GNYACSM Abstract

Identifying Anger through Gait and Balance Analysis using Machine Learning Models

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ABSTRACT

Anger may have detrimental effects on an individual's flexibility, muscle tension, and cognitive function. Gait and balance data have emerged as promising indicators for accurately identifying anger. However, the use of machine learning (ML) models in developing algorithms to predict anger levels using such data remains limited. **PURPOSE**: To contribute to the development of algorithms that can be used to identify individuals who are angry based on their gait and balance data. **METHODS**: The Profile of Mood Survey-Short Form (POMS-SF) was administered to 133 individuals (male = 50) to assess mood state, followed by the modified Clinical Test of Sensory Interaction on Balance (mCTSIB), and a 2-minute walk around a 6m track with participants wearing APDM mobility monitors. Spatiotemporal gait and balance parameters were extracted and used in ML models to classify individuals reporting no anger (NA), mild feelings of anger (MA), or moderate to high feelings of anger (HA). A leave-one-out cross-validation technique was employed in model training, and F1 scores were utilized to assess sensitivity due to imbalanced data. **RESULTS**: The Gaussian Naive Bayes model achieved the highest accuracy of 87.15% (F1 = 0.87) in distinguishing individuals reporting NA from those reporting HA when utilizing both gait and balance data. The Random Forest Classifiers exhibited the best performance in differentiating between individuals reporting NA and those reporting MA, with an accuracy of 81.20% (F1 = 0.81) when analyzing data from the eyes open, feet on the ground portion of the mCTSIB. In discriminating individuals with MA from those with HA, the Gradient Boosting classifier showed the highest accuracy of 90.24% (F1 = 0.90). **CONCLUSION**: Being able to accurately identify anger in individuals can inform exercise professionals in tailoring interventions to improve physical performance and reduce injury risk. The present study provides evidence that the use of gait and balance analysis may serve as a viable method for identifying individuals exhibiting anger-related affective states. Despite promising results, further investigations are necessary to refine/optimize the ML algorithms employed in this study; thus, providing a more comprehensive/reliable framework for identifying emotional states via biomechanical measures.