

# Decoding Digital Dynamics: An Intensive Longitudinal Study of Smartphone Use, Physiology, and Mental Health in College Students

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## Background

- Reports of mental health is considerable for U.S. college students (Paiva et al., 2025).
- Passive smartphone data can detect meaningful behavioral pattern related to stress, anxiety, and depression in non-clinical adults (Beames et al., 2024; Choi et al., 2024; Rahmati et al., 2024).
- Mental health has been found linked with sleep, physical activity, social interaction (Han et al., 2024).
- Sleep is particularly important, with negative association with smartphone use (Hjetland et al., 2025).
- Prior multimodel work often focused on clinical or high-risk groups, and usually conducted in a small sample (Melcher et al., 2020; Shen et al., 2025).

## Study Objective

This study investigates the relationships among smartphone use, physiological functioning, and mental health symptoms in U.S. college students during a 28-day intensive longitudinal protocol.

## Significance

Findings may help identify generalizable behavioral and physiological markers of mental health risk, improve understanding symptom dynamics, and support development of just-in-time monitoring and intervention strategies for students.

## Research Aims

- **Aim 1.** Identify smartphone and physiological markers associated with mental health symptoms.
- **Aim 2.** Examine within-person day-level and prospective associations among smartphone use, physiological functioning, and mental health symptoms.
- **Aim 3.** Examine coordinated change across these domains over 28 days.

**H1a.** Greater smartphone use (i.e., higher total screen time, more evening use, & heavier app engagement) will be associated with greater depressive symptoms negatively.

**H1b.** Better physiological functioning (i.e., lower HRV, better sleep quality, & higher activity level) will be associated with fewer symptoms.

**H2.** Within individuals, above-usual smartphone use and poorer-than-usual physiological functioning will predict worse next-day mental health symptoms.

**H3.** Students showing increasing maladaptive smartphone use across 28 days will also show worsening physiological functioning and worsening mental health symptoms.

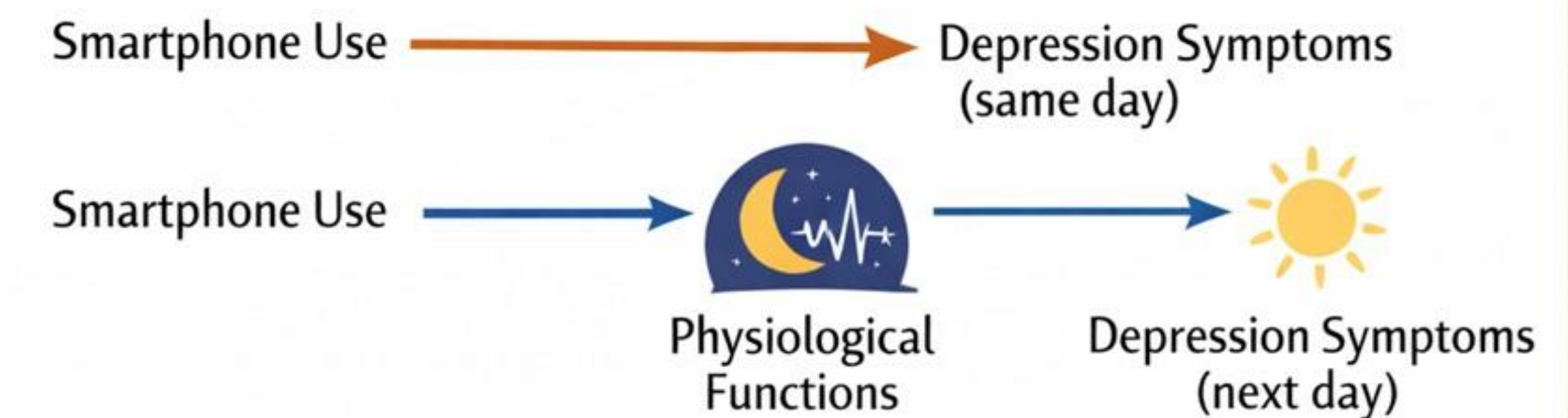
## Participants & Procedures

- 100 TCU undergraduates, 28-day observation.
- Baseline and post-study mental health surveys.
- 5 single-item self-report per day.
- Passive smartphone and physiological sensing via AWARE & Garmin Vivoactive smartwatch.

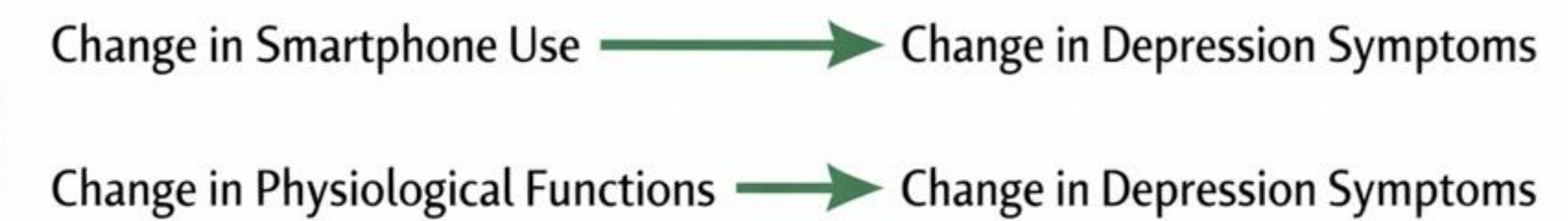
### BETWEEN-PERSON



### WITHIN-PERSON



### COORDINATED CHANGE



## References

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