

## Association between Self-Reported Prior Nights' Sleep and Single-Task Gait in Healthy Young Adults: An Exploratory Study Using Machine Learning

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Category: *Doctoral*

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### ABSTRACT

Failure to obtain 7-9 hours of sleep has been associated with decreased gait speed in young adults. While Machine Learning (ML) has been used to identify sleep quality in young adults, there are no current studies that have used ML to identify prior night's sleep in a sample of young adults. **PURPOSE:** To use ML to identify prior night's sleep in healthy young adults using single-task walking gait. **METHODS:** Participants (n=126, age 24.3±4.0yrs; 65% female) completed a survey on their prior night's sleep and performed a 2-minute walk around a 6m track. Gait data were collected using inertial sensors. Participants were split into 2 groups (<7hs or >9hs: poor sleepers; 7-9hs: good sleepers) and gait characteristics were used to classify participants into each group using ML models via a 10-fold cross validation. A post-hoc ANCOVA was used to assess gait differences. **RESULTS:** Using Random Forest Classifiers (RFC), top 9 features were extracted. Classification results suggest a 0.79 correlation between gait parameters and prior night's sleep. The RFC models had a 65.03% mean classification accuracy rate. Top 0.3% of the models had 100% classification accuracy rate. The top 9 features were primarily characteristics that measured variance between lower limb movements. Post-hoc analyses suggest significantly greater variances between lower limb characteristics. **CONCLUSION:** Good sleepers had more asymmetrical gait patterns (faster gait speed, less trunk motion). Poor sleepers had trouble maintaining gait speed (increased variance in cadence, larger stride lengths, and less time spent in single leg support time). Although the mechanisms of these gait changes are unknown, these findings provide evidence that gait is different for individuals who not receive 7-9 hours of sleep the night before. As evidenced by the high correlation co-efficient of our classification models, gait may be a good way of identifying prior night's sleep.