Qeios

Peer Review

Review of: "Exploring the Multidimensional Influences on Sleep and Active Heart Rate Dynamics: A Comprehensive Study"

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This manuscript presents a **longitudinal, multidimensional analysis** of sleep and active heart rate patterns using wearable device data from college students. The study integrates **social, psychological, environmental, behavioral, and physiological determinants**, analyzed through latent growth-curve modeling.

The topic is highly relevant, especially with the increasing clinical and research reliance on wearable cardiovascular monitoring. The manuscript demonstrates strong data depth and statistical rigor. However, several issues related to causal interpretation, external validity, and physiological interpretation should be addressed.

🔴 1. Causal Interpretation Risk

The study frequently discusses determinants as influences or drivers of heart rate changes, yet:

The design is observational.

Potential bidirectional relationships exist.

Example:

Higher heart rate may influence activity levels rather than being caused by them.

A clearer distinction between **association and causation** is needed.

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🔴 2. Limited Physiological Interpretation

While statistical associations are well presented, physiological explanations are sometimes superficial.

Examples needing expansion:

Mechanisms linking social interaction to heart rate

Biological explanation for observed gender differences

Interpretation of the increasing baseline heart rate over time

The increasing heart rate trend especially requires deeper clinical interpretation.

🔴 3. Population Generalizability

Participants represent:

A single university cohort

Predominantly young, healthy adults

Therefore, extrapolation to:

Older populations

Clinical cardiovascular patients

Diverse socioeconomic groups

is limited.

🔴 4. Wearable Device Accuracy Limitations

Although Fitbit validation is cited, the manuscript should discuss:

Measurement variability during sleep stages

Motion artifacts during active periods

Potential systematic bias compared to ECG-derived heart rate

🔴 5. Confounding Variables Not Included

Important cardiovascular determinants are absent, including:

Medication use

Substance use (caffeine, nicotine, alcohol)

Stress biomarkers

Chronic medical conditions

Genetic predisposition

Declarations

Potential competing interests: No potential competing interests to declare.