

The Role of Stress in the Etiology of Oral Parafunction and Myofascial Pain

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KEYWORDS

• Stress • Temporomandibular disorders • Oral parafunction • Behavior • Pain • Myofascial pain

KEY POINTS

- Oral parafunction during waking comprises many possible behaviors beyond those based on tooth contact, and awake parafunction must be distinguished from sleeping parafunction.
- Stress, parafunction, and myofascial pain are complex and comprise an assumed causal chain. However, how each component is measured can lead to different conclusions about causation.
- Experimental stress increases oral parafunction and, in turn, pain. Psychosocial stress is often accompanied by anxiety, hypervigilance, and somatosensory amplification, which also contribute to pain.
- Longitudinal research studies indicate that a high amount of awake parafunction is strongly associated with the first episode of masticatory myofascial pain.
- Successful assessment and treatment of awake oral parafunction requires consideration of multiple factors, and the causal pathway may be simple for some individuals but complex for others.

INTRODUCTION

Early publications about painful musculoskeletal disorders of the jaw, with varying levels of evidence, often referred to stress, oral parafunction, or both in combination as important contributors to these disorders.¹⁻³ After that early literature, a now-classic summary in 1973 proposed 4 major theories underlying the etiology of temporomandibular disorders (TMDs), two of which were psychological and psychophysiological.⁴ Subsequently, the biopsychosocial framework for considering TMDs became dominant,^{5,6} with stress, oral parafunction, and TMD pain remaining an active theory. Yet, across this entire period, every element of this proposed set of causal

relationships has remained challenging in terms of definition and, consequently, measurement and meaningfulness. Varying definitions and measurements have influenced the available evidence since the early texts to the present, contributing to substantial controversy. The goal of this article is to review how stress may affect behavior and TMD pain. It examines the causal hypothesis and addresses it via 3 perspectives within the existing literature: concepts, definitions, and measures; experimental studies; and observational studies. Given the complexity of the topic and the available space for this article, the literature has been selectively referenced to highlight areas of convergence as well as divergence.

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CONCEPTS, DEFINITIONS, AND MEASURES

Stress

Psychological stress, a process that includes both stressors as stimuli and stress reactivity as the consequence, is clearly implicated in TMDs. For example, stressful life events are highly prevalent in individuals with TMD.^{7–9} Such patients report that stress initiates, exacerbates, or perpetuates their pain,¹⁰ and stress affects treatment responsiveness.^{11–13} In these examples, stress acts through multiple mechanisms that coexist with the mechanism of interest for the present article: the self-report of stress leading to a specific physiologic response pattern. The stress response system is an initially adaptive, but chronically nonadaptive, physiologic process. It is initiated by, but coextensive with, either a physiologic burden (eg, cancer pain) or psychosocial context (eg, job stress), the result of a transaction between individual coping resources and environmental demands.¹⁴ Much controversy surrounding stress and TMD pain emerges from different conceptions of stress, its measurement, and the time base.^{15–17}

The most commonly used measurement scale that incorporates the transactional aspect of the stress response is the Perceived Stress Scale (PSS), which has strong validity and usefulness.^{18,19} Stress is also measured as a single question such as, “Please rate your average level of stress,” using anchors of 0 (no stress) and 10 (maximal stress).²⁰ Single item scales are particularly useful in clinical settings and have high face validity.

Oral Parafunction

Oral, masticatory, and facial behaviors that do not serve any functional purpose are broadly termed oral parafunction.²¹ These behaviors are usually harmless but, when the frequency or forces exceed some physiologic tolerance, they seem to cause harmful effects on muscles and joints^{22–24} and are presumed to be important initiating and perpetuating factors in TMDs. These behaviors occur during either sleeping or waking hours. The term bruxism is inconsistently used, variously referring to any of the following: grinding of the teeth only during sleep, grinding of the teeth during sleep and when awake, grinding and clenching of the teeth only during sleep, and grinding and clenching of the teeth during sleep and when awake. Current evidence favors different mechanisms underlying sleep versus awake parafunctional behaviors, and consequently combining them helps neither understanding nor clinical management.

Parafunctional behaviors of tooth grinding or clenching that occur during sleep are currently

considered a sleep disorder. Whether stress substantially affects the episodic onset of sleep bruxism is presently poorly understood, and whether sleep bruxism is even associated with pain is currently controversial.²⁵ Sleep bruxism is not further addressed herein, and excellent material can be found elsewhere.^{26–30}

Awake parafunctional behaviors include tooth clenching, bracing, and tapping, as well as tongue pushing, among many others, and are the focus of the rest of this article. The measurement of such behaviors, however, has traditionally been very difficult, in large part because they typically occur outside the individual’s awareness.³¹ A simple inquiry regarding unconscious behaviors often leads to potentially false-negative reports.³² Consequently, current evidence suggests that associations reported to date between, for example, stress and parafunction are likely underestimated.³³ In addition, research has focused primarily on grinding and clenching, and has most often ignored the wider range of oral behaviors. For example, 52% of patients with TMD pain report tooth-contacting behaviors that are distinguished from clenching.³⁴ Also, including other parafunctional behaviors, such as tongue bracing or tongue position, will increase the proportion of individuals reporting behaviors of potential importance.

Adequate parafunctional measurement methods include ambulatory electromyography in research contexts, but most often rely on self-observations using a paper symptom log, time-based prompting³⁵ such as within experience sampling methods (ESM),³⁶ or a checklist for rating each of multiple behaviors. The last approach is currently available as the Oral Behaviors Checklist (OBC),^{21,37} and is part of the Diagnostic Criteria for Temporomandibular Disorders.³⁸ The OBC invites the respondent to consider whether each behavior falls into their repertoire. The OBC (score range from 0 to 84) has good test–retest reliability.^{39,40} When highlighting uniqueness as well as similarity, item correlations range from $r = 0.39$ to 0.89 .³⁹ Concurrent validity is $r = 0.76$, using an alternative oral parafunction questionnaire,³⁹ demonstrating acceptable operationalization of this complex construct.

Completing a self-report instrument in the clinic as a valid measure of parafunctional behaviors that are typically unconscious may seem improbable. To assess the ecologic validity of the OBC, an adapted version was administered before and after an approximately 7-day field ESM study (see Observational Studies section), in which subjects were randomly prompted up to 14 times per day and asked at each prompt to report on each of 10 different oral parafunctional behaviors. High variability regarding which behavior(s) occurred on

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