Electrode Pair Selection using an EMG Electrode Array

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Recent technological advances have the potential to facilitate the use of electrode arrays for locomotor electromyography (EMG). This study examined the repeatability of common EMG parameters, to help select parameters that can identify the best electrode pair from an electrode array. Four amplitude parameters (absolute mean, maximum, root mean square, and absolute integral) and four frequency parameters (mean, median, peak count and zero crossings) were collected from lower extremity muscles of eight subjects. 3x4 electrode arrays of 2mm sintered electrodes were placed over each of the biceps femoris, semitendinosus, rectus femoris, vastus lateralis, tibialis anterior, gastrocnemius medialis, and gastrocnemius lateralis. For each muscle, subjects completed five maximal isometric contraction trials. For each electrode pair in the array, the value for each parameter was ranked from lowest to highest. If the same electrode pair had the highest ranking in at least 4 of 5 trials, the parameter was considered repeatable for that subject and muscle. The percent repeatability was calculated for each parameter, across all subjects and all muscles. On average, amplitude parameters had a higher percent repeatability than frequency parameters (77.68% compared to 60.71%). The parameters with the highest percent repeatability were root mean square amplitude, maximum amplitude, and absolute integral (83.93 %, 82.14%, and 82.14% respectively). Therefore, amplitude parameters were better suited to consistently identify the same electrode pair and could be useful for identifying the best electrode pair in an array. Although the literature is generally in agreement that higher amplitude parameters are favorable, maximal frequency values are not necessarily indicative of the best electrode pair.