

Paper Category:	Gerontechnology/e-health
Paper Title:	Machine Learning-based Classification of Sarcopenia Risk using Surface Electromyography Data During Wide-Squat Exercises
Abstract Body:	<ul style="list-style-type: none"> • Background • Objectives • Method • Results • Discussions and Conclusions
<p>Background: Sarcopenia is a condition characterized by age-dependent progressive loss of muscle mass, strength, and function. Surface electromyography (sEMG) is a non-invasive tool that can provide insights into the degree of muscle activation, including muscle fatigue and overall function.</p> <p>Objectives: This study aimed to distinguish between healthy individuals and those at sarcopenia risk using sEMG features during wide-squat exercises, and to classify these groups through machine learning technique.</p> <p>Methods: This study included 49 healthy individuals (age, 39.2±10.7 years; 53.1% men) and 44 individuals at risk of sarcopenia (age, 38.2±12.3 years; 40.9% men) based on a body mass index threshold of 21 kg/m² and low physical activity status. sEMG sensors were attached to the rectus femoris, biceps femoris, tibialis anterior, and gastrocnemius muscles. Relative features were selected using the minimum-redundancy-maximum-relevance (mRMR) method, and these features were compared using an independent t-test. For the machine learning analysis, K-nearest neighbor (KNN), naïve Bayes (NB), random forest (RF), extreme gradient boosting (XGB), and multi-layer perceptron (MLP) were included.</p> <p>Results: The peak frequency on the rectus femoris and the median frequency, Willison amplitude, and zero-crossing on the gastrocnemius showed significant differences between the healthy group and the sarcopenia risk group ($p < 0.05$). Of the five machine learning models used, the MLP model exhibited the highest accuracy (90%) in classifying the healthy and sarcopenia risk groups during the wide-squat exercise. This was followed by the XGB model (81%), RF model (75%), KNN model (70%), and NB model (59%).</p> <p>Discussion and Conclusion: The selected features showed significant differences between the healthy group and the sarcopenia risk group. Machine learning models effectively classified the groups with high accuracy, emphasizing the potential of sEMG signals in detecting early signs of sarcopenia risk.</p>	