ministrante de algumas aulas. Também foi bolsista PIBIC durante o último da graduação. Durante o mestrado, ministrou cursos de revisão sistemática na SEPEX e na Unioeste. Nesse período, realizou um estudo primário no Hospital Baía Sul, juntamente com duas colegas, visando o projeto do doutorado. Além disso, publicou três artigos como primeira autora (revisões sistemáticas) em revistas internacionais e teve um aceito como segunda autora, todos em revistas Qualis A. Atualmente, possui três artigos submetidos aguardando as respostas das revistas e três revisões sistemáticas em andamento. Além dos artigos, foi coautora do livro "Revisões Sistemáticas da Literatura - Guia Prático", participando de três capítulos: "Capítulo 3: Registro do Protocolo", "Capítulo 12: Formatação do artigo para submissão" e "Capítulo 13: Aplicabilidade". Em todos os semestres do mestrado foi bolsista CAPES.

Esta dissertação foi originalmente escrita como um artigo na língua inglesa, com o objetivo de ser submetida ao periódico *Journal of Oral Rehabilitation*. A pesquisa foi realizada em parceria com os pesquisadores Jéssica Conti Réus, Ms Israel Maia e Drª. Graziela De Luca Canto, da Universidade Federal de Santa Catarina; Dr. Bruce Dick e Dr. Carlos Flores-Mir, da *University of Alberta*; e o Dr. Gilles Lavigne da *University of Montreal.*

RESUMO

Objetivo: sintetizar e revisar criticamente a associação entre bruxismo do sono (BS) e sintomas de estresse em adultos.

Métodos: Foi realizada uma revisão sistemática com meta-análise. A pesquisa foi concluída usando sete bases de dados eletrônicas, além de uma pesquisa bibliográfica na literatura cinzenta. Dois revisores selecionaram cegamente estudos com base em critérios de elegibilidade pré- definidos. Estudos que associaram o BS (possível, provável e definitivo) com o autorrelato de sintomas de estresse e biomarcadores por métodos validados foram incluídos. O risco de viés dos artigos incluídos foi realizado usando a Joanna Briggs Institute Critical Appraisal Checklist for Analytical Cross-Sectional Studies.para Estudos Transversais Analíticos. O RevMan 5.4 (Review Manager 5.4, The Cochrane Collaboration) foi usado para realizar a meta-análise e gerar os números. A qualidade da evidência foi avaliada de acordo com a Grading of Recommendations Assessment, Development and Evaluation (GRADE).

Resultados: Nove estudos foram incluídos para análise qualitativa, dos quais três também foram incluidos para análise quantitativa. Dois estudos apresentaram baixo e sete foram avaliados com risco moderado de viés. A qualidade da evidência foi classificada como muito baixa para todos os resultados. Verificou-se que indivíduos com SB apresentam níveis mais altos de alguns sintomas de estresse, avaliados através do autorrelatado em questionários. Os níveis de adrenalina, noradrenalina, cortisol, adrenalina, dopamina e noradrenalina também mostraram associação positiva com o SB.

Conclusões: Embora algumas associações tenham sido identificadas entre BS e sintomas de estresse autorrelatados e biomarcadores de estresse em adultos, uma vez que a qualidade das evidências foi muito baixa, deve-se ter cuidado ao interpretar esses resultados. Esses achados sugerem a necessidade de estudos adicionais melhores desenhados, a fim de esclarecer a ligação entre BS e estresse.

Palavras-chaves: Odontologia baseada em evidências. Bruxismo do sono. Sintomas de estresse. Revisão sistemática.

ABSTRACT

Aim: To synthesize and critically review the association between sleep bruxism (SB) and stress symptoms in adults.

Methods: A systematic review with meta-analysis (MA) was performed. The search was completed using seven electronic databases in addition to a gray literature search. Two reviewers blindly selected studies based on pre-defined eligibility criteria. Studies that associated SB (possible, probable and definite) with self-reported stress symptoms and biomarkers through validated methods were included. Risk of bias of the included articles was performed using the Joanna Briggs Institute Critical Appraisal Checklist for Analytical Cross-Sectional Studies. RevMan 5.4 (Review Manager 5.4, The Cochrane Collaboration) was used to perform the MA and to generate the figures. Cumulative evidence was evaluated according to the Grading of Recommendations Assessment, Development and Evaluation (GRADE).

Results: Nine studies were included for qualitative analysis, of which three were also included for quantitative analysis. Two studies presented low risk of bias and seven were assessed with moderate risk of bias. Cumulative evidence was classified as very low for all outcomes. Individuals with SB were found to have higher levels of some self-reported stress symptoms as assessed through questionnaires. Epinephrine, norepinephrine, cortisol, adrenaline, dopamine and noradrenaline levels showed a positive association with SB.

Conclusions: Although some associations were identified between SB and self- reported stress symptoms and biomarkers of stress in adults, given that the quality of evidence was found to be very low, caution should be exercised in interpreting these results. These findings suggest that additional and better designed studies are warranted in order to clarify the link between SB and stress.

Keywords: Evidence-based dentistry. Sleep bruxism. Stress symptoms. Systematic review.

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LISTA DE ABREVIATURAS E SIGLAS

BS - Bruxismo do sono

BV - Bruxismo de vigília

PSG - Polissonografia

RS - Revisão sistemática

Do artigo em inglês:

AB - Awake bruxism

CI - Confidence interval

EMG - Electromyography

MA - Meta-analysis

OR - Odds ratio

OSF – Open Science Framework

PRISMA - Preferred reporting items for systematic reviews and meta-analysis

PROSPERO - Prospective Register of Systematic Reviews

PSG - Polysomnography

SB - Sleep bruxism

SR - Systematic review

LISTA DE SÍMBOLOS

% - Percentual

± - Mais ou menos

SUMÁRIO

1 INTRODUÇÃO

1.1 BRUXISMO

O bruxismo é uma atividade repetitiva dos músculos da mandíbula cacterizado por apertando e/ou rangimento dos dentes. O bruxismo tem duas manifestações circadianas distintas: pode ocorrer durante o sono, caracterizado como bruxismo do sono (BS), ou enquanto o indivíduo está acordado, denominado como bruxismo em vigília (BV) (LOBBEZOO et al., 2013).

O BS pode ser definido como uma atividade muscular mastigatória que ocorre durante o sono (caracterizada como rítmica ou não-rítmica). Em indivíduos saudáveis, o BS não deve ser considerado um distúrbio, mas um comportamento que pode ser um fator de risco (e /ou protetor) para certas consequências clínicas (LOBBEZOO et al., 2018). Quando o indivíduo não apresenta nenhuma conseguência clínica é considerado um "normo-bruxismo", porém quando apresenta associação com sinais e sintomas prejudiciais o bruxismo é considerado "pato-bruxismo" (SVENSSON e LAVIGNE, 2020). A distinção do bruxismo em relação ao ciclo circadiano, é um pouco mais antiga, classificando o bruxismo em BS e em bruxismo em vigília (BV) (LOBBEZOO et al., 2013).

Por muitos anos não houve um padrão na forma de diagnóstico do bruxismo. Em 2013, (LOBBEZOO et al., 2013) sugeriram uma classificação em relação ao método diagnóstico, sendo dividido em possível, provável e definitivo. Uma revisão sistemática analisou a validade diagnóstico das ferramentas disponíveis (questionários, exame clínico e o exame de polissonagrafia (PSG)) (CASETT et al., 2017) Os resultados mostraram que o método instrumental pela PSG é o padrão de referência para o diagnóstico SB. Já métodos não instrumentais como questionários, exames clínicos são recomendadas para a triagem do BS, por apresentarem uma alta sensibilidade, ou seja são muito bons para excluir aqueles que não apresentam a condição. Em 2018 (LOBBEZOO et al., 2018), houve uma atualização dessa classificação, e o bruxismo do sono foi definido como "possível" quando questionários validados forem utilizados; "provável" quando a avaliação clínica ocorrer, e "definitivo" quando o diagnóstico é feito com base na polissonografia (PSG).

Uma revisão sistemática sobre a prevalência de bruxismo possível encontrou uma taxas de prevalência para BS de 12.8% (± 3.1%). Entretanto, os estudos de prevalência de BS apresentam uma alta heterogeneidade em relação ao métodos de diagnóstico (MANFREDINI et al., 2013). Considerando apenas a BS definitivo, a prevalência diminui para 7.4% (Maluly et al., 2013). No Brasil, a prevalência encontrada em adultos é estimada em 8,1% (IC 95% - 6,6 - 9,5) (PONTES e PRIETSCH, 2019).

O SB possui etiologia multifatorial e ainda não totalmente definida na literatura (LOBBEZOO et al., 2018). Hoje se entende que a etiologia do bruxismo está relacionada com fatores centrais, e não periféricos (LOBBEZOO e NAEIJE, 2001). Durante o sono, acontecem microdespertares. Esses eventos estão relacionados com o aumento da atividade muscular mastigatória do indíviduo (KRIEGER et al., 2001). Além disso, alguns medicamentos psicotrópicos, cafeína, tabaco e álcool estão relacionados com a presença de bruxismo do sono (BERTAZZO-SILVEIRA et al., 2016; MELO et al., 2018). Assim como, fatores psicológicos como sintomas de ansiedade (POLMANN et al., 2019).

1.2 ESTRESSE

Estresse foi definido 1990 como "uma experiência emocional negativa acompanhada de mudanças bioquímicas, fisiológicas, cognitivas e comportamentais previsíveis, direcionadas à alteração do evento estressante ou à acomodação de seus efeitos" (BAUM, 1990). A Associação Americana de Psicologia (VANDENBOS, 2013) define estresse como a resposta fisiológica ou psicológica a estressores internos ou externos. Esses estímulos contínuos podem levar ao aumento de alguns biomarcadores e refletem na diminuição da saúde sistêmica do indivíduo (MARRELLI et al., 2014). Uma única definição para o estresse ainda não foi formulada, visto que ele apresenta-se em vários momentos do dia a dia e pode afetar cada indíviduo de forma singular (KAGAN, 2016).

O estresse pode ser classificado em agudo ou crônico. A resposta imediata a um estressor é considerada estresse agudo, quando há uma série de respostas psicológicas e fisiológicas imediatas (GIANAROS e WAGER, 2015). Após a remoção desse estressor, reguladores retornam a homeostasia do corpo (SEEMAN et al., 2001). Quando um estressor não é removido, essas alterações podem ser mais persistentes, caracterizando o

estresse crônico, podendo levar a mudanças mais permanentes (FISKE e TAYLOR, 2013).

Não há um consenso sobre um teste referência para o estresse, sendo vários métodos serem aceitos como questionários, biomarcadores salivares e urinários entre outros (FIGUEROA-FANKHANEL, 2014). Alguns exemplos de sintomas são manifestados por palpitações, sudorese, boca seca, falta de ar, inquietação, fala acelerada, aumento de emoções negativas (se já estiver ocorrendo) e maior duração da fadiga por estresse. Ao causar essas mudanças mente-corpo, o estresse contribui diretamente para distúrbios e doenças psicológicas e fisiológicas e afeta a saúde mental e física, reduzindo a qualidade de vida (CHROUSOS, 2009).

Estudos em humanos associaram o BS a sintomas de estresse (OHAYON et al., 2001; ABEKURA et al., 2011; FERREIRA-BACCI et al., 2012; SERRA-NEGRA et al., 2012), bem como estudos em animais, (ROSALES et al., 2002) no entanto, de forma oposta, alguns estudos não encontraram essa associação (PIERCE et al., 1995; NAKATA et al., 2008; OHLMANN et al., 2018). Portanto, ainda há necessidade de estudos metodologicamente mais rigorosos para avaliar a associação do BS com sintomas de estresse.

2 JUSTIFICATIVA

Em 2009, uma revisão de literatura avaliou o efeito dos fatores psicossociais na etiologia do bruxismo. Vários sintomas foram avaliados como estresse, ansiedade e depressão. Em relação ao estresse, não houve uma conclusão definitiva sobre sua associação com bruxismo. O estudo avaliou a detecção do bruxismo como um todo, sem a distinção em relação ao ciclo cicardiano, além disso não houve padronização da forma de detecção do bruxismo e nenhum estudo avalido utilizou o método definitivo (MANFREDINI e LOBBEZOO, 2009).

Uma revisão sistemática (CRUZ et al., 2016) publicada em 2016, incluindo estudos primários que associaram bruxismo e cortisol salivar para avaliar o estresse, encontrou apenas dois estudos sobre o assunto (CASTELO et al., 2012; KARAKOULAKI et al., 2015) e não encontrou evidência científica conclusiva. Desde então, diversos estudos primários sobre este tópico foram publicados visto isso, uma nova revisão sistemática foi proposta para sintetizar o assunto.

3 OBJETIVOS

3.1 Objetivo geral

Revisar sistematicamente e analisar criticamente a associação entre bruxismo do sono e sintomas de estresse em adultos.

3.2 Objetivos específicos

Associar os diferentes tipos de bruxismo do sono (possível, provável e definitivo) com sintomas de estresse em adultos.

Verificar a significância estatística resultante da associação entre as variáveis relativas a estresse e bruxismo do sono nos estudos incluídos.

4 ARTIGO

Artigo formatado conforme as normas da revista *Journal of Oral Rehabilitation.*

Association between sleep bruxism and stress symptoms in adults: A systematic review and meta-analysis

Running tittle: Sleep bruxism and stress

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Conflict of interest

Authors have no conflicts of interest to declare.

Abstract

Aim: To synthesize and critically review the association between sleep bruxism (SB) and stress symptoms in adults.

Methods: A systematic review was performed. The search was completed using seven primary electronic databases in addition to a gray literature search. Two reviewers selected studies blindly based on pre-defined eligibility criteria. Studies that associated SB (possible, probable and definite) with self-reported stress symptoms and biomarkers through validated methods were included. Risk of bias of the included articles was performed using the Joanna Briggs Institute Critical Appraisal Checklist for Analytical Cross-Sectional Studies. RevMan 5.4 (Review Manager 5.4, The Cochrane Collaboration) was used to perform the meta-analysis and to generate the figures. The quality of evidence was evaluated according to the Grading of Recommendations Assessment, Development and Evaluation (GRADE).

Results: Nine studies were included for qualitative analysis, of which three were also included for quantitative analysis. Two studies presented low and seven were assessed with moderate risk of bias. Quality of evidence was classified as very low for all outcomes. Individuals with SB were found to have higher levels of some self-reported stress symptoms as assessed through questionnaires. Epinephrine, norepinephrine, cortisol, adrenaline, dopamine and noradrenaline levels also showed a positive association with SB.

Conclusions: Although some associations were identified between SB and self- reported stress symptoms and biomarkers of stress in adults, given that the quality of evidence was found to be very low, caution should be exercised in interpreting these results. These findings suggest that additional and better designed studies are warranted in order to clarify the link between SB and stress.

Keywords: Evidence-based dentistry. Sleep bruxism. Stress symptoms. Systematic review.

INTRODUCTION

Sleep bruxism (SB) can be defined as a masticatory muscle activity that occurs during sleep (characterized as rhythmic or non-rhythmic).[1] In healthy individuals, SB should not be considered as a disorder, but rather as a behavior that can be a risk (or protective) factor associated with certain clinical consequences. SB has a multifactorial etiology,[1,2] that has been broadly classified into three groups of etiological factors. Biological factors,[3-5] psychological factors such as anxiety symptoms,[6] and exogenous factors such as consumption of some medicines, caffeine, tobacco and/or alcohol.[7,8]

Baum[9] described stress as "a negative emotional experience accompanied by predictable biochemical, physiological, cognitive, and behavioral changes that are directed either toward altering the stressful event or accommodating to its effects". Moreover, the American Psychological Association [10] defines stress as the physiological or psychological response to internal or external stressors. These continuous stimuli can lead to increase of some biomarkers, and can be reflected by worsening of the systemic health of the affected individual.[11] Some examples of related symptoms are palpitations, sweating, dry mouth, shortness of breath, fidgeting, accelerated speech, augmentation of negative emotions (if already being experienced), and longer duration of stress-related fatigue. By eliciting these mind–body changes, stress contributes directly to psychological and physiological disorders and diseases that affect mental and physical health, thereby reducing quality of life. [12]

Previous studies in animals[13] as well as in humans [14-17] have associated SB with stress symptoms; however, not all studies have found this association. [18-20] Moreover, a literature review[21] was performed in 2009 about the role of psychological factors and bruxism. Most of the included studies did not assess SB through polysomnography (PSG), which is the standard test for detection of SB. [22] Additionally, bruxism was evaluated as a whole and not separated in relation to the circadian cycle, such as in awake or sleep bruxism. A previous systematic review (SR)[23] was performed including primary studies that explored an association between bruxism and salivary cortisol to evaluate stress. Only two studies were included in that SR[24,25] and there was no conclusive scientific evidence detected in that study.

The association between SB and multiple stress symptoms has not yet been consolidated in the literature. Therefore, the aim of this systematic review was to critically evaluate current evidence and answer the following focused question: "Is there an association between sleep bruxism and stress symptoms among adults?"

METHODS

Protocol and registration

A study protocol was elaborated following the PRISMA-P [26] guidelines and registered at PROSPERO under the code CRD42020157471.

This SR was reported according to Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA). [27]

Eligibility criteria

The acronymic PECOS (Population, Exposition, Comparison, Outcomes and Studies) was used to formulate the focused question in this SR, in which: P) Adults with quantified stress; E) Presence of SB; C) Absence of SB; O) Association between SB and stress; and S) Observational studies. We therefore included studies that investigated the association between SB and stress symptoms in adults (18 years and older).

Based on the new international consensus,[1] the assessment of SB can be classified through either a non-instrumental approach or an instrumental approach. The non-instrumental includes self-reporting (questionnaires and oral history) and clinical examination. The instrumental approach includes an electromyography (EMG) record that can also include audio and/or video recordings, through a PSG.[1] A grading system for SB assessment was proposed although further validation in clinical milieu is awaited to support it use in discriminating the behavioral and disorders issues and if it is valid for causality assessments.[1,28,29] Such grading methodology have been used in other condition such as neuropathic pains for qualification of symptoms, clinical and test findings.[30,31] The first level of the SB grading is 'possible SB', based on positive self-report only. SB is considered 'probable' with a positive clinical inspection, with or without a positive self-report. 'Definite SB' grading is based on use of a positive instrumental assessment(s), as confirmatory test(s), with or without a positive self-report and/or a positive clinical inspection. The SB was graded regarding the assessment by the first author.

In addition, stress symptoms were assessed through validated questionnaires, such as the "Stress Questionnaire" from the International Stress Management Association, [32] Perceived Stress Scale,[33] Manual of Student Stress Inventory (SSI),[34] Copenhagen Psychosocial Questionnaire (COPSOQ II), [35] and the Questionnaire WHO.[36]

Moreover, we also included studies that evaluated self-reported stress symptoms through biomarkers[37] such as cortisol, catecholamines, a-amylase and/or proinflammatory cytokines (interleukin (IL)-6, IL-1b levels) found in salivary, urine,

blood and/or body fluids samples. The specificity and validity of these biomarkers was not assessed for the present review; it is a topic for another review.

Our exclusion criteria included: 1) Studies that included individuals with comorbidities such as temporomandibular joint disorders, obstructive sleep apnea, depression, or other psychiatric disorders such as Post-Traumatic Stress Disorder (PTSD), insomnia; anxiety. 2) Studies that evaluated awake bruxism (AB); Studies in which SB diagnostic criteria or stress criteria were not reported or not sufficiently described; 3) Studies with no healthy control group; studies that did not associate SB and stress; 4) Reviews, letters, conference abstracts, personal opinions, case reports, and laboratory research or abstracts with no full text available. No sex or time of publication restrictions were applied.

Information sources and search strategy

Electronic search strategies were developed for EMBASE, Latin American and Caribbean Center on Health Sciences (LILACS), LIVIVO, PubMed, SCOPUS, Web of Science, and PsycINFO. Additionally, a grey literature search was performed on Google Scholar, Open Grey, and ProQuest. There was no time period restriction. Furthermore, hand-searches were performed on the reference lists of included articles. Experts were also consulted in order to improve search findings, following the recommendations of Greenhalgh and Peacock.[38] More information concerning truncation and word combinations are available in Supplementary Table S1. Reference management software (EndNote X7, Thomson Reuters) was used to exclude duplicates and organize references (Rayyan).[39]

Study Selection

A two-phase process was conducted by the same two reviewers to select studies. In phase-one, two reviewers (H.P. and J.C.R.) independently screened the titles and abstracts of all identified references. Studies that did not fulfill the above noted eligibility criteria were excluded. In phase-two, the same two reviewers applied the eligibility criteria to the full-text of the studies. A third reviewer (C.M.) was consulted in the event of unresolved rating disagreements between the two reviews following a consensus discussion.

Data collection process and data items

The first reviewer (H.P.) collected and extracted the required information from the selected studies. A second reviewer (J.C.R.) extracted the same information separately. Collected data were subsequently compared. Any unresolved disagreement was decided by the third reviewer (C.M.) if needed. The data collected consisted of: study

characteristics (authors, year of publication, country), population characteristics (sample size, mean age of participants, gender), methods of disorder assessment, and main findings.

Risk of bias in individual studies

Risk of bias was assessed by using the Joanna Briggs Institute Critical Appraisal Checklist according to the design of the included studies. Separately, two reviewers (H.P. and J.C.R.) performed the risk of bias evaluation and judged the included articles as "high risk" when the study bias rating "yes" score was between 0 and 49%, "moderate risk" when the study "yes" score was between 50 and 69%, and "low risk" when the study "yes" score was above 70%. In cases of rating category discordance between the two reviewers, the third reviewer (C.M.) was consulted to resolve the disagreement. RevMan 5.4 (Review Manager 5.4, The Cochrane Collaboration) was used to generate the figures.

External and internal validity

Clinical heterogeneity across studies was assessed by comparing variability across participants' characteristics (such as age and type of medication used). Methodological heterogeneity was evaluated by comparing variability in study design (such as diagnostic methods) and risk of bias in individual studies.

Summary measures

The main outcome assessed was the association between SB and stress symptoms. The summary measure considered odds ratios (OR) in dichotomous variables, with 95% confidence intervals (CI). For continuous variables, the Mean Difference (MD) was considered, also with 95% confidence intervals (CI).

Statistical heterogeneity was quantified using the I^2 test, and a value >50% was considered as an indicator of substantial heterogeneity. According to the appropriate Cochrane Guidelines, a value greater than 50% is considered an indicator of substantial heterogeneity among studies. As a result, the random effect method was chosen to be appropriate method[40]. On the other hand, when I^2 was lower than 50%, the fixed effect model is recommended. [41] The software RevMan 5.4 (Review Manager 5.4, The Cochrane Collaboration) was used to perform all the meta-analyses and create the figures.

Confidence in cumulative evidence

A summary of the overall strength of evidence available was presented and categorized by groups analyzed using "Grading of Recommendations Assessment, Development and Evaluation" (GRADE). Summary of Findings (SoF) tables were produced with the aid of the GRADE online software (GRADEpro GTD, Copenhagen,

Denmark) provided by the GRADE Working Group in association with the Cochrane Collaboration and Members of McMaster University.

RESULTS

Study selection

In phase-1, 2267 references were found within all searches. After duplicates were removed, 1147 were left for screening of title and abstract. After screening, 39 references were selected by both reviewers to phase-2. After applying the eligibility criteria on full-text, thirty more articles were excluded (please see Supplementary Table 2 for exclusion details). Following careful article review, nine articles were finally included. The search on main databases was carried out on January 5, 2020, as well as the grey literature search. Eight articles were found in the databases and one through the reference list search.

Study characteristics

Nine analytical cross-sectional studies were included. They were published in Brazil, [42-44] Greece, [24] Indonesia, [45] Lithuania, [46] Peru, [47] Poland [48] and the United States.[49] They were published between 1980 and 2019. Overall, 3028 participants were registered in these studies. The largest sample presented was 394[43] individuals and the smallest, 30.[49] In addition, only two of the included studies reported a priori calculations to estimate sample size. [46,47] Only three studies could be included for quantitative analysis. [24,46,48] Information regarding study characteristics can be found in Table 1.

Two studies[45,46] assessed possible SB using only questionnaires. SB assessment was considered probable in seven studies [24,42-44,47-49] using clinical examination, of which four used an instrumental approach (EMG) to detected SB. None of the articles had a definitive assessment using the standard test polysomnography.

Risk of bias within studies

Two studies[43,47] presented low risk of bias while six articles were assessed with moderate[24,42,44-46,48,49] risk of bias. The question which elevated the risk of bias was "Were confounding factors identified?" only four studies identified at least one confounding factor such as coffee, tobacco, alcohol and/or the presence of tori.[3,7] Further information about the criteria for grading the questions as "yes" or "no" can be found in the Checklist for Analytical Cross Sectional Studies of the Joanna Briggs Institute. More information about risk of bias can be found in Figure 2.

Results of individual studies

The results of the analytical cross-sectional studies were scrutinized according the assessment method of stress symptoms. The evaluation of stress symptoms could be done through questionnaires that presented dichotomous or continuous results, and also through biomarkers.

Carvalho et al[43] evaluated 395 policemen and 198 of them presented with probable SB. Approximately 27.34% of the individuals with SB also presented with stress symptoms. Stress symptoms were evaluated using the Stress Symptoms Inventory (SSI). A qui-square test demonstrated that sleep bruxers had a 2.07 (95% CI 1.38 to 3.09) increased risk of stress symptoms than non-sleep bruxers.

Carvalho et al[42] analyzed 81 police officers through self-report and clinical examination and found that 27 presented with probable SB. Nine participants presented with both conditions. SSI was used to estimate stress levels. A negative association was found through a qui-square test, with an OR of 0.02 (95% CI 0.01 to 0.10).

Clark et al[49] recruited a sample of 30 adults from the Dental Center that were assessed by EMG for probable SB and biomarkers to evaluate stress symptoms. Three groups were classified according to EMG results: control, light muscle activity and heavy muscle activity. A positive association between the heavy muscle activity group and the other groups concerning stress was found using Student *t*-test. The MD between the heavy muscle activity and control groups was 4.27 (95% CI 3.96 to 4.58) with respect to the measured epinephrine biomarker and 19.17 (95% CI 17.33 to 21.01) for norepinephrine.

Indrasari et al[45] conducted a study with 214 individuals from an aircrew where 51 were assessed with possible SB. Occupational Stress Indicator Management guide was chosen to evaluate stress symptoms. The MD between SB and non SB was 2.10 (95% CI 0.39 to 3.81). A Mann-Whitney test was performed and a significant association between SB and stress symptoms was found.

Jokubaukas et al[46] collected a sample of 102 participants with SB from a total 228 undergraduate dental students evaluated. SB was classified as probable and stress assessment was made using the Perceived Stress Scale (PSS). A chi-squared test and Fisher's exact test found a negative association between SB and stress. The MD between groups was 1.64 (95% CI -0.10 to 3.38).

Karakoulaki et al[24] used a portable device to detect SB along with a questionnaire in 45 individuals under treatment at School of Dentistry. Twenty five were classified with possible SB. Stress was evaluated via questionnaire (PSS) and biomarkers (cortisol and

α-amylase). The MD regarding PSS was 10.72 (95% CI 5.95 to 15.49). Cortisol was found to have a MD of 0.10 (95% CI 0.06 to 0.14) and α-amylase showed a negative MD 0.98 (95% CI -14.99 to 16.95). The Mann-Whitney test was used to compare those variables.

Marin et al[47] investigated 204 individuals from the military aircrew and 62 presented with probable SB and 62 presented with probable SB. Only two individuals presented with both conditions. The World Health Organization (WHO) questionnaire was used to assess stress symptoms. Pearson's chi-square non-parametric test was used to carry out statistical analysis. This study found that SB sufferers had an 11.78 (95% CI 0.56 to 248.95) times higher risk of experiencing stress symptoms.

Saczuk et al[48] analyzed 60 adults who came to consultation to the Laboratory of Masticatory Dysfuctions using a portable device and 35 were found to have probable SB. The PSS was used to evaluate stress. The Mann-Whitney test was used to carry out the primary analysis. A negative MD was found between groups 3.00 (95% CI -0.07 to 6.07).

Seraidarian et al[44] evaluated possible SB in 40 men found in general population through questionnaire and 20 were found to have SB. Catecholamines (adrenalin, noradrenalin and dopamine) were used to assess stress levels. The Mann-Whitney test showed a positive association between all three catecholamines and SB. The MD for adrenaline, dopamine and noradrenaline were respectively: 75.90 (95% CI 59.99 to 91.81), 277.90 (95% CI 220.97 to 334.83) and 125.73 (95% 108.91 to 142.55).

Synthesis of results

Stress assessed by questionnaire

A meta-analysis was performed for continuous outcomes in four studies by using Mean Difference (MD) and the Inverse Variance analysis method [24,46,48]. A positive association was found ($p<0.001$) and the MD was 4.59 (95% CI 0.26 to 8.92) between bruxers and non-bruxers. However, a considerable level of heterogeneity was discovered through I^2 and Tau^2 tests, indicating that the included studies were particularly heterogeneous in their reported effect size. Further details of these data can be found in Figure 3.

For dichotomous outcomes, relative frequencies, absolute frequencies, and p-values were collected from the studies as outcomes measurements. Moreover, since different approaches were used to evaluate stress symptoms, the data appeared to have wide variation and the samples had different degrees of SB classification (e.g., possible, probable). Of note, the included studies were considered clinically, methodologically and

statistically heterogeneous. Therefore, quantitative data were not directly comparable and therefore a meta-analysis was deemed inappropriate.

Stress assessed by biomarkers

Three studies [24,44,49] used biomarkers to evaluate stress symptoms. Epinephrine, norepinephrine, cortisol, α-amylase, adrenaline, dopamine and noradrenaline levels were used. A quantitative analysis could not be performed since each study used one different biomarker. All biomarkers analyzed in this SR were found to have significantly higher levels in sleep bruxers than non-bruxers. Only α-amylase did not show a positive association with SB. Meta-analysis was not performed due to high levels of clinical, methodological and statistical heterogeneity.

Confidence in cumulative evidence

Confidence in cumulative evidence was performed for stress assessment markers. Confidence was found to be very low according to the GRADE criteria. Imprecision was judged to be serious since different tools for stress assessment were used across studies. Adding to that, some concerns regarding SB detection was present given that no standardized method was used across studies. The risk of bias was also evaluated for continuous and biomarker outcomes. Most of the studies did not report whether confounders were identified nor did they report how confounders were dealt with. As well, all studies used convenience sampling, a method that is not ideal. Most of studies did not report the process of researcher method calibration. Inconsistency was considered serious given that divergent results were found using both questionnaires as outcomes. Supplementary information relevant to these issues can be accessed in Table 2.

External and internal validity of findings

Internal validity was highly affected in this SR, since neither SB nor stress were assessed through standardized tests. External validity was limited due to the use of convenience sampling in most studies. Almost all participants were selected from convenience samples (universities, clinics, and hospitals), only one study selected their participants from general population, however only men were included. As well, studies were collected from four different continents: America, Europe, Asia and Oceania (since Indonesia is a transcontinental nation). Caution should be taken when extrapolating the results of this SR from a worldwide population.

DISCUSSION

Summary of evidence

Results from this SR suggest a positive association between SB and stress symptoms. However, caution should be exercised in this interpretation due to the moderate risk of bias of almost all studies and the very low quality of evidence to support the assessed outcomes. Possible SB was positively associated with stress symptoms in one study[45] as well as in two studies[45,46] that evaluated SB through questionnaires. All included studies [24,42-44,47-49] that evaluated probable SB showed a positive association with a measured stress symptom.

Stress symptoms are present in our daily life tasks. The presence of stress *per se* will not automatically cause a disorder or disease in a health subject, however, an extended exposure to stressors might cause the organism to range a phase of exhaustion with adverse damages can be perceive.[50]

Catecholamines, cortisol and alfa-amylase levels were assessed through biomarkers in four of the included SB studies. Catecholamines are similar hormones and neurotransmitters with several functions, such as control of motoneuron activity, regulation of sleep and modulation of heart rate.[51] They are regulated through the hypothalamic-adrenal axis, which releases catecholamines in the presence of a stress trigger. In our SR, dopamine, serotonine, adrenalin and noradrenalin levels were evaluated. All included studies that associated catecholamines with SB found higher levels in sleep bruxers than in non-sleep bruxers. This association has been also found in a pediatric sample.[52] Further, it has been suggested that neurotransmitters might be involved in the origin of jaw movements.[5] Moreover, two studies that associated sleep bruxism with cortisol found higher levels of cortisol in the case group sample. Cortisol, also known as hydrocortisone, is a hormone that is also regulated by the hypothalamic-adrenal axis, as is the case with the neurotransmitters listed above. Cortisol levels also change according to the circadian rhythm. [53] Higher levels of cortisol also increase vigilance and hypervigilance, [54] among other conditions.

A-amylase has been known as a biomarker for acute stress. However the use of this biomarker has generated some conflicting findings in the published literature. [55] The negative association found in this SR should be considered with caution given that SB is unlikely to develop from a single episode of stress.

Three [24,46,48] articles evaluated *perceived* stress in their sample via questionnaires. Perceived stress is “feelings or thoughts that an individual has about how much stress they are under at a given point in time or over a given time period”. [56] A meta-analysis was performed that found an overall positive association.

Limitations

Our SR identified only analytical cross-sectional studies, a limitation that precludes any causal inferences between SB and stress symptoms. [57] Longitudinal studies that include therapeutic interventions, clinical trials and that encompass long-term follow-up periods would better support any directionality and provide a higher quality of evidence. [58]

Moreover, there are some comorbidities that may influence the variables of our SR, such as the presence of some anxiety symptoms[6] and the use of some psychotropic medications.[8] Studies that presented participants with these conditions were excluded. Nevertheless, there is no assurance that these conditions were present but unreported by study participants.

All questionnaires assessed self-reported stress and studies did not report the presence of a psychological profession in the evaluation and analysis process. There are diverse vantages for a self-report evaluation, however caution should be taken upon the results since the credibility of their answers. Even when interviewees meant to be honest, their self-reports may be imprecise. Some limitations such as self-deception and lack of memory can be related.[59]

Assuming that the occurrence of stress during vigilance could carry over effect-persistence or dominance from circadian rhythm into nonREM/REM sleep rhythm should be taken with caution.

Moreover, is not possible to assess how the presence of AB could affect the SB activity is this study. A subject without the detection of AB may show inaccurate results when evaluated for probable SB, since the clinical signs and symptoms for both conditions are similar. [60]

CONCLUSIONS

Based on current published literature, a positive association between SB and stress symptoms seems to exist, but caution should be exercised due to the moderate risk of bias and the very low quality of evidence included in this SR to support the association. Stronger methodologically and more standardized prospective studies, i.e., participants selection from general population, standardize clinical and test protocols with long-term follow-up are needed to increase the quality of evidence in order to confirm this possible association and to help clarify the direction of the association between the two assessed variables.

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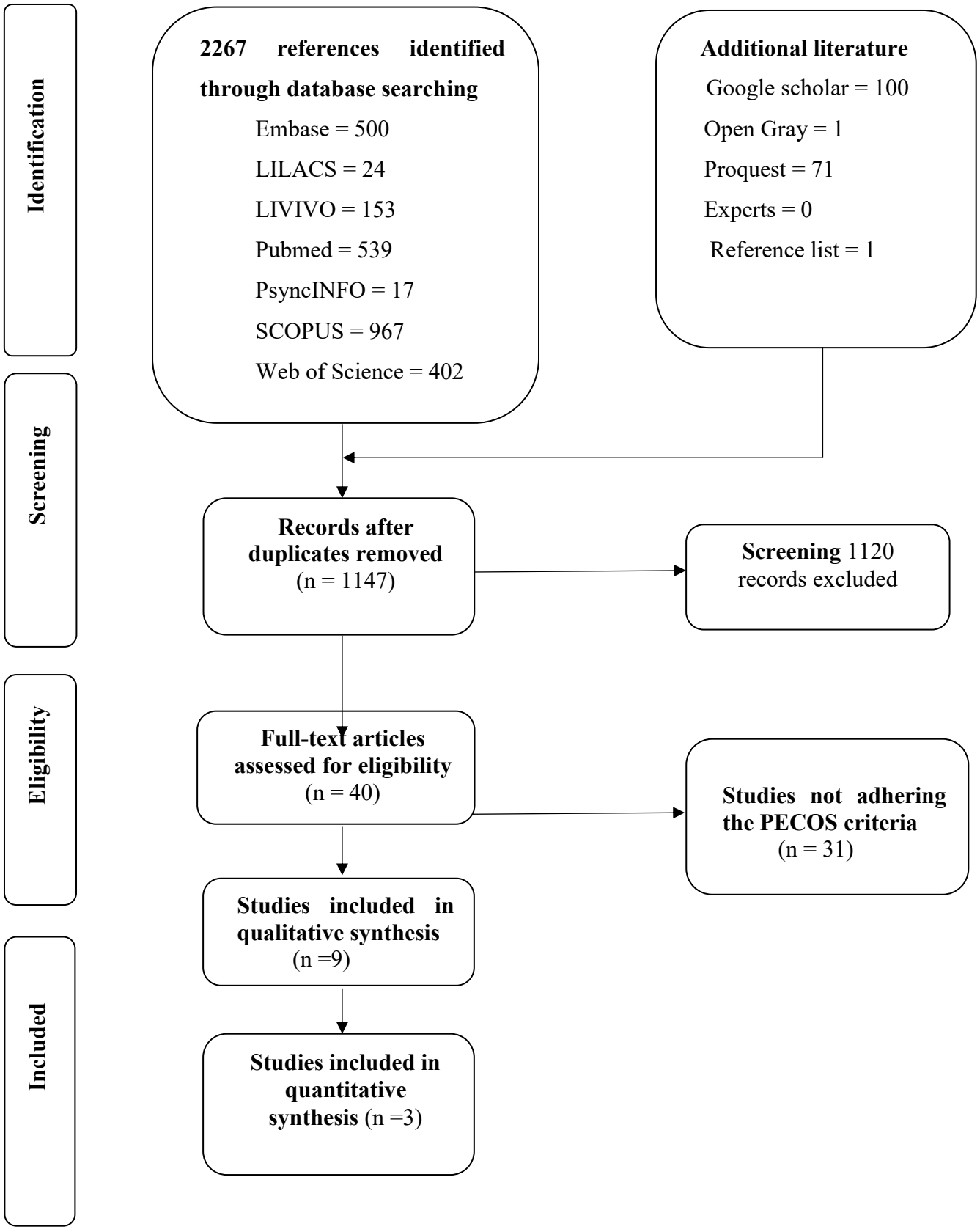
Figure 1 - Flow Diagram of Literature Search and Selection Criteria.[1]



[1] Adapted from PRISMA.

Table 1 - Summary of overall descriptive characteristics of included studies (n=9)

Author (Year) Country	**Sample (n)**	**Groups (n)**	**Age (mean±SD or range in years)**	**SB Diagnostic Methods and Classification†**	**Stress Diagnostic Method**	**Results (Mean ± SD, or other pertinent findings)**		**Main conclusion**
Carvalho et al (2007) Brazil	394	SB 198 NB 196	35.5	1)Questionnaire 2)Clinical examination	Questionnaire SSI	**SB and stress** 108 **NB and stress** 72	**p<0.05**	Emotional stress was found to be associated with SB.
Carvalho et al (2008) Brazil	81	SB 27 NB 54	22-46 years	1)Clinical examination	Questionnaire SSI	**SB and stress** 9 **NB and stress** 52	**p<0.05**	Association between SB and emotional stress was found.
Clark et al (1980) United States	30	SB 20 NB 10	Light muscle activity: 21-40 Heavy muscle activity: 19-49 NB: 19-29	1) EMG	Biomarkers	**Light muscle activity and stress** Epinephrine: 6.44±0.97 Norepinephrine 28.15±3.78 **Heavy muscle activity and stress** Epinephrine: 10.26±0.48 Norepinephrine 39.08±3.42 **NB and stress** Epinephrine: 5.99±0.51 Norepinephrine: 19.91±2.44	**p>00.5** **p<0.05** **p>0.05**	The difference between the heavy muscle activity group and the other two groups was significant.

Indrasari et al (2017) Indonesia	214	SB 51 NB 163	19-57 years	1)Questionnaire	Sloan and Cooper's questionnaire	**SB and home stress** 23.39±5.50 **NB and home stress** 21.29±5.24	**p>0.05**	There is no association between SB and home stress.
Jokubaukas et al (2019) Lithuania	228	SB 102 NB 126	22.67 ± 2.27	1)Questionnaire	Questionnaire PSS	**SB and stress** 21.43±6.56 **NB and stress** 19.79±6.77	**p>0.05**	No association between SB and perceived stress was found.
Karakoulaki et al (2015) Greece	45	25 SB 20 NB	34.5±6.4	1)Questionnaire 2)EMG (BiteStrip)	Questionnaire PSS Biomarkers	**SB and PSS** 34.52±7.98 **NB and PSS** 23.80±8.21	**p<0.05**	A positive association was found between perceived stress and cortisol levels of stress.
						SB and cortisol 0.37±0.08 **NB and cortisol** 0.27±0.06	**p<0.05**	
						SB and α-amylase 39.74±31.86 **NB and α-amylase:** 38.76±22.70	**p<0.05**	
Marin et al (2007) Peru	204	62 SB 142 NB	31-41	1)Questionnaire 2)Clinical examination	Questionnaire WHO	**SB and stress** 2 **NB and NB and stress** 0	**p<0.05**	A significant association was found between SB and work stress.

Saczuk et al (2019) Poland	60	35 SB 25 NB	SB 29.9± 8.35 NB 35±10.9	1)Self-report 2)Clinical examination 3)EMG (BiteStrip)	Questionnaire PSS	**SB and stress** (18.0±6.74) **NB and stress** (15.0±5.36)	**p<0.05**	Perceived stress showed a positive association with SB.
Seraidarian et al (2009) Brazil	40	20 SB 20 NB		1)Clinical examination	Biomarkers	**SB and adrenaline** (111.41±32.98) **NB and adrenaline** (35.51±15.19) **SB and dopamine** (479.6±77.7) **NB and dopamine** (201.7±104.1) **SB and noradrenaline** (274.45±26.77) **NB and noradrenaline** (148.72±27.50)	**p<0.05** **p<0.05** **p<0.05**	A statistically significant positive correlation was found between catecholamine levels and the presence of SB.

SB (sleep bruxism); NB (no bruxism); SSI (stress symptoms inventory); EMG (electromiography); Questionnaire PSS (Perceived Stress Scale); Questionnaire WHO (World Health Organization; (†) Based on an expert consensus (Lobbezoo et al, 2013). [1]

Table 2 - Grading of Recommendations Assessment, Development and Evaluation summary of findings table.

Certainty assessment						№ of patients		Certainty
№ of studies	**Study design**	**Risk of bias**	**Inconsistency**	**Indirectness**	**Imprecision**	**SB**	**stress**	**Absolut (95% CI)**
Questionnaire (continuous)								
3	Observational study	serious[a]	serious[b]	not serious	serious	268/949 (28.2%)	681/949 (71.8%)	⊕◯◯◯ VERY LOW
Questionnaire (dichotomous)								
3	Observational study	not serious[a]	not serious	not serious	serious[c]	287/679 (42.3%)	392/679 (57.7%)	⊕◯◯◯ VERY LOW
Biomarkers								
4	Observational study	serious[d]	serious[b]	not serious	not serious	173/355 (48.7%)	182/355 (51.3%)	⊕◯◯◯ VERY LOW

CI: Confidence interval

Explanations

a. Risk of Bias was considered serious because most of the studies did not stated if confounders were identified and how to deal with them

b. Stress symptoms were assessed through different tools.
c. Divergent results were found

Figure 2 – Risk of Bias summary, assessed by the Joanna Briggs Institute Critical Appraisal Checklist for Analytical Cross-Sectional Studies (generated using the software Review Manager 5.4, The Cochrane Collaboration)

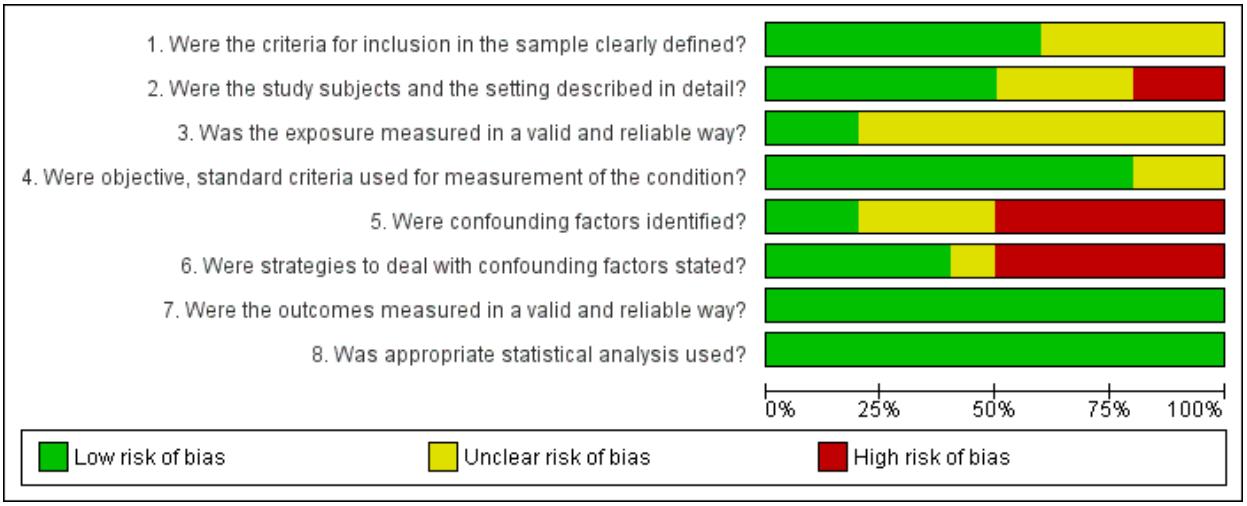
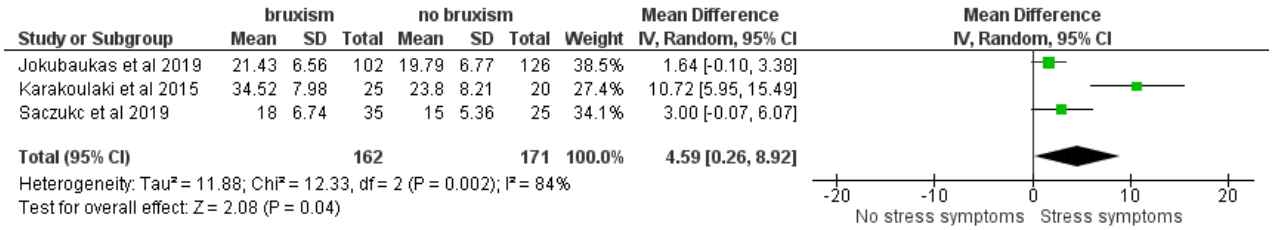


Figure 3 – Forest plot, generated using the software Review Manager 5.4, The Cochrane Collaboration).



Supplementary table 1 – Data search strategy

PubMed	#3 "Stress, Psychological"[Mesh Terms] OR "Life Stress"[All Fields] OR "Psychological Stressor"[All Fields] OR "Psychological Stressors"[All Fields] OR "Emotional Stress"[All Fields] OR "stress"[All Fields] OR "stressful"[All Fields] OR "chronic stress"[All Fields] #2 "Biomarkers"[Mesh Terms] OR "Biologic Markers"[All Fields] OR "Biologic Marker"[All Fields] OR "Biological Marker"[All Fields] OR "Biological Markers" [All Fields] OR Saliva[Mesh Terms] OR "salivary biomarker"[All Fields] OR "catecholamines"[All Fields] OR "cortisol"[All Fields] OR "proinflammatory cytokines"[All Fields] OR "alfha-amylases"[Mesh Terms] OR "salivary alpha-amylases"[Mesh Terms] OR "α-amylase" OR "Body Fluids"[Mesh Terms] OR "Body Fluids"[All Fields] OR "blood"[Mesh terms] OR urine[Mesh terms] #1 bruxism[MeSH Terms] OR "sleep bruxism"[MeSH Terms] OR bruxism[All Fields] OR bruxers[All Fields] OR "tooth grinding"[All Fields] OR "teeth grinding"[All Fields] OR "teeth clenching"[All Fields] OR "tooth clenching"[All Fields] #1 AND (#2 OR #3)
Web of Science (Filter: Articles)	#3 TS=("Stress, Psychological" OR "Life Stress" OR "Psychological Stressor" OR "Psychological Stressors" OR "Emotional Stress" OR "stress" OR "stressful" OR "chronic stress")

	#2 TS=("Biomarkers" OR "Biologic Markers" OR "Biologic Marker" OR "Biological Marker" OR "Biological Markers" OR "salivary stress biomarker" OR "salivary biomarker" OR "catecholamines" OR "cortisol" OR "proinflammatory cytokines" OR "a-amylase" OR "alfha-amylases" OR "salivary alpha-amylases" OR "α-amylase" OR "Body Fluids" OR "blood" OR "urine") #1 TS=(bruxism OR "sleep bruxism" OR bruxers OR "tooth grinding" OR "teeth grinding" OR "teeth clenching" OR "tooth clenching") #1 AND (#2 OR #3)
Scopus	#3 TITLE-ABS-KEY ("Stress, Psychological" OR "Life Stress" OR "Psychological Stressor" OR "Psychological Stressors" OR "Emotional Stress" OR "stress" OR "stressful" OR "chronic stress") #2 TITLE-ABS-KEY ("Biomarkers" OR "Biologic Markers" OR "Biologic Marker" OR "Biological Marker" OR "Biological Markers" OR "salivary stress biomarker" OR "salivary biomarker" OR "catecholamines" OR "cortisol" OR "proinflammatory cytokines" OR "a-amylase" OR "alfha-amylases" OR "salivary alpha-amylases" OR "α-amylase" OR "Body Fluids" OR "blood" OR "urine") #1 TITLE-ABS-KEY (bruxism OR "sleep bruxism" OR bruxers OR "tooth grinding" OR "teeth grinding" OR "teeth clenching" OR "tooth clenching") #1 AND (#2 OR #3)

Embase	#3 'stress, psychological' OR 'life stress' OR 'psychological stressor' OR 'psychological stressors' OR 'emotional stress' OR 'stress' OR 'stressful' OR 'chronic stress') AND [embase]/lim #2 'biomarkers' OR 'biologic markers' OR 'biologic marker' OR 'biological marker' OR 'biological markers' OR 'salivary stress biomarker' OR 'salivary biomarker' OR 'catecholamines' OR 'cortisol' OR 'proinflammatory cytokines' OR 'a-amylase' OR 'alfha-amylases' OR 'salivary alpha-amylases' OR 'α-amylase' OR 'body fluids' OR 'blood' OR 'urine') AND [embase]/lim #1 'bruxism'/exp OR bruxism OR 'sleep bruxism'/exp OR 'sleep bruxism' OR bruxers OR 'tooth grinding'/exp OR 'tooth grinding' OR 'teeth grinding'/exp OR 'teeth grinding' OR 'teeth clenching'/exp OR 'teeth clenching' OR 'tooth clenching'/exp OR 'tooth clenching') AND [embase]/lim #1 AND (#2 OR #3)
Livivo	("Stress, Psychological" OR "Life Stress" OR "Psychological Stressor" OR "Psychological Stressors" OR "Emotional Stress" OR "stress" OR "stressful" OR "chronic stress" OR "Biomarkers" OR "Biologic Markers" OR "Biologic Marker" OR "Biological Marker" OR "Biological Markers" OR "salivary stress biomarker" OR "salivary biomarker" OR "catecholamines" OR "cortisol" OR "proinflammatory cytokines" OR "a-amylase" OR "alfha-amylases" OR "salivary alpha-amylases" OR "α-amylase" OR "Body Fluids" OR "blood" OR "urine") AND (bruxism OR "sleep bruxism" OR bruxers OR "tooth grinding" OR "teeth grinding" OR "teeth clenching" OR "tooth clenching")

PsyncInfo	Bruxism and Stress
Lilacs	#3 "Stress, Psychological" OR "Estrés Psicológico" OR "Estresse Psicológico" #2 Biomarkers OR biomarcadores #1 Bruxism OR bruxismo #1 AND (#2 OR #3)
Google Scholar	("Life Stress" OR "Emotional Stress" OR "stress" OR "stressful" OR "chronic stress" OR "Biomarkers" OR "salivary biomarker" OR "catecholamines" OR cortisol OR "proinflammatory cytokines" OR "α-amylase" OR "Body Fluids") AND (bruxism OR "sleep bruxism")
Proquest	noft((bruxism OR "sleep bruxism" OR bruxers OR "tooth grinding" OR "teeth grinding" OR "teeth clenching" OR "tooth clenching")) AND noft(("Stress, Psychological" OR "Life Stress" OR "Psychological Stressor" OR "Psychological Stressors" OR "Emotional Stress" OR "stress" OR "stressful" OR "chronic stress" OR "Biomarkers" OR "Biologic Markers" OR "Biologic Marker" OR "Biological Marker" OR "Biological Markers" OR "salivary stress biomarker" OR "salivary biomarker" OR "catecholamines" OR "cortisol" OR "proinflammatory cytokines" OR "a-amylase" OR "alfha-amylases" OR "salivary alpha-amylases" OR "α-amylase" OR "Body Fluids" OR "blood" OR "urine"))
OpenGrey	Bruxism and stress

Supplementary table S2 - Articles excluded and the reasons for exclusion (n=31).

Reference	Authors	Reasons for Exclusion*
1.	Abe et al (1)	2
2.	Abekura et al (2)	1
3.	Alhberg et al (2002) (3)	1
4.	Alhberg et al (2003) (4)	3
5.	Alhberg et al (2013) (5)	1
6.	Alhberg et al (2019) (6)	1
7.	Azodo et al (7)	1
8.	Cavallo et al (8)	1
9.	Fluerasu et al (9)	1
10.	Gayathri et al (10)	1
11.	Giraki et al (11)	1
12.	Goto et al (12)	3
13.	Gouw et al (13)	1
14.	Haraki et al (14)	1
15.	Kamiski et al (15)	1
16.	Kaur et al (16)	3
17.	Makino et al (17)	1
18.	Melis et al (18)	3
19.	Mengatoo et al (19)	3
20.	Miletic et al (20)	1
21.	Murillo et al (21)	1
22.	Nakata et al (22)	1

23.	Ohlmann et al (23)	1
24.	Okamura et al (24)	2
25.	Pingitore et al (25)	1
26.	Pontes et al (26)	1
27.	Raftu et al (27)	1
28.	Smardz et al (28)	1
29.	Soares et al (29)	3
30.	Winocur et al (2011) (30)	1
31.	Winocur et al (2019) (31)	1

Legend: 1) Studies that included individuals with comorbidities such as temporomandibular joint disorders, obstructive sleep apnea, depression, or other psychiatric disorders, such as Post-traumatic stress disorder (PTSD), insomnia; anxiety. 2) Studies that evaluated awake bruxism; Studies in which SB diagnostic criteria or stress criteria were not reported or not sufficiently described; 3) Studies with no healthy control group; Studies did not associate SB and stress; 4) Reviews, letters, conference abstracts, personal opinions, case reports, and laboratory research or abstracts with no full text available.

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5 CONSIDERAÇÕES FINAIS

Com base na literatura disponível, parece existir uma associação positiva entre BS e sintomas de estresse. Deve-se ter cautela ao interpretar estes resultados devido ao risco moderado de viés e a muito baixa qualidade das evidências. Sugere-se a realização de novos estudos prospectivos, com maior rigor metodológico, especialmente na seleção da amostra e nos métodos de diagnóstico do bruxismo. Além disso, estudos longitudinais poderiam ser úteis para confirmar essa possível associação e ajudar a esclarecer a direção da a associação entre as duas variáveis avaliadas.

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APÊNDICES

Apêndice A - Registro do protocolo

NIHR | National Institute for Health Research

PROSPERO
International prospective register of systematic reviews

Association between sleep bruxism and stress symptoms: a systematic review

Helena Polmann, Jéssica Conti Réus, Carla Massignan, Junia Serra Negra, Bruce Dick, Carlos Flores-Mir, Gilles Lavigne, Graziela De Luca Canto

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