TACSM Abstract

Machine Learning Analysis of Chronotype and Mental Toughness in Predicting Sleepiness Among Collegiate Dancers: Preliminary Findings

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ABSTRACT

Understanding the interplay between chronotype (a trait-like characteristic denoting an individual's inherent preference for sleep and activity periods), *mental toughness* (MT; a state-like construct that equips individuals with the skills to endure adversity while pursuing goals), and sleepiness (a fluctuating state of propensity towards dozing off) is critical in domains where optimal performance is crucial, such as in athletics. The utilization of *machine learning* (ML) techniques to explore the impact of MT and chronotype on sleepiness categorization is notably scarce in collegiate dancing; thus, this approach could provide novel insights into managing dancers' health and performance. **PURPOSE**: To evaluate the predictive influence of chronotype and MT on levels of sleepiness with a focus on identifying collegiate dancers at a higher risk of excessive sleepiness and the potential need for medical attention. **METHODS**: The sample consisted of 34 female collegiate dancers (M_{age} = 19.53, *SD* = 1.13). An MT-focused team intervention was implemented, during which athletes were repeatedly reminded and motivated to prioritize sleep. Data collection occurred over four sessions. The initial session included a single chronotype measurement using the Morningness-Eveningness Questionnaire (19 items; categorizing morning vs. evening types) and pre- and post-intervention MT assessments using the Mental Toughness Index (8 items; range 1-7). Subsequent sessions (2-4) involved biweekly sleepiness assessments using the Epworth Sleepiness Scale (8 items; range 0-3; scores ≥ 16 indicating potential medical concern) and additional MT assessments pre- and post each session. A Random Forest Classifier was employed to categorize sleepiness levels based on chronotype and MT, with model performance evaluated via precision, recall, F1-score, and accuracy metrics. **RESULTS**: The classifier achieved a precision of 0.88 and a recall of 1.00 for detecting sleepiness scores '16 or above', indicating a strong ability to identify individuals potentially needing medical attention (F1-score = 0.94). Conversely, it exhibited challenges in accurately classifying individuals with scores 'less than 16', as reflected by a precision and recall of 0.00, with an overall model accuracy of 88%. These findings underscore a notable class imbalance with a lower representation of the 'less than 16' category within the dataset. **CONCLUSION**: These preliminary findings suggest that ML can effectively discern collegiate dancers at a higher risk of excessive sleepiness and a potential need for medical attention, as indicated by elevated sleepiness scores. The model's robust identification of athletes scoring '16 or above' on the Epworth Sleepiness Scale highlights its potential utility in preemptive health interventions. However, the disparity in classifying lower-risk individuals calls for an expansion of the dataset to enhance model accuracy and reliability. Further research incorporating a balanced representation of sleepiness scores is imperative to refine predictive capabilities. The insights from this study may inform tailored strategies to bolster MT and manage sleepiness, thereby optimizing athlete health and performance.