

## Optimising the Measurement of Genioglossus Fatigue Using Surface Electromyography

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**Introduction:** Obstructive Sleep Apnoea (OSA) occurs when upper airway (UA) dilator muscle activity is overcome by collapsing forces. Theoretically, fatigue of UA muscles e.g. genioglossus (GG), could contribute to OSA development. Skeletal muscle fatigue causes characteristic changes in the surface electromyogram (sEMG) e.g. a decrease in the median frequency of the power spectrum ( $f_{med,pow}$ ). Adapting a GGsEMG electrode described by Doble (J. Appl. Physiol. 58:1378-1382,1985) to best detect the myoelectric manifestations of GG fatigue, we report the effects of changing inter-electrode distance (IED) and electrode location on the GGsEMG. **Methods:** In 10 healthy volunteers; age 23.5 (22-33) years, BMI 25 (21-37) kg/m<sup>2</sup>, [median (range)], we compared the GG sEMG during short isometric contractions at 10-100% of the maximum voluntary contraction (MVC) using (a) an IED of 5, 10, and 15mm, and (b) at electrode distances of 5, 10, 15, 20, and 25mm from the apices of the lower incisor teeth. **Results:** Increasing force and IED caused a significant increase in root mean square GGsEMG amplitude ( $p < 0.001$  and  $p < 0.01$ , respectively, ANOVA + Student-Neuman-Keuls). No significant change in  $f_{med,pow}$  occurred with changes in force, IED or electrode location, but there was a tendency to record a higher  $f_{med,pow}$  at the extreme poles of the electrode array. There was a significant decrease in  $f_{med,pow}$  over time during sustained isometric contractions to fatigue at 50% MVC, not influenced by IED or electrode location. **Conclusions:** GG fatigue can be reliably measured by GGsEMG. IED had no effect on the frequency characteristics of the GGsEMG. We recommend an IED of 10mm, with the most anterior electrode located 15 mm from the apices of the incisor teeth. This arrangement maximises signal to noise ratio and minimises artefact due to end-plate or tendon end effects.

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