

The bruxism paradigm in the absence of teeth: observational cross-sectional study in full denture users

O paradigma do bruxismo na ausência de dentes: estudo observacional de corte transversal em usuários de próteses totais

Henrique Ohno de Souza¹, Alex Moreira Mélo², Melissa de Oliveira Melchior^{2,3}, Lais Valencise Magri^{1,2,4}

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ABSTRACT

BACKGROUND AND OBJECTIVES: Bruxism is defined as an activity of the masticatory muscles, which is independent of the teeth presence, so it can occur in total edentulous patients and users of dental prostheses. In this sense, It is therefore necessary to know the clinical manifestations of bruxism in this population. The objective of this study was to evaluate the clinical manifestation and the presence of probable sleep and awake bruxism in a sample of users of full dentures treated at a teaching dental clinic in the city of Ribeirão Preto/SP.

METHODS: The adopted sample consisted of 30 patients (mean age 72 years, 18 women/12 men). The following questionnaires were used to assess probable bruxism: Oral Behavior Checklist (OBC), Questionnaire of the American Academy of Orofacial Pain (AADO) and the Depression Anxiety and Stress Scale (DASS-21). The clinical assessment included the identification of wear on the prostheses, tongue indentations, bitten cheek and sensitivity in the masticatory muscles and temporomandibular joints. The data was analyzed using descriptive statistics.

RESULTS: The average of use of the dentures were nine years. Six patients (20%) reported self-perceived sleep bruxism, and 11 (36%) reported self-perceived awake bruxism. OBC showed an average total score of 9.8 ± 6.2 , with “teeth clenching” being

the most described symptom. DASS-21 presented an average of 16.5, and stress, anxiety and depression were within normal limits. The most commonly reported symptoms in the AADO were headache, neck pain, pain and/or difficulty during jaw function and recent trauma to the head, neck or jaws. In the clinical evaluation, 15 (50%) patients had wear on prosthesis, only 2 (6%) had bitten cheek, none had tongue indentations, 4 (13%) had pain during palpation.

CONCLUSION: Despite the limitations of the study (cross-sectional, small sample and absence of instrumental evaluation of bruxism), it is possible to conclude that a significant portion of users of total dentures presented probable bruxism, with tooth clenching being the main report and wear on the prosthesis the main clinical manifestation.

Keywords: Bruxism, Complete denture, Edentulous mouth.

RESUMO

JUSTIFICATIVA E OBJETIVOS: O bruxismo é definido como uma atividade da musculatura mastigatória, que independe da presença de dentes, portanto pode ocorrer em pacientes desdentados totais e usuários de próteses dentárias. Assim, é preciso conhecer como o bruxismo se manifesta clinicamente nessa população. O objetivo deste estudo foi investigar a presença do provável bruxismo de sono e de vigília em usuários de prótese total atendidos em uma clínica odontológica de ensino em Ribeirão Preto/SP.

MÉTODOS: Uma amostra de conveniência foi composta por 30 pacientes (média de 72 anos, 18 mulheres e 12 homens). Os seguintes questionários foram utilizados para avaliar o provável bruxismo: *Oral Behavior Checklist* (OBC), Questionário da Academia Americana de Dor Orofacial (AADO) e o *Depression Anxiety and Stress Scale* (DASS-21). A avaliação clínica incluiu a identificação de desgastes nas próteses, língua dentada, bochecha mordiscada e sensibilidade nos músculos mastigatórios e nas articulações temporomandibulares. Os dados foram analisados por meio de estatística descritiva.

RESULTADOS: A média de uso das próteses foi de nove anos. Seis indivíduos (20%) relataram bruxismo do sono e 11 (36%) relataram bruxismo de vigília. O OBC apresentou média de score total de $9,8 \pm 6,2$, sendo “apertar de dentes” o sintoma mais descrito. O DASS-21 apresentou média total de 16,5, com valores de estresse, ansiedade e depressão dentro da normalidade. Os sintomas mais relatados no Questionário AADO foram cefaleia, dores no pescoço, dor e/ou dificuldade durante a função mandi-

Henrique Ohno de Souza – <https://orcid.org/0009-0009-2514-1807>;
Alex Moreira Mélo – <https://orcid.org/0000-0002-0433-2681>;
Melissa de Oliveira Melchior – <https://orcid.org/0000-0003-4943-1242>;
Lais Valencise Magri – <https://orcid.org/0000-0001-8050-4396>.

1. University of Ribeirão Preto, Dentistry, Ribeirão Preto, SP, Brazil.
2. University of São Paulo, Department of Restorative Dentistry, Ribeirão Preto, SP, Brazil.
3. University of São Paulo, Ribeirão Preto School of Nursing, Department of Psychiatric Nursing and Human Sciences, Ribeirão Preto, SP, Brazil.
4. University of São Paulo, Ribeirão Preto School of Philosophy, Sciences and Letters, Department of Psychology, Ribeirão Preto, SP, Brazil.

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HIGHLIGHTS

- A significant proportion of denture wearers are likely to have bruxism.
- Dental clenching is the main complaint of complete denture wearers.
- Wear on the prostheses is the main clinical manifestation.

Correspondence to:

Alex Moreira Mélo

E-mail: alexmelo@usp.br

bular e trauma recente na cabeça, pescoço ou maxilares. Na avaliação clínica, 15 (50%) dos pacientes apresentaram desgastes na prótese, 4 (13%) dor por palpação, 2 (6%) bochecha mordiscada e nenhum (0%) língua dentada.

CONCLUSÃO: Apesar das limitações deste estudo (corte transversal, amostra reduzida e ausência de avaliação instrumental do bruxismo) foi possível concluir que uma parcela significativa de usuários de próteses totais apresentou provável bruxismo, sendo o apertamento dentário o principal relato e desgastes na prótese a principal manifestação clínica.

Descritores: Bruxismo, Prótese total, Boca edêntula.

INTRODUCTION

Bruxism is a repetitive activity of the masticatory muscles, characterized by clenching or grinding the teeth and/or clenching or jerking the jaw. Bruxism has two distinct circadian manifestations: it can occur during sleep (sleep bruxism) or wakefulness (awake bruxism)¹. According to one study², bruxism in healthy individuals should be seen as a risk factor rather than a disorder. Some habits can be considered probable bruxism and are related to certain actions, such as teeth grinding or clenching, lip smacking, nail biting (onychophagia), object biting and pathophysiological factors that are associated with alcohol consumption, smoking and caffeine, which are factors associated with emotional state³.

Awake bruxism occurs when the individual is not sleeping and is most often manifested by tooth contact or static and dynamic muscle contraction², which can cause damage to the periodontium, temporomandibular joints (TMJ) and pain in the masticatory muscles. Sleep bruxism, on the other hand, occurs when the patient is asleep. It is an unconscious activity related to swallowing and is most often manifested by teeth grinding, generating repetitive eccentric movements of laterality and latero-protrusion, which can result in tooth wear and muscle contraction⁴.

According to the new definition, bruxism can be classified as: possible, when based only on the report (from the patient or someone they live with); probable, when based on the report plus clinical investigation of possible consequences of bruxism, for example wear on the teeth, pain in the masticatory muscles and bitten cheeks; and definitive, when the diagnosis is established on the basis of the report, clinical investigation and instrumental assessment, by means of electromyography for awake bruxism and polysomnography for sleep bruxism^{1,2}.

In the past, morphological factors, such as anomalies in the dental joint and occlusion, which resulted in fractures, tooth wear and pain in the orofacial region, were seen as the initial causes in the etiology of bruxism. However, it is now understood that these conditions play a less relevant role than psychosocial and pathophysiological factors, since it has been understood that bruxism is an activity of the masticatory muscle, controlled by the central nervous system².

Psychosocial factors involve aspects such as anxiety, stress, depression and mood disorders. The activity of clenching teeth during the day can be associated with emotional tensions and episodes of depression and anxiety⁵. Various psychological

factors such as stress, fear and anxiety have been increased by the COVID-19 pandemic, and are associated with the development and perpetuation of bruxism and temporomandibular disorder (TMD)⁶.

Most edentulous patients with complete dentures have an imbalance in their stomatognathic system due to their oral condition or the use of poorly made prostheses⁷. One consequence of this is the loss of the vertical dimension of occlusion (VDO), which can aggravate future damage if not re-established⁸. Re-establishing VDO is essential to restore all the lost functions, restoring facial harmony and the maxillo-mandibular relationship. To this end, one of the possibilities would be to make temporary prostheses, which aim to prove the height of the rehabilitation and restore VDO quickly and effectively^{9,10}.

In addition, phonetic and masticatory difficulties and impairment of TMJ and masticatory muscles was observed. This decrease is usually related to loss of posterior occlusal stability and/or parafunctional habits such as bruxism, which are caused by psychosocial and pathological factors, rather than by changes in VDO^{2,11}.

Patients wearing full dentures who exhibit bruxism show pronounced wear on the prostheses, leading to VDO loss, thus generating occlusal instability and alterations in the joint and muscle system, causing pain and discomfort, which can lead to lesions in the stomatognathic system¹³. However, adjusting the patient's occlusion alone is not effective in ending bruxism, bearing in mind that bruxism is a centrally-acting behavior of the masticatory muscles and has no cure. In addition, stress can generate psychological distress, increasing painful manifestations and stimulating the return of this behavior².

The rehabilitation of edentulous patients with complete dentures includes the reestablishment of mastication, phonetics, swallowing and self-esteem, as long as it is properly planned and executed¹⁴. However, proper fitting alone does not lead to a reduction in bruxism events, and other interventions are needed to mitigate its harmful consequences and reduce possible events. For this reason, it is first necessary to reach a correct diagnosis and understand the real cause of bruxism, thus enabling the correct treatment¹⁵.

Interventions related to bruxism aim to minimize negative effects on the stomatognathic system¹⁶. The main option for sleep bruxism consists of occlusal plates and investigating possible associations with other sleep disorders, such as apnea. For awake bruxism, the focus is on controlling this behavior through cognitive-behavioral strategies such as reminders, diaries and mobile apps¹⁷⁻²⁰.

In the scientific literature, the understanding of the relationship between teeth and bruxism has evolved significantly in recent years, and bruxism is currently defined as a behavior of the masticatory muscles that is independent of the presence of teeth^{1,2,21-23}. From this new perspective, it is necessary to understand the manifestation of bruxism in edentulous populations.

Based on the problems presented, the aim of this study was to investigate the presence and clinical manifestations of probable sleep and awake bruxism in a sample of patients wearing full dentures treated at a teaching dental clinic in Ribeirão Preto/SP.

METHODS

This cross-sectional observational study was approved by the Research Ethics Committee (*Comitê de Ética em Pesquisa - CEP*) of the Faculty of Dentistry of the University of Ribeirão Preto (*Universidade de Ribeirão Preto - UNAERP*, CAAE: 61228822.1.0000.5498). Data was only collected after approval by CEP. All volunteers were informed about the objectives, risks and benefits of the study and signed the Free and Informed Consent Term (FICT).

According to data from the Health Care Regulation Center of the Municipality of Ribeirão Preto/SP (*Central de Regulação de Atendimentos à Saúde do Município de Ribeirão Preto/SP*), the average annual number of patients treated for complete dentures at the UNAERP Dental Clinic is 42. Considering a sample calculation based on the average, a minimum sample would be 23 volunteers to observe the outcome “presence of probable bruxism”, with an estimated sampling error of 20%. The sample therefore consisted of 30 volunteer patients who had been wearing upper and lower dentures for less than 10 years.

The inclusion criteria were patients with upper and lower complete dentures, less than 10 years old, seen at the UNAERP Dental Clinic. Patients with cognitive impairment, who were unable to understand and answer the questionnaires, and patients with neurological disorders were excluded.

The diagnosis of probable sleep and/or awake bruxism was based on self-report and clinical assessment of possible outcomes/consequences. According to a recent review, both non-instrumental approaches (based on self-report and clinical signs and symptoms) and instrumental approaches (electromyography for awake bruxism and polysomnography for sleep bruxism) can be used to diagnose bruxism, since the cut-off points for these instrumental assessments are not completely defined in the scientific literature²⁴.

In order to systematize the information provided in the self-report, the following questionnaires were used: sociodemographic, Depression, Anxiety and Stress Scale (DASS-21 - translated and validated for Brazilian Portuguese), American Academy of Orofacial Pain Questionnaire (AADO) and Oral Behavior Checklist (OBC - Brazilian Portuguese version). These questionnaires will be briefly described below.

Sociodemographic questionnaire

A sociodemographic questionnaire was administered with the following information: name, age, gender, address, religion, health conditions, family income, length of time wearing dentures, degree of satisfaction with dentures, previous diagnosis of bruxism, medical health conditions, drugs in continuous use.

Oral habits/behaviors: Oral Behavior Checklist - Brazilian Portuguese version

OBC is a questionnaire that assesses oral habits and behaviors during sleep and wakefulness. The questionnaire consists of 21 items, with five possible answers (zero to four), which correspond to the frequency of oral behavior perception.

American Academy of Orofacial Pain Questionnaire

It is a questionnaire that assesses the signs and symptoms of TMD and bruxism, through a sequence of questions with “YES” or “NO” alternatives.

Depression, Anxiety, and Stress: DASS-21 - translated and validated for Brazilian Portuguese

It assesses the subjective perception of experiences related to symptoms of depression, anxiety and stress.

Clinical evaluation of possible bruxism outcomes/consequences

The following items were assessed: the presence of wear on the prosthesis, bitten cheek, tongue indentations and muscle palpation of the masseter and anterior temporal muscles, as well as the temporomandibular joint site. A single examiner, previously trained and calibrated, carried out the clinical examination.

Statistical analysis

Data was analyzed using descriptive statistics, with measurements of mean, standard deviation, absolute frequencies and percentages, in order to identify the presence of probable sleep and awake bruxism in the study population. Previously, the Shapiro-Wilk normality test was used and it was found that the sample data had a normal distribution ($p > 0.05$).

RESULTS

A total of 30 participants were assessed, with a mean age of 72 years, 18 women and 12 men, with a mean prostheses use duration of 9 years, and a mean satisfaction rate of 7.6 with the old prostheses (scale from zero to 10). Of the 30 participants evaluated, 6 (20%) reported perception of sleep bruxism, and 11 (36%) reported perception of awake bruxism. The clinical assessment showed that 15 individuals had denture wear (50%), 4 had pain on palpation of the masticatory muscles (13%), 2 had bitten cheek (6%) and none had tongue indentations (Figure 1).

The average total score on OBC questionnaire was 9.8 ± 6.2 , indicating the presence of oral behaviors. It is worth noting that

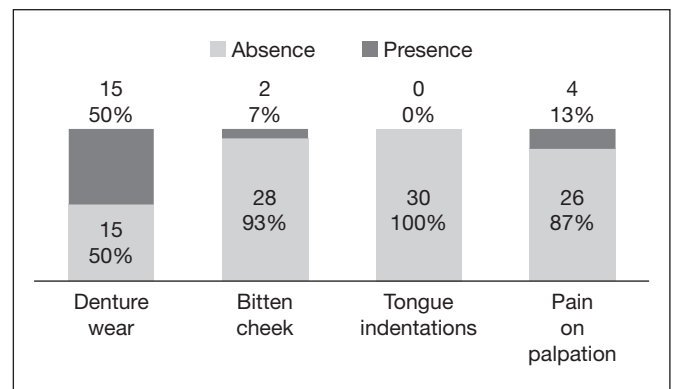


Figure 1. Frequency (in percent) of the absence and presence of clinical signs of bruxism (denture wear, bitten cheek, tongue indentations, pain on palpation) assessed by clinical investigation.

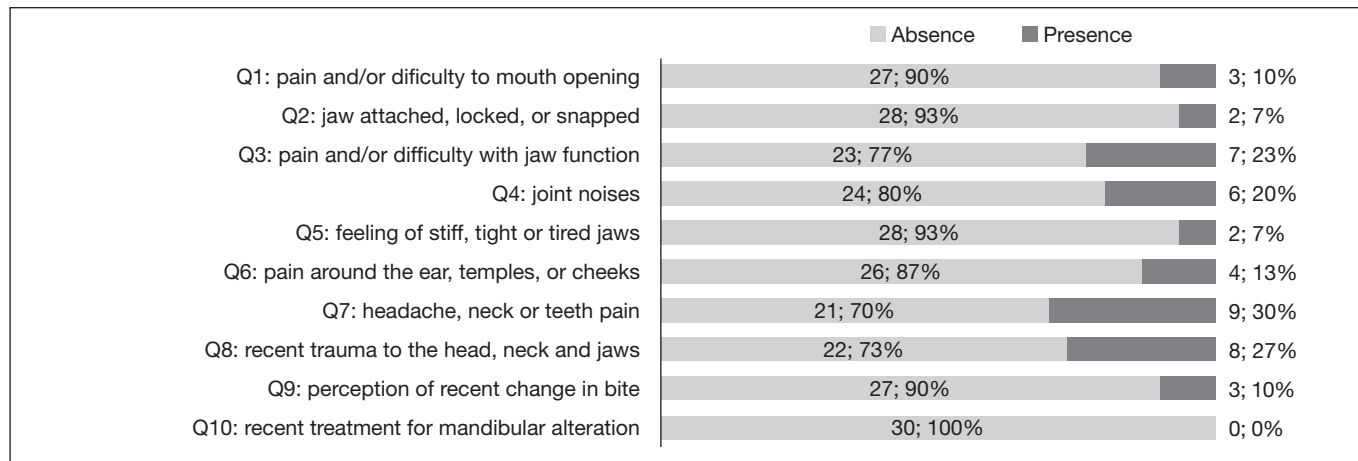


Figure 2. Frequency (in percent) of the absence and presence of signs and symptoms related to bruxism, based on self-report, from the application of the American Academy of Orofacial Pain (AADO) questionnaire.

Table 1. Sample mean and cut-off values of the DASS-21 questionnaire for the Depression, Anxiety and Stress sub-items, according to Normal/Mild, Minimal, Moderate, Severe and Very Severe characterization.

		Depression	Anxiety	Stress
Cut-off DASS-21	Normal/Mild	0-9	0-7	0-14
	Minimal	10-13	8-9	15-18
	Moderate	14-20	10-14	19-25
	Severe	21-27	15-19	26-33
	Very Severe	28+	20+	34+
Sample average		2.7	5.4	8.4

the most frequently described behaviors were “clenching teeth” and “chewing food only on one side”.

As shown in figure 2, and according to the evaluation using AADO questionnaire, the most frequently answered positive questions were: headache, neck pain (9 patients), recent trauma to the head, neck and jaws (8), and pain and/or difficulty with jaw function (7). These symptoms may be associated with the difficulty of using full dentures, but may also be related to the presence of pain in the orofacial region.

With regard to the assessment of emotional aspects using DASS-21, the sample had an overall average of 16.5, and the values for stress, anxiety and depression were within the normal range, according to the cut-off values established by the protocol (Table 1).

DISCUSSION

A few years ago, morphological factors such as anomalies in occlusion and articulation were considered the main triggers in the etiology of bruxism². Although this assumption drives the clinical reality of many dental professionals, this link is less relevant when compared to psychosocial and pathophysiological factors, especially since the event is understood as a manifestation of the central nervous system²².

Psychosocial factors are increasingly considered to be related to the onset of awake bruxism, especially emotional tension, anxiety, stress and depression²³. Pathophysiological factors are related to other aspects, such as alcohol consumption, smoking and caffeine, which need to be considered and assessed²⁴.

In addition, bruxism can be a contributing factor to tooth loss, since it is an activity controlled by the central nervous system^{1,2,22}, present before the event of tooth absence in the vast majority of patients. Tooth loss is frequent in patients with severe bruxism, and this pattern of masticatory muscle activity continues even after the absence of teeth.

The interrelationship between bruxism, psychosocial factors and oral condition is complex, since one factor can lead to the worsening of the other, and it is difficult to clinically establish a direct and unique cause and consequence relationship^{8,19}.

The average age of the sample was 72 years. Studies show that older denture wearers have a higher incidence of pain in the face and head, limited mouth opening and difficulty with stability and retention of the dentures. It is important to consider that the age group where TMD is most common is young adults, but older individuals can also present the condition, especially degenerative joint disease and other joint manifestations²⁵⁻²⁷.

A study published in 2023 found a prevalence of 24% of bruxism in an elderly population, 12% of which was awake bruxism and 16% sleep bruxism, both based on self-report. However, this prevalence was not assessed in isolation for samples of toothless people and prosthesis users²⁸. These results are similar to the occurrence of probable bruxism in the sample evaluated in this study, regardless of dental and occlusal condition, which is not a determining factor in the pathophysiology of bruxism.

Bruxism can trigger intense occlusal forces, especially clenching-type bruxism, overloading the dentition, alveolar bone, periodontium and TMJ²⁴. The modification of these structures can be one of the consequences of bruxism, including tooth wear, fracture and loss of teeth, hypertrophy of the

masseter muscle, headaches, noise, muscle spasms, pain on palpation of the muscles and TMJ, TMJ disorder and limited mandibular movements^{24,25}.

Wear and tear of structures can be present in dentate or edentulous patients, in whom there is a risk of compromising aesthetics, joints, muscle comfort and basic activities such as speech, chewing and swallowing^{24,26}.

Totally edentulous patients show morphological and functional alterations in the stomatognathic system, which may be contributing reasons for the onset of orofacial pain²⁴, corroborating the results found in this study and justifying the need to understand the clinical manifestation of bruxism in this sample, given that the population is getting older, with increasingly longer life expectancies.

Patients wearing complete dentures have persistent pain and ulceration of the mucous membrane under the surface of the dentures²⁵. These causes can occur due to teeth clenching during sleep and wakefulness, or as a result of inadequate dentures, especially in aspects involving VDO. According to the Glossary of Prosthodontic Terms²⁹, VDO is determined by the “distance measured between two points when teeth are in contact”, i.e. the determining factor is the contact between teeth or devices such as dentures.

Patients with old or altered total dentures, with recurrent episodes of headache and facial pain, show an improvement in the intensity and frequency of their complaints when the dentures are replaced and an adequate functional pattern of the stomatognathic system is re-established³⁰.

The wear present on the occlusal surfaces of complete dentures may be associated with bruxism or the natural friction of chewing and the long time the dentures have been worn²⁶, although it is important to emphasize that wear is a consequence of bruxism and not the cause of this behavior. Simply restoring the patients' VDO with bruxism is not a direct intervention for bruxism, since a series of other factors initiate and modulate this activity of the masticatory muscles, such as psychosocial factors. These factors are more relevant than the peripheral aspect of occlusion²¹ and require the association of other interventions to mitigate the damage²⁶.

Anxiety has been investigated as one of the emotional factors that can cause parafunctional habits, such as awake bruxism^{1,2,6}. Studies have shown a more significant relationship between anxiety and awake bruxism than its association with sleep bruxism^{6,22}. This may justify the results relating to emotional aspects found in the present study, with reduced total and partial scores for the DASS-21.

As this study used a sample of older people, it is plausible to consider that sleep bruxism was more active, perhaps more related to respiratory aspects such as obstructive sleep apnea and snoring, or that this sample is in a less active phase of life, and consequently with less positive modulation of emotional aspects related, for example, to work and family life, among others. Still in relation to this association between bruxism and respiratory conditions, the prevalence of obstructive sleep apnea and snoring in the over-70 age group was high, with data ranging from 38 to 87%^{31,32}.

Interventions related to waked bruxism involve cognitive behavioral control of this habit, through reminders and cell phone apps, as well as actions aimed at the consequences of this behavior, such as pain in the orofacial region and tooth wear/tears. As for sleep bruxism, which happens unconsciously, the main intervention is a rigid occlusal plate to protect the teeth^{33,34}.

In short, despite the limitations of this cross-sectional study, with a small sample, carried out in a teaching dental clinic, and without instrumental assessment of bruxism, it was clear that this population of denture wearers showed clinical manifestations and self-reported bruxism, and deserves evaluation and care related to this behavior, which can occur in a protective manner for many patients, but for others can have negative consequences. Few studies have reported on the prevalence of bruxism in edentulous patients and users of complete dentures³⁴. This population is neglected when it comes to assessing bruxism due to the absence of teeth, and signs and symptoms such as headaches and wear on dentures go unnoticed and are not related to bruxism. It is therefore necessary to look at this issue as the population ages and factors related to bruxism, such as emotional aspects and the use of central drugs, are increasingly present.

CONCLUSION

Despite the limitations of this study (cross-sectional, small sample size and lack of an instrumental assessment of bruxism), it is possible to conclude that a significant proportion of denture wearers presents probable bruxism, with clenching being the main complaint and wear on the denture being the main clinical manifestation.

AUTHORS' CONTRIBUTIONS

Henrique Ohno de Souza

Data Collection, Conceptualization, Research, Writing - Preparation of the Original, Software

Alex Moreira Mélo

Writing - Preparation of the Original, Writing - Review and Editing, Validation, Visualization

Melissa de Oliveira Melchior

Writing - Review and Editing, Validation, Visualization

Lais Valencise Magri

Statistical Analysis, Funding Acquisition, Data Collection, Conceptualization, Resource Management, Project Management, Research, Methodology, Writing - Preparation of the Original, Writing - Review and Editing, Software, Supervision, Validation, Visualization

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