Predicting optimal surface electromyographic control of communication devices in individuals with motor speech disorders

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Individuals with motor speech disorders can supplement their oral communication using augmentative and alternative communication (AAC). Surface electromyography (sEMG) provides an alternative access solution to ACC technology for those with limited movement capabilities. However, placing sEMG sensors in an optimal configuration is a tedious task even in healthy users, requiring trial-and-error by an expert. Sensor placement is more challenging in individuals with motor speech disorders (e.g., dysarthria) who may have difficulties volitionally activating muscles in isolation. We sought to reduce sensor placement complexity by using quantitative signal features extracted from a short calibration task to predict user performance. Our cursor control system translated electrical activity of sEMG-targeted musculature into cursor movements across a range of sensor placements. Eighteen healthy individuals activated specific muscles to navigate a target selection task for each sensor configuration. Signal features were extracted from calibration to predict performance in the subsequent target selection task. Results suggest that non-experts can place sEMG sensors in the vicinity of usable muscle sites and healthy individuals will rapidly learn to efficiently control the modality. Similar methodology was repeated in individuals with motor speech impairments; results will elucidate features to improve the clinical applicability of using sEMG as an access modality.