










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Updating the Bruxism Definitions: Report of an International Consensus Meeting

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ABSTRACT

Background: Bruxism is receiving increasing attention from both clinicians and researchers over the past decades. Recently, it has become clear that some aspects of the currently proposed, expert-driven bruxism definitions raise questions and cause confusion among clinicians, researchers, educators and patients.

Objectives: The aim of this report is threefold: (1) to provide the reader with a glossary of the existing definitions, (2) to discuss frequently asked questions regarding these definitions and (3) to suggest a road map for the next steps to be taken towards a better understanding of bruxism.

Material and Methods: A closed (invitation-only) full-day workshop at the 2024 General Session & Exhibition of the International Association for Dental, Oral and Craniofacial Research (IADR) convened international bruxism experts to discuss the current definitions. Insights from these discussions were compiled, analysed and summarised.

Result: The present report provides a glossary of the constituent terms of the currently proposed definitions, an overview of the frequently asked questions and insights into the next steps to be taken. By current consensus and to avoid any further confusion, the addendum 'in otherwise healthy individuals' has been removed from the specific definitions of sleep and awake bruxism. In addition, the grading system's hierarchical organisation, as proposed previously, was revised and clarified, proposing the inclusion of terms based on self-reporting, clinical examination and device-based assessment tools.

Conclusion: To ascertain that we all use the same terminology, we recommend using the current publication when referring to the definitions of bruxism and its constituent terms.

Merel C. Verhoeff and Frank Lobbezoo share first authorship.

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1 | Introduction

Bruxism is receiving increasing attention from both clinicians and researchers [1, 2]. Over the years, an international group of bruxism experts produced a series of consensus papers [3–5], accumulating in the publication of the Standardised Tool for the Assessment of Bruxism (STAB) [6] and the BruxScreen [7], along with a 12-step guideline for the translation and cultural adaptation of those tools [8]. The road towards these publications started in 2013, when an international consensus definition of bruxism was published, along with a proposal for a grading system to determine the likelihood that a particular assessment approach yields a valid outcome [9]. Among others based on several critical commentaries [10–12], in 2018, the unspecified bruxism definition was formulated for sleep bruxism and awake bruxism separately, issues that were unaddressed in the 2013 paper were clarified, and the grading system was modified to meet the level of knowledge and insights at that time [13].

However, over the past few years, it has become clear that some aspects of the currently proposed definitions raise questions and cause confusion among clinicians, researchers, educators and patients [14–19]. Part of the voiced concerns were already addressed in an explanatory note [20]. However, a more comprehensive approach was deemed necessary. Therefore, a closed (invitation-only) full-day workshop, initiated by two of the authors (MCV, FL), was held on 11 March 2024, at the 102nd General Session & Exhibition of the International Association for Dental, Oral and Craniofacial Research (IADR) in New Orleans (LA) with a panel of bruxism experts (Table 1). Of these experts, about half of them also contributed to the international consensus projects in 2013 and/or 2018 [1, 2]. During the 2024 workshop, discussions were held which developed, among others, into the three aims of this report: (1) provide a glossary of the existing definitions, (2) discuss frequently asked questions regarding the definitions and (3) suggest a road map for the next steps to be taken towards a better understanding of bruxism.

TABLE 1 | Participants and contributors to the INFORM (International Network for Orofacial Pain and Related Disorders Methodology of the International Association for Dental, Oral and Craniofacial Research [IADR]) International Bruxism Consensus Meeting on 11 March 2024.

Name	City, State, Country	Contributed to Lobbezoo et al. [9]	Contributed to Lobbezoo et al. [13]	Participated in the 2024 consensus meeting	Invited for the 2024 consensus meeting but unable to attend
Jari Ahlberg	Helsinki, Finland	✓	✓	✓	
Steven Bender	Dallas, TX, USA	—	—	✓	
Alessandro Bracci	Padova, Italy	—	—		✓
Anna Colonna	Siena, Italy	—	—	✓	
Cibele Dal Fabbro	Sao Paulo, Brazil	—	—		✓
Justin Durham	Newcastle, UK	—	—	✓	
Alan G. Glaros	Kansas City, MO, USA	✓	✓	✓	
Birgitta Häggman-Henrikson	Malmö, Sweden	—	—	✓	
Takafumi Kato	Osaka, Japan	✓	✓		✓
Michail Koutris	Amsterdam, the Netherlands	—	—	✓	
Gilles J. Lavigne	Montreal, QC, Canada	✓	✓		✓
Frank Lobbezoo ^a	Amsterdam, the Netherlands	✓	✓	✓	
Daniele Manfredini	Siena, Italy	✓	✓	✓	
Laura Nykänen	Helsinki, Finland	—	—	✓	
Karen G. Raphael	New York, NY, USA	—	✓	✓	
Peter Svensson	Singapore, Singapore	✓	✓		✓
Merel C. Verhoeff ^a	Amsterdam, the Netherlands	—	—	✓	
Mieszko Wieckiewicz	Wroclaw, Poland	—	—		✓

Note: ✓ = yes; — = no.

^aOrganisers/Chairpersons.

2 | Aim 1: Bruxism Glossary

As mentioned in the introduction, it is important to address the confusion that arose after the publication of the definition of unspecified bruxism (viz., ‘Bruxism is a repetitive jaw-muscle activity characterized by clenching or grinding of the teeth and/or by bracing or thrusting of the mandible. Bruxism has two distinct circadian manifestations: it can occur during sleep (indicated as sleep bruxism) or during wakefulness (indicated as awake bruxism)’ [9] and the later-formulated, specific, more detailed definitions of sleep bruxism (viz., ‘Sleep bruxism is a masticatory muscle activity during sleep that is characterized as rhythmic (phasic) or non-rhythmic (tonic) and is not a movement disorder or a sleep disorder in otherwise healthy individuals’ [13] and awake bruxism (viz., ‘Awake bruxism is a masticatory muscle activity during wakefulness that is characterized by repetitive or sustained tooth contact and/or by bracing or thrusting of the mandible and is not a movement disorder in otherwise healthy individuals’ [13]. These definitions are included in Table 2, which serves as a glossary enabling us to explain the constituent terms of the three currently proposed bruxism definitions.

As can be gathered from Table 2, we have been able to explain most of the definitions’ constituent terms. However, some of the terms require further explanation and are, therefore, discussed below as part of the second aim.

3 | Aim 2: Frequently Asked Questions and Important Points of Discussion Among Experts

The authors of this report were often confronted with the confusion that colleagues (clinicians, researchers and educators) experienced regarding the bruxism definitions (see Section 1). Therefore, all issues that gave rise to confusion were collected, collated and phrased as questions. Below, these questions are explained in the clearest possible way in a Questions & Answers (Q&A) format. It is the authors’ hope and expectation that herewith, the confusion has been resolved as much as possible. In Table 3, an overview of the questions is given, and the suggested answers are summarised. In the section below, the answers are explained in a more comprehensive way, so that the background of the summarised answers in Table 3 can also be appreciated.

3.1 | Q&A 1: What Is the Meaning of the Addendum ‘in Otherwise Healthy Individuals’?

The World Health Organization defines health as ‘a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity’ [22]. Keeping this definition in mind, it follows that when we are assessing bruxism in individuals who are healthy at that specific time point, we refer to them as ‘otherwise healthy individuals’.

However, when describing bruxism in individuals with disorders, hence unhealthy people, some interpret the addendum ‘in otherwise healthy individuals’ as that individuals with disorders are thus excluded from the current definition of

bruxism, whereas others state that the addendum only refers back to the absence of a movement disorder or a sleep disorder. The latter implies that only in individuals with a movement disorder or a sleep disorder, the definitions of sleep and awake bruxism may not be applicable, regardless of their health status. To avoid any further misunderstandings regarding this addendum, we have decided to remove ‘in otherwise healthy individuals’ from the currently proposed specific definitions of sleep and awake bruxism [2]. Hence, these definitions are now formulated as follows:

- Sleep bruxism is a masticatory muscle activity during sleep that is characterised as rhythmic (phasic) or non-rhythmic (tonic) and is not a movement disorder or a sleep disorder.
- Awake bruxism is a masticatory muscle activity during wakefulness that is characterised by repetitive or sustained tooth contact and/or by bracing or thrusting of the mandible and is not a movement disorder.

3.2 | Q&A 2: Is Bruxism a Behaviour or a Disorder?

As recently stated in a commentary, ‘... bruxism is not *the* disorder, neither in otherwise healthy individuals nor in non-healthy ones’ [20]. Rather, bruxism is considered a motor behaviour [10] that may be associated with certain disorders in one of three hypothetical ways: (1) bruxism of which it is as yet unknown whether or not it is actually associated with a certain disorder or that both are only present at the same time (i.e., primary bruxism), (2) bruxism that is proven to be associated with a certain disorder, treatment or lifestyle (i.e., secondary bruxism) and (3) bruxism that is part of the signs of a certain disorder, that is, the disorder causes jaw-muscle activities to occur. In the latter case, the question arises whether it can still be called bruxism [23].

3.3 | Q&A 3: Is Bruxism a Comorbidity or a Risk Factor?

As elaborated above, bruxism is not a disorder and, therefore, cannot be considered a comorbidity (i.e., ‘a condition existing simultaneously with and usually independently of another medical condition’) [24].

Bruxism can, however, be associated with other health conditions. According to the consensus published in 2018, bruxism can be considered to have one of three potential associations with a specific health outcome: (1) a risk factor when bruxism is associated with one or more negative health outcomes, (2) a protective factor when bruxism is associated with one or more positive health outcomes and (3) a neutral factor when bruxism is neither a risk factor nor a protective factor [13].

The most often described form of bruxism is that of it being a risk factor that may lead to conditions such as temporomandibular disorder-related pain or mechanical tooth wear [10]. Notably, however, bruxism may also act as a protective factor, the most often suggested example is in people with obstructive

TABLE 2 | A detailed explanation of the constituent terms (underlined) of the bruxism definitions according to Lobbezoo et al. [9, 13, 15].

Bruxism manifestation	Definition
Unspecified bruxism	Bruxism is a <u>repetitive jaw-muscle activity</u> characterised by clenching or <u>grinding</u> of the teeth and/or by <u>bracing</u> or <u>thrusting</u> of the mandible. Bruxism has two distinct <u>circadian manifestations</u> : it can occur during sleep (indicated as sleep bruxism) or during wakefulness (indicated as awake bruxism).
Sleep bruxism	Sleep bruxism is a <u>masticatory muscle activity</u> during <u>sleep</u> that is characterised as <u>rhythmic (phasic)</u> or <u>non-rhythmic (tonic)</u> and is not a <u>movement disorder</u> or a <u>sleep disorder</u> [<i>in otherwise healthy individuals</i>]. ^a ^a By current consensus, the addendum 'in otherwise healthy individuals' has been removed from the bruxism definitions as proposed by Lobbezoo et al. [13, 15].
Awake bruxism	Awake bruxism is a masticatory muscle activity during <u>wakefulness</u> that is characterised by repetitive or <u>sustained</u> tooth contact and/or by <u>bracing</u> or <u>thrusting</u> of the mandible and is not a <u>movement disorder</u> [<i>in otherwise healthy individuals</i>]. ^a ^a By current consensus, the addendum 'in otherwise healthy individuals' has been removed from the bruxism definitions as proposed by Lobbezoo et al. [13, 15].
Constituent term	Explanation
Repetitive	In contrast to the term 'rhythmic', which has been used to describe bruxism behaviour in previous definitions and refers to a recurrence of activities at regular intervals, 'repetitive' simply refers to the fact that the jaw-muscle activity re-occurs from time to time.
Sustained	A sustained activity continues for an extended period of time, without interruption.
Masticatory/jaw-muscle activity	Masticatory muscle activity and jaw-muscle activity refer to the same phenomenon, namely a contracting muscle within the masticatory (or stomatognathic) system at any possible level.
Clenching	Clenching is the act of sustained (static) tooth contact as a consequence of jaw-muscle activity.
Grinding	In the context of bruxism, grinding is characterised by dynamic tooth contacts brought about by jaw-muscle activities. Grinding may or may not be accompanied by sounds.
Bracing	Bracing is the equivalent of clenching, but without tooth contact. It literally means 'holding parts together or in place; making something rigid or steady'.
Thrusting	Thrusting is the equivalent of grinding, but then without tooth contact. It literally means 'a sudden forceful movement'.
Rhythmic (phasic)	Sleep bruxism events can be characterised as rhythmic (or phasic) when the constituent bursts within an event recur at regular time intervals. Please note that this differs from the term 'rhythmic' as explained for the lemma 'Repetitive'.
Non-rhythmic (tonic)	A sleep bruxism event can be characterised as non-rhythmic (tonic) when the event shows prolonged, sustained jaw-muscle activity and lacks recurrence at regular time intervals.
Circadian manifestation	A circadian manifestation is an expression of a behaviour in relation to the 24-h sleep-wake cycle. In the case of bruxism, sleep bruxism and awake bruxism are considered the behaviours' circadian manifestations.
Sleep	A period of rest for the body and mind, during which volition and consciousness are in partial or complete abeyance and the bodily functions partially suspended. Sleep has also been described as a behavioural state marked by a reversible sensitivity to external stimuli [21].
Wakefulness	Wakefulness is a condition of being alert and aware, rather than asleep.
Movement disorder	A movement disorder is a neurologic condition characterised by problems with movement.
Sleep disorder	A sleep disorder is a condition that involves complaints or abnormalities related to the quality, timing, and amount of sleep.

sleep apnea, where the activity may contribute to maintaining the patency of the upper airway, thus preventing collapse [25, 26]. In addition, it may aid in increasing salivation in case of

gastroesophageal reflux, and it may even exert a positive effect on cognitive function [25, 27, 28]. Lastly, bruxism can be a neutral factor [13].

TABLE 3 | A summary of Aim 2: 'Frequently asked questions and important points of discussion among experts'.

Questions	Brief explanation
Q1: What is the meaning of the addendum 'in otherwise healthy individuals'?	A1: 'Otherwise healthy' refers to individuals who are healthy, according to the WHO definition of health, on the time point at which the assessment took place.
Q2: Is bruxism a behaviour or a disorder?	A2: Bruxism is a motor behaviour rather than a disorder.
Q3: Is bruxism a comorbidity or a risk factor?	A3: Bruxism is a motor behaviour that can be a risk factor, protective factor or neutral factor. Since it is a behaviour, it cannot be a comorbidity.
Q4: Are we diagnosing or assessing bruxism?	A4: We assess bruxism to determine its presence in conjunction with its possible consequences, rather than to diagnose it as a disorder.
Q5: When do we manage or treat bruxism?	A5: Management of consequences is only needed and possible when any potential positive effect of bruxism is not compromised by the proposed management. Treatment of a disorder of which bruxism is a sign is usually indicated for medical reasons.
Q6: Is bruxism a stable jaw-muscle activity?	A6: Device-based sleep bruxism fluctuates considerably over time, whereas self-reported bruxism (sleep, awake) seems to be a fairly persistent trait over longer periods of time.
Q7: Is there any evidence for bracing and thrusting of the jaw?	A7: Emerging research suggests that bracing and thrusting may contribute to, among others, increased muscle fatigue and pain.
Q8: How to proceed with citing the definition articles?	A8: Cite the current report, where every term is discussed thoroughly and most of the confusion is eliminated.
Q9: What is the value of the grading system?	A9: The grading system (i.e., possible, probable and definite) has helped to organise and develop our understanding of bruxism, but it should now be replaced with the terms subject-based, clinically based and device-based.
Q10: When should we select one or the other assessment mode?	A10: The selection of one or the other assessment mode (i.e., subject-based, clinically based or device-based) depends on the actual clinical need or specific research question.

In conclusion, bruxism is considered to have one of three associated relationships with specific health outcomes (i.e., risk, protective or neutral) and not as a comorbidity. Depending on the health outcome under consideration, its association may differ.

3.4 | Q&A 4: Are We Diagnosing or Assessing Bruxism?

Since bruxism is not a disorder, we do not diagnose it as such [10]. Instead, we assess the motor behaviour and determine if any positive or negative consequences are associated with it. Clinicians may recommend management of the negative consequences, if present, thereby ensuring that any potential positive effects are not compromised by the proposed management options [2]. In addition, if bruxism is a sign of a disorder, treatment of that disorder may be indicated for medical reasons (e.g., in the case of obstructive sleep apnea). In such cases, the benefits of treating the underlying disorder will generally outweigh the risk of compromising any potential positive effects of bruxism. Thus, we must approach the clinical decision-making on each patient's potential management or treatment on an individual basis. In the future, it might be feasible to utilise algorithms based on extensive data to provide support for such individualised management and treatment recommendations.

3.5 | Q&A 5: When Do We Manage or Treat Bruxism?

See Q&A 4: Are we diagnosing or assessing bruxism? In short, when indicated and possible, negative consequences of bruxism can be managed as long as this does not compromise any potential positive effects of the motor behaviour. If bruxism is a sign of a disorder, treatment of the underlying disorder may be indicated for medical reasons.

3.6 | Q&A 6: Is Bruxism a Stable Jaw-Muscle Activity?

Bruxism is known for its fluctuations over time, which can be considerable in individual polysomnographically confirmed sleep bruxism patients [29–33]. Self-reported sleep bruxism, on the other hand, seems to be a fairly persistent trait over a 20-year period in same-sex twins [34]. Self-reported awake bruxism, recorded with a smartphone application, was also found to be quite constant over a 6-month monitoring period [35].

In conclusion, while considerable fluctuations in sleep bruxism have been reported over time, especially when assessed device-based, the trait of being a self-reported bruxer (sleep or awake) seems to be fairly constant over longer periods of time.

3.7 | Q&A 7: Is There any Evidence for Bracing and Thrusting of the Jaw?

Bruxism is commonly associated with clenching and grinding of the teeth, but the definition of bruxism also includes two other characteristics: bracing and thrusting. Although little research has been done on these two phenotypes regarding the extent of their negative, positive or neutral impact, some studies indicate that bracing [36] and thrusting [37] are frequent behaviours and can lead to increased muscle fatigue and pain.

3.8 | Q&A 8: How to Proceed With Citing the Definition Papers?

There is often confusion about when to cite a particular definition paper [9, 13]. Therefore, we recommend citing the current report instead, which covers all definitions and provides comprehensive and updated explanations of all constituent terms. Most importantly, as per our current consensus, the addendum 'in otherwise healthy individuals' has been removed from the specific definitions of sleep and awake bruxism. As such, new readers will have all the necessary information readily available, including answers to all frequently asked questions. When discussing bruxism in general, one can use the unspecified definition, and when referring to specific manifestations such as sleep or awake bruxism, one is encouraged to use the respective sleep and awake bruxism definitions without the addendum 'in otherwise healthy individuals' (Table 2).

3.9 | Q&A 9: What Is the Value of the Grading System?

The previously proposed grading system (viz., possible, probable and definite bruxism) has helped us to further develop our understanding of bruxism [9, 13]. The grading was intended to increase awareness that, for example, self-reports of bruxism actually representing jaw-muscle activity would only be graded as 'possible' because of false-positive responses [38]. Nevertheless, during the 2024 consensus meeting, we discussed the potential suggestiveness of such a hierarchical construction. We agreed that this hierarchy is not accurate because self-reporting, clinical examination and device-based tools could conceivably assess different aspects of bruxism (See Q&A 10: When should we select one or the other assessment mode?).

Therefore, we propose to call the used assessment tools as they are: subject-based (self-report), clinically based (clinical examination) and device-based (e.g., electromyography, polysomnography) tools [6]. For articles published before the publication of the current report, reported primary data can still be utilised for systematic reviews and meta-analyses, as this covers the same content as that of the present proposal.

3.10 | Q&A 10: When Should We Select One or the Other Assessment Mode?

Self-reporting reflects the patient's experiences and beliefs, and, provided that the patient is aware of the behaviour, it allows

the assessment of the perceived time course of bruxism [39]. In addition, clinical examination does not measure bruxism itself but rather clinical signs of the motor behaviour that are possibly present independently from the patients' beliefs (e.g., tongue impressions) and may also be historical (e.g., mechanical tooth wear) [39]. Finally, device-based tools are used to actually measure jaw-muscle activities, as to provide insight into, for example, the pathophysiological mechanisms or physiological correlates of those activities [39, 40]. Hence, the selection of one or the other assessment mode depends on the actual clinical need or specific research question.

4 | Aim 3: Taking the Next Steps

Based on the above, we hope and expect to have resolved a substantial part of the confusion inherent to the previously proposed definitions. However, it may also be clear that some aspects are still not fully crystallised. Because of that, we are currently planning the next step to be taken towards a better understanding of bruxism. For example, implementation strategies need to be developed to promote the integration of the currently proposed bruxism definitions into education, clinical settings and research projects [41]. Studies carried out in practice-based research network settings may be suitable to that end [42, 43]. In addition, although great strides have been made in the field of bruxism assessment [6, 7], there is a paucity of studies on the similarities and differences between sleep/awake bruxism and other orofacial motor activities. To that end, we will work on a classification of orofacial motor activities during an upcoming consensus meeting. Since consensus meetings like the current one only serve as first steps towards obtaining face validity and thus have methodological limitations, stronger methods, such as Delphi studies, are considered for the next steps. Further, more research is needed on the associations between sleep bruxism and sleep-related conditions such as obstructive sleep apnea, restless leg syndrome, periodic limb movement during sleep, sleep-related gastroesophageal reflux disease, REM behaviour disorder (RBD), Parkinson's disease and sleep-related epilepsy [21]. Finally, since the aetiology of bruxism is complex with motor neurons originating in the central nervous system playing a significant role [44], it will be examined in the future whether these etiological aspects can be added to the definition in a sustainable way.

5 | Conclusion

In conclusion, the present report of the 2024 international consensus meeting provides a glossary of all constituent terms of the definitions of unspecified, sleep and awake bruxism that have been published previously. In addition, responses are provided to frequently asked questions regarding bruxism and its definitions. With this, we hope that we have created clarity in the former, sometimes cloudy waters around this topic. Finally, the report looks ahead towards the possible next steps to be taken, for example, bruxism in unhealthy individuals who have conditions in which bruxism behaviour is directly increased due to the underlying health condition. To ascertain that, from now on, we all use the same terminology, we recommend using the current publication when referring to the definitions of bruxism in clinical and research settings.

Author Contributions

M.C.V. and F.L. were the initiators and co-chairpersons of the international consensus meeting. The participation per author is presented in Table 2. All authors contributed to drafting the manuscript and approved submission.

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Conflicts of Interest

M.C.V., J.A., S.B., A.C., C.D.F., A.G.G., B.H.-H., T.K., M.K., G.J.L., L.N., K.G.R., M.W. and D.M. report no competing interests. A.B. serves as a scientific consultant for the company WMA srl. F.L. receives research grants from Sunstar Suisse, S.A., Vivisol-ResMed, Health Holland and the Dutch Research Council (NWO). F.L. is an unsalaried member of the Academic Advisory Board of Sunstar Suisse S.A. for GrindCare. J.D. is an unsalaried Director of, and shareholder in, JawSpace. P.S. is a paid consultant for Sunstar Suisse, S.A.

Data Availability Statement

Data sharing does not apply to this article as no datasets were generated or analysed during the current study.

Peer Review

The peer review history for this article is available at <https://www.webofscience.com/api/gateway/wos/peer-review/10.1111/joor.13985>.

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