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Performance-Enhancing Mouth Wear and Craniofacial Neurometabolic Physiology

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In this special supplemental issue of *Compendium*, readers will be introduced to a new retail category—performance-enhancing mouth wear and its effect on the body. The literature and science presented in this issue will encourage new reflections on an old idea that has been anecdotally and qualitatively described in the past, but is now being supported by a number of scientific studies.

The role of neuroreceptors, neurotransmission, activation or suppression of neuropathways, the mechanism of neuropathways, stress, cortisol, lactate, concussion causation, and the craniofacial musculoskeletal system is beginning to be unraveled and comprehended in different ways. Scientists are reviewing known phenomena and applying double blind studies with remarkable results. Their conclusions are forging a new branch of science: craniofacial neurometabolic physiology.

Numerous published papers, as well as much anecdotal evidence, support the contention that a mandibular orthodontic repositioning appliance provides some beneficial physiological effect. Even two tongue depressors held between the molars seem to permit some degree of bodily strength enhancement. Of course, responsible dental professionals do not make decisions based on anecdotal evidence: treatment protocols are based on science. The gold standard is a double blind study with a large population of participants. When professionals can separate blatant commercialism from science and prescribe objective solutions, patients receive appropriate, current therapy that will create a better quality of life.

The Stress Response

Stress is a normal physiologic response and can be beneficial, maintaining alertness, focus, and efficiency. However, when stress becomes excessive (such as the “fight or flight response”), the body is overloaded, and both performance and health are adversely affected. Teeth clench in response to elevated stress levels. This clenching mechanism completes a circuit, as it were, and signals the brain to begin a complex series of responses in the hypothalamic-pituitary-adrenal (HPA) axis.

The HPA axis is a feedback loop signaling the release of hormones¹ and affects various parts of the body. When someone is faced with a stressful situation, the hypothalamus releases the corticotropin-releasing hormone (CRH), which activates the pituitary gland to release adrenocorticotropin into the bloodstream.¹ This triggers the adrenal glands to release epinephrine (adrenaline), norepinephrine (noradrenaline), and cortisol, all enabling the body’s stress response.¹ Epinephrine increases blood pressure, reaction time, and heart rate, and sends blood to the muscles. Cortisol releases glucose to supply the brain and muscles with immediate energy.¹

The HPA axis communicates with regions of the brain, including the limbic system, which controls motivation and mood.¹ It also communicates with the hippocampus, which has a vital role in memory formation, mood, and motivation.¹ Other affected areas include body temperature, appetite, and pain control. Stress will also shut down hormonal systems, which affects growth, metabolism, and immunity.¹ This serves as a useful short-term solution when the body must marshal its energies to confront or run from the source of stress.¹ However, stress’s interference outlives its usefulness and becomes detrimental when chronic.

Cortisol, the “stress hormone,” is essentially the trigger for adrenaline. Cortisol belongs to a class of hormones called glucocorticoids, which affect almost every organ and tissue in the body.¹ Scientists believe cortisol has hundreds of positive effects in the body but its most important job is to help the body respond properly to stress. Cortisol helps maintain blood pressure and cardiovascular function and is essential to normal functioning but needs to remain in proper balance.¹ At excessively high levels, particularly for long periods, the whole endocrine system is affected negatively. High cortisol levels limit peripheral vision, decrease metabolism, cause fatigue, reduce muscle-building, and suppress the immune system.¹

The results of tests showing, among other benefits, a significant increase in endurance as well as a marked reduction in cortisol during stress, indicate that a properly designed oral appliance can interrupt the fight-or-flight signal by preventing the completion of the clenching mechanism.

Current Technology

Various companies throughout the years have sought to deliver the “power position” through mouthguards; however, no studies to substantiate their claims have appeared in peer-reviewed journals. The products employed uniform-thickness bite plates that essentially locked or fixed the position of the jaw. All were bulky, uncomfortable, and hard to retain, and none proved successful.

What was needed was a device that would effectively “short circuit” the HPA process by preventing the completion of the clenching mechanism, thereby interrupting the fight-or-flight signal. This then clears the channels for enhanced performance and prevents the negative effects of stress from overloading the system. In simple terms, a person needs an oral appliance that prevents teeth from occluding or clenching under stress and halts the body’s preconditioned flight-or-flight reflex.

Researchers have studied a unique oral device that unlocks the body’s true potential and delivers performance enhancement without drugs. A simple wedge was the solution. Properly placed in the mouth, it enhances athletic performance in multiple ways and reduces stress.

The wedge is a multicomposite (elastomer, polymer) bioengineered intraoral device that relieves pressure on the temporomandibular joint that occurs each time the jaw clenches during stress. The wedge relieves this pressure by causing the lower jaw to be moved into the “optimal safety power position.” The desired movement of the jaw is achieved by positioning a “reverse wedge” bite plate over both sets of rear molars. Subsequently, when the teeth are clenched—exerting pressure—the twin wedges provide the necessary pivot points that induce the mandible (lower jaw) to move downward in a slight arc.

This supplemental issue of *Compendium* includes a number of reports on the various effects of these devices, including a literature review of research focusing on stress control, cortisol production, and a mechanism to interrupt a complex neuropathway that is being massively overworked in modern society.

Disclosure

The author is an employee of Bite Tech Inc.

Reference:

1. Stress system malfunction could lead to serious, life threatening disease. National Institute of Child Health and Human Development Web site. <http://www.nichd.nih.gov/news/releases/stress.cfm>. Accessed April 6, 2009.

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