

# The influence of mouth guard usage on neuromuscular activation and performance

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**Aim:** The aim of this study was to investigate the effects of a commercially-available mouth guard (BRUX Mod. Sport) on neuromuscular activation and force capacity. Mouth guards, indeed, are commonly used in different sports to prevent injuries, but it is not yet clear whether they can influence the force expression and some athletes remain wary of the perceived potential performance detriments using them.

**Method:** Ten participants completed a balanced randomized study with (S-MG) and without (Con) a sport mouth guard. Each participant performed two tests, with elbow flexors and knee extensors muscles: 1-min contraction at 100% of maximum voluntary contraction (MVC) and an 80% MVC contraction until exhaustion. During 80% MVC, the time of force within the target (t-target) and the coefficient of variation (CV) of the force signal were calculated. During 100% MVC, force decay ( $\Delta F\%$ ) and the root mean square (RMS) of the electromyogram (EMG) were calculated.

**Results:** MVC values in S-MG were significantly higher than in Con in the elbow flexors ( $P < 0.05$ ). No differences were found in knee extensors muscles.

At 80% MVC, no differences in t-target values were observed between Con and S-MG for both muscles group. Conversely, in knee extensors muscles, CV was significantly lower in S-MG compared to Con. During 1-min at 100% MVC contraction,  $\Delta F\%$  was significantly lower in S-MG than in Con in the elbow-flexors ( $P < 0.05$ ).

**Conclusion:** Overall, these findings indicate that despite neuromuscular activation was not affected, S-MG usage increased maximum force production, endurance time and force stability, especially in the upper limb muscles.

## References

- Dunn-Lewis, C, Luk, H-Y, Comstock, BA, Szivak, TK, Hooper, DR, Kupchak, BR, Watts, AM, Putney, BJ, Hydren, JR, Volek, JS, Denegar, CR, and Kraemer, WJ. The effects of a customized over-the-counter mouth guard on neuromuscular force and power production in trained men and women. *J Strength Cond Res* 26(4): 1085–1093, 2012.
- Cetin, C, Kececi, AD, Erdogan, A, and Baydar, ML. Influence of custom-made mouth guards on strength, speed and anaerobic performance of taekwondo athletes. *Dent Traumatol* 25: 272–276, 2009.
- Bourdin M, Brunet-Patru I, Hager PE, Allard Y, Hager JP, Lacour JR et al. Influence of maxillary mouthguards on physiological parameters. *Med Sci Sports Exerc* 38:1500–4,2006.