Biopsychosocial aspects of sleep bruxism in children

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[Link to publication](#)

Citation for published version (APA):
Restrepo Serna, C. C. (2018). *Biopsychosocial aspects of sleep bruxism in children*.

1 Chapter

Introduction

Bruxism was defined by a panel of experts, as a repetitive jaw-muscle activity characterized by clenching or grinding of the teeth and/or by bracing or thrusting of the mandible[1]. Although bruxism is not necessarily a treatment-demanding condition[2,3], it remains a common concern for parents, who are usually worried when their children gnash and grind their teeth during sleep[4].

Over the years, several studies have been performed in adults to try explaining the pathophysiology of sleep bruxism (SB) and its clinical correlates. As a result, researchers working on adults agree on some basic concepts. Among those, there is consensus that SB is of central origin[5,6,7] and that it should be assessed within a multiple-variable framework[1,8], due to the multiplicity of biological, psychological, and social factors that interact and lead to its occurrence[9]. In addition, the common belief that tooth wear has a linear relationship with SB, has been discarded in adults[8].

On the other hand, investigations on bruxism in children are scarce, in part because of potential poor compliance with research protocols, as well as ethical and legal issues that make it difficult to perform researches in children. In addition, validated criteria for the assessment of SB in children are lacking.

The literature suggests that polysomnography (PSG) should be considered the reference standard for a quantitative assessment of SB[1]. Such technique monitors multiple physiologic parameters during sleep and it is useful in the evaluation of sleep disorders (i.e., treatment-demanding conditions), as well as their discrimination from sleep behaviors (i.e., physiological phenomena)[10]. The electroencephalogram, eye movements, chin and masticatory muscles electromyogram, nasal airflow, thoracic and abdominal respiratory effort, electrocardiogram, and oxygen saturation; are among the parameters that are recorded continuously during sleep in a laboratory setting and are displayed on a computerized system or on paper[10,11].

The widespread use of PSG is limited by the high costs, limited availability, and comprehensive technical requirements[12,13]. Unfortunately, those issues are even more critical in children than adults, thus further limiting the diffusion of PSG for SB assessment in children. Therefore, available investigations have forcedly adopted parental (proxy) report as the main strategy to gather data on SB in children.

Whilst such an approach seems reasonable from a cost-effectiveness ratio, the literature suggests that any self- or parental-reported approach to the assessment of SB may have its limits, if used alone[12,13]. In particular, there are ongoing debates on the validity of self-report in adults[2,3]. Thus, researches are currently performed to identify alternative options to PSG and to determine

the correlation between the various approaches to SB assessment (viz., self-report, clinical assessment, and PSG measurement)[8,14].

In children, as stated above, the most common method is the use of questionnaires answered by the parents, which is particularly useful when evaluating large numbers of participants[15,16]. Nevertheless, the main concern regarding the use questionnaires for SB data collection in children, is that their agreement with PSG findings has not been assessed.

Due to the potential shortcomings of self-reported approaches and the technical limitations that prevent the large-scale usage of PSG, alternative methods are being explored. Among those, the use of portable electromyography (EMG) devices, which are available to measure the masticatory muscle activity (MMA) during sleep time at home in adults[17,18], could be useful for children as well. Portable EMG recorders would allow keeping a child in his/her habitual sleep environment, but the correlation between portable EMG findings and PSG measurements has never been evaluated in children.

The diagnostic difficulties to approach SB and to provide a definite assessment in children, reflect in the inconclusive knowledge that is available on some etiological and clinical aspects. For decades, the search for an association of a tense personality and/or a stressful life with SB in children has been the main target of etiological studies[19,20,21,22,23], while tooth wear was the general focus for the evaluation of SB consequences[24,25]. Notwithstanding, findings on those two topics deserve further investigation, to provide a comprehensive assessment of SB in children.

From the above, it emerges that evidence on SB in children is still scarce and fragmental, and that getting deeper into the study of several biopsychological issues may provide further insights into the pathophysiology of SB in children.

Aims and outline of the thesis

The general aim of this thesis is to obtain a deeper insight into the mutual interactions of the biopsychological aspects of SB in children. Below, the specific aims are formulated for each chapter.

The starting point of the project is a systematic literature review on the epidemiology of SB in children. The review, described in **Chapter 2** of this thesis, aims to summarize all the available information concerning SB prevalence in children.

In the study described in **Chapter 3,** the correlation between proxy-reported SB and a "definite" SB diagnosis via PSG, using PSG/SB adult criteria

as the gold standard[1], will be explored. In addition, due to the difficulties of using PSG in children, a study on the correlation between the measurements of MMA, using a portable single-channel EMG device and PSG, will be presented in **Chapter 4.**

The next studies aim to investigate the psychosocial issues that may be linked to the central origin of SB in children. Due to the psychological and behavioral nature of the variables, as well as the need to recruit large samples for epidemiological purposes, the studies described in **Chapter 5 and 6** are questionnaire-based. The investigations assess the associations of SB with quality of life (QoL) variables and sleep behaviors, in children belonging to different social layers. Validated psychological instruments will be used, and both studies will be performed on representative samples, to increase the internal and external validity of the results and to explore possible associations to be refined in future studies.

Finally, the investigation presented in **Chapter 7** evaluates one of the clinical signs that is commonly considered a consequence of SB, viz., tooth wear. Specifically, SB and dietary-habits will be evaluated as comorbidities and associated factors to the presence and severity of tooth wear in the mixed dentition.

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