Sleep Factors and Behavioral Adaptation: Differential Effects on Adaptive & Maladaptive Behaviors During COVID-19

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INTRODUCTION

Extensive research has established the influence of sleep on behavioral regulation and how it facilitates adaptive behaviors that promote well-being, as well as prevent maladaptive behaviors that undermine health and functioning. While the relationship between poor sleep and maladaptive behaviors is well-documented, the connection between sleep and adaptive behavioral responses remains under-explored despite their critical importance for maintaining psychological resilience and healthy lifestyle patterns.

Concurrently, sleep research has predominantly treated sleep as a unitary construct, despite emerging evidence that sleep quality comprises distinct dimensions - sleep onset and perception difficulties, sleep maintenance problems, and sleep duration - each potentially contributing unique variance to different self-regulatory outcomes.

The intersection of these research areas reveals important gaps. Most studies examine global sleep effects on maladaptive behaviors, limiting our understanding of how specific sleep dimensions might differentially impact the full spectrum of behavioral responses

OBJECTIVE

This cross-sectional study utilizes the SPADCACs survey dataset (n=619) to investigate how different aspects of sleep quality and duration uniquely relate to self-regulatory capacities during COVID-19, examining both inhibitory control over emotions and maladaptive behaviors (overeating, binge drinking, social media overuse), as well as initiatory control for positive self-regulatory behaviors
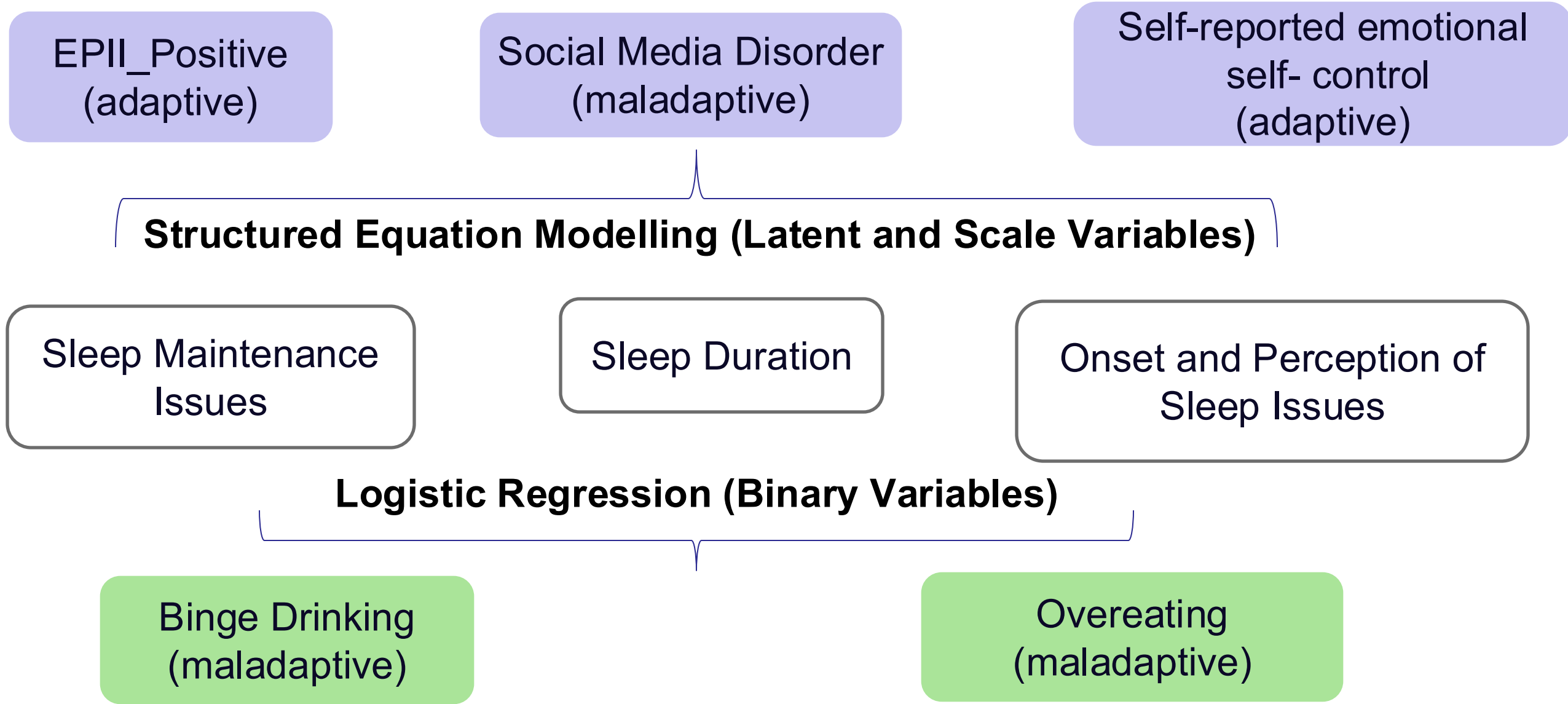
ANALYSIS

2 Independent Variables derived from factor analysis of Insomnia Severity Index Items (see figure 1a.)
1. Sleep onset difficulty/perception of sleep
2. Sleep maintenance problems

3rd Independent variable independently collected:
3. Sleep duration
   - ISI does not assess sleep duration
   - Demonstrated low correlations with ISI dimensions

5 Dependent Variables:
Adaptive behaviors:
1. EPII_Positive: 10 positive behavioral changes from Epidemic-Pandemic Impacts Inventory
2. Self-reported emotional self-control
Maladaptive behaviors:
1. Binge drinking
2. Overeating
3. Social Media Disorder

Figure 1a. Varimax Rotated Factor Analysis of Insomnia Severity Index (ISI) Items

Highlighted cells indicate which items loaded onto the two factors

ISI Items	onset & perception	maintenance
Difficulty falling asleep	0.728	0.297
Difficulty staying asleep	0.337	0.754
Problems waking up too early	0.104	0.882
Satisfaction w/ sleep	0.782	0.23
Sleep issues noticeability to others	0.833	0.086
Worry w/ current sleep	0.835	0.244
Sleep issues interference w/ daytime functioning	0.839	0.193

Figure 1b. Independent Variables (white), Dependent Variables used in SEM (purple) and Logistic Regression (green)

EPII_Positive (adaptive) | Social Media Disorder (maladaptive) | Self-reported emotional self-control (adaptive)

Structured Equation Modelling (Latent and Scale Variables)

Sleep Maintenance Issues | Sleep Duration | Onset and Perception of Sleep Issues

Logistic Regression (Binary Variables)

Binge Drinking (maladaptive) | Overeating (maladaptive)

RESULTS

Figure 2a. Structured Equation Model Fit Indices. parsimony-adjusted measures used PRATIO 0.089 (only available for NFI & CFI)
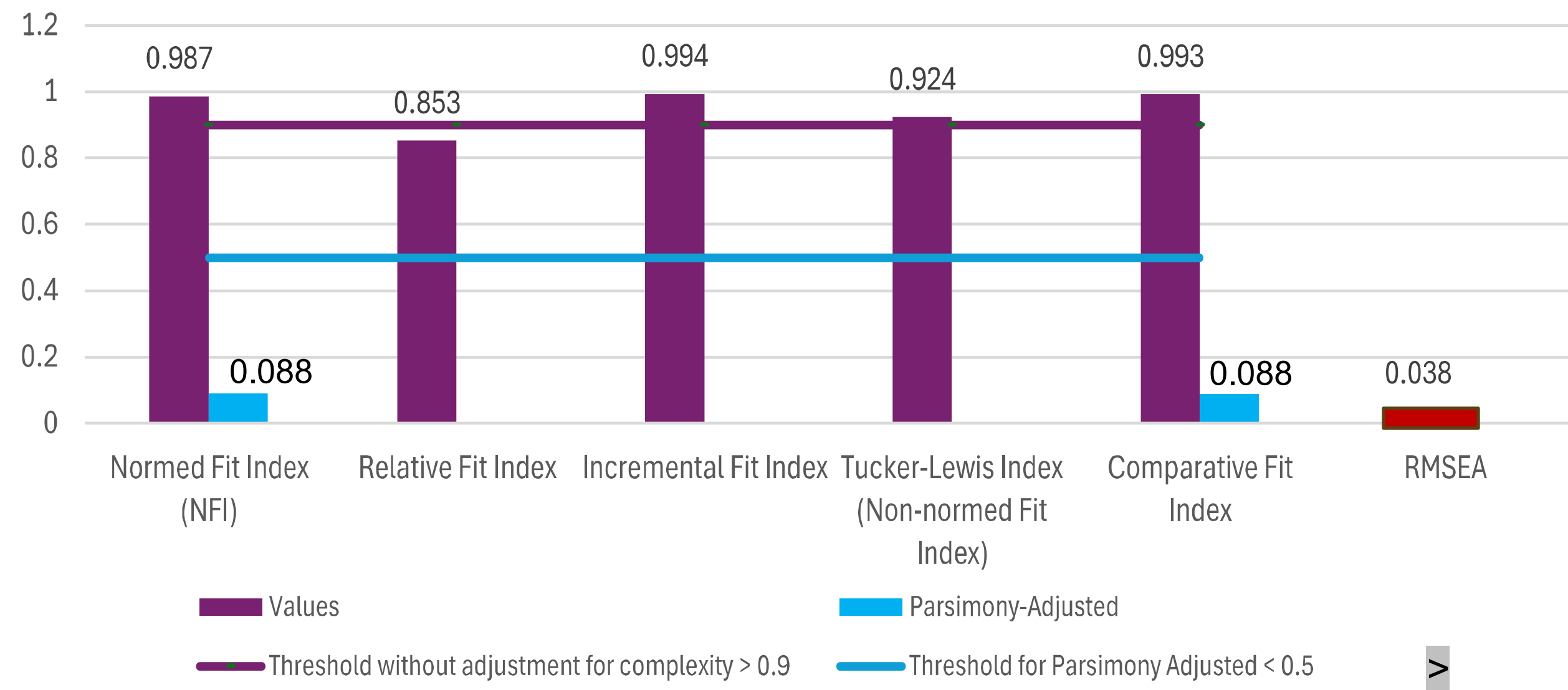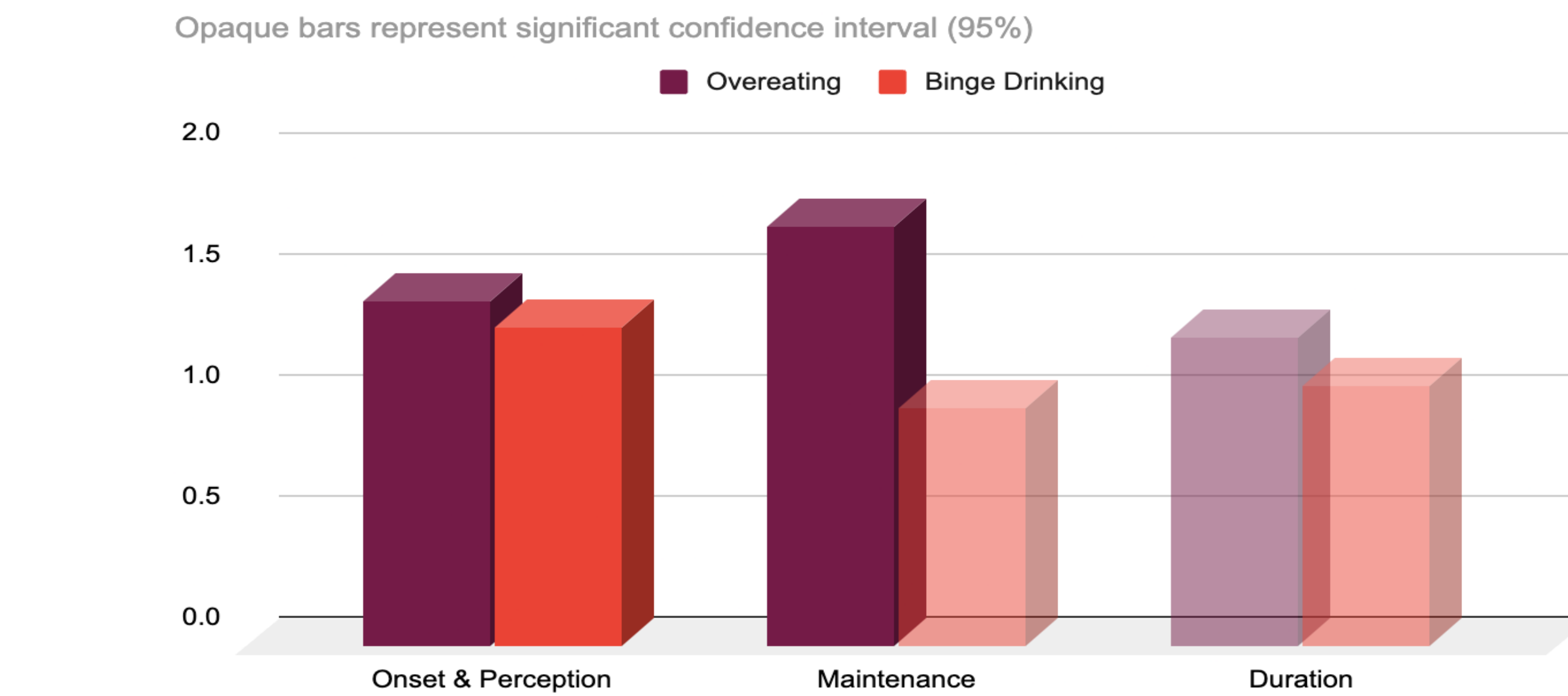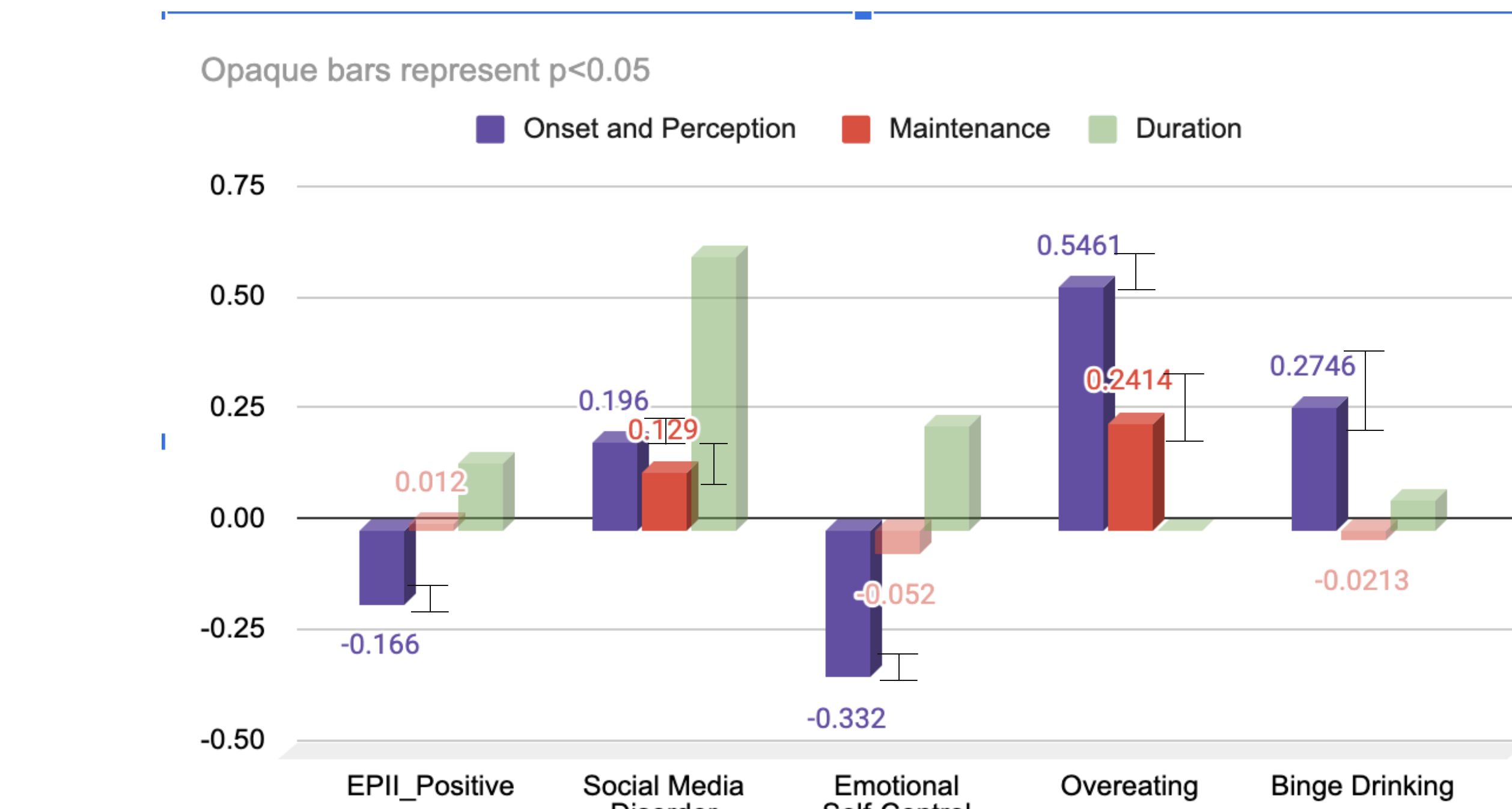

Normed Fit Index (NFI): 0.987, 0.088
Relative Fit Index: 0.853
Incremental Fit Index: 0.994
Tucker-Lewis Index (Non-normed Fit Index): 0.924
Comparative Fit Index: 0.993, 0.088
RMSEA: 0.038

Legend: Values | Parsimony-Adjusted | Threshold without adjustment for complexity > 0.9 | Threshold for Parsimony Adjusted < 0.5

Figure 2b. Logistic Regression Odd Ratios.

Opaque bars represent significant confidence interval (95%)

Legend: Overeating | Binge Drinking
Categories: Onset & Perception | Maintenance | Duration

note: logistic regression for overeating and binge drinking both passed the Omnibus (model significance) and Hosmer-Lemeshow (goodness of fit) tests

Figure 2c. Standardized Regression Coefficients for All Models.

Opaque bars represent p<0.05

Legend: Onset and Perception | Maintenance | Duration

EPII_Positive: -0.166, 0.012
Social Media Disorder: 0.196, 0.1129
Emotional Self-Control: -0.332, -0.052
Overeating: 0.5461, 0.2414
Binge Drinking: 0.2746, -0.0213

note: While standardized coefficients illustrate relative predictor importance within each model, direct magnitude comparisons between SEM (continuous outcomes) and logistic regression (binary outcomes) are not appropriate due to differing underlying scales.

DISCUSSION

Model Fit: Model fit indices for SEM model (Figure 2a) indicated an excellent fit – surpassed parsimony-adjusted thresholds. Suggests the model accurately captured key underlying relationships. Logistic regression model fits were validated by Omnibus and Hosmer-Lemeshow tests

Onset & Perception of Sleep Issues: Strongest predictor of maladaptive behaviors, especially overeating (β = +0.5461) and binge drinking (β = +0.2746); also predicted increased social media disorder scores (β = +0.196) and decreased EPII Positive behaviors (β = -0.166).
- Potential bidirectional relationship: prior research suggests social media usage, overeating and binge drinking (particularly before bedtime) can all negatively impact sleep quality
- Primary driver of behavioral dysregulation (adaptive and maladaptive); supports literature highlighting sleep quality (vs. duration) as key to behavioral regulation.

Sleep Maintenance: Uniquely associated with overeating (β = +0.2414); moderate contribution compared to onset/perception.
- Potential bidirectional relationship: prior research suggests that late-night overeating may disrupt sleep via digestive processes.

Sleep Duration: Only significant for predicting higher social media disorder (β = +0.613
- Unexpected positive association may reflect factors such as irregular sleep schedules or compensatory sleep following late-night social media use. Long (>8 hr) sleep durations have also been associated with reduced executive control in existing literature.
- Measure that's particularly prone to self-reporting inaccuracies due to recall bias and a tendency to confuse "time in bed" with "actual sleep time".

CONCLUSIONS

- **Causality limitations:** Cross-sectional design prevents definitive conclusions; bidirectional effects between behavior and sleep are plausible.
- **Literature gap:** Relationship between maladaptive behaviors and sleep is established, but sleep's effect on adaptive behaviors is under-explored.
- **Differential impact of distinct sleep dimensions:** Negative association between Onset & Perceptions and adaptive behaviors underscores this understudied connection.
- **Future directions:** Longitudinal and experimental studies needed to clarify bidirectional links between behavioral regulation and sleep quality/duration.

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