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THE ERGOGENIC EFFECT OF USING OCCLUSAL SPLINT: A REVIEW

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Background: the impact of oral appliances to improve human strength or decrease stress has been reported since ancient times. The origin of this phenomenon is poorly understood. Roman soldiers were using leather straps between their teeth to improve their prowess in battle. Women would bite on sticks during childbirth to ease delivery. And in the absence of general anesthesia amputation procedures were conducted the same way. In late years we observed higher numbers of mentioning the ergogenic effect on upper body muscles and improvement in kinetical stabilization in asymptomatic athletes. Therefore, it`s essential for us to assess most of the reports to better understand the ergogenic effect of the occlusal splints and bring us closer to their origin.

Materials and methods: meta-analysis. We found 18 articles related to this topic and published between September 1984 and February 2022 in the PubMed database. Three questions were asked: 1. Do occlusal splints improve the strength of body muscles? 2. Do occlusal splints improve coordination and foothold? 3. Is it safe to use dental splints in asymptomatic athletes?

Results: 9 publications indicate that there is significantly higher muscular EMG activation in the occlusal splints condition when compared to the other conditions for some of the tested muscles and splints may have a positive ergogenic effect on shoulder muscular strength in healthy male subjects (1); cervical flexor

strength increased 24% and deltoid strength increased an average of 29% from that of biting without an increase as subjects were instructed to bite on mandibular acrylic bite plates 2, 4, 6 and 12 mm (2); most of the athlete analyzed showed better results during training session with occlusal splint compared to athlete without occlusal splint, in countermovement jump, in 10m and 30m sprint test, in the squat jump, the drop jump from 32cm and 40cm, trunk extension, leg press force and rate of force development as an improvement between 3% and 12% (3,4); the occlusion stability that results from stabilization splints and mouthguards is thought to increase the club head speed and driving distance in professional golf players (5); the optimization of neuro-muscular coordination and improvement of the competitive performance of athletes (6,7); athletes using a controlled mouthguard demonstrate a significant higher peak acceleration and peak force than those using no mouthguard (8); the splint jaw conditions lead to a more symmetrical running pattern than the control condition (9).

One article indicates that balance deficits seem to correlate with deteriorated body sway and can be improved by a myocentric bite position using a DPS splint (Dental Power Splint) what is shown by the improvement of balance behavior and weight distribution with the eyes closed on a balance platform (10).

One article indicates improvement of the movement of the occlusal muscles, increasing of the height of the squat jump, increasing of the forearms and wrists muscles strength and increased maximum clenching voltage shown on EMG (11).

Two publications of systematic review depicted a wide heterogenicity in the experimental conditions and suggested the application of the occlusal splints as a way to improve athlete's or individual's oral health, and as a potential tool to optimize marginal aspects of exercise performance (12,13). One publication claimed that a 46-year-old woman after application of occlusal splint demonstrated an increased athletic ability and grip strength. The patient could get out of bed, change clothes, and maintain posture during defecation without assistance, when wearing the bite splint, even during no drug efficacy (14). One article showed statistically significant changes for all EMG tests and the Flamingo Balance Test carried out for ballet dancers, who were treated with the customized occlusal splints. It appears that the use

of a customized occlusal device improved neuromuscular coordination and the overall performance of dancers (15). One study indicates that among asymptomatic females, artificial imbalanced occlusion induces immediate and significant alteration of knee eccentric muscle performances and that`s why it is essential to use balanced splints (16). One article showed that incorrect mandibula position guided by occlusal splints alters the gait stability (17).

One study found no significant differences in EMG activity between experimental conditions (Occlusal splint, Placebo splint, No splint) in the five upper limb muscles monitored and shooting performance was similar in all conditions (18).

Conclusions: to conclude, incorrect mandibula position could possibly alter the gait stability and neuro-muscular coordination. 1. Occlusal splints improve body muscles which include upper extremity, deltoid muscles and lower extremity. 2. Occlusal splints could improve gait stability, and neuro-muscular coordination. 3. It is safe to use dental splints as an ergogenic aid and we recommend athletes to use them as it might help to reduce the risk of injuries or help in performance.

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