2024-05-08

# Sleep, Eat, Repeat: An Examination of the Influence of Sleep and Biological Sex on Eating-Related Inhibitory Control in Overweight Emerging Adults

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A thesis submitted to the faculty of
Brigham Young University
in partial fulfillment of the requirements for the degree of

Master of Science

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## ABSTRACT

### Sleep, Eat, Repeat: An Examination of the Influence of Sleep and Biological Sex on Eating-Related Inhibitory Control in Overweight Emerging Adults



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**Background**: Lower inhibitory control has been shown to associate with greater risk for obesity in adolescence. On average, females have moderately higher rates of behavioral inhibitory control than males. These difference in inhibitory control across sex may influence overeating and development of obesity. This study examined whether sleep duration and sleep quality are associated with food-related inhibitory control and whether this association is moderated by biological sex.

**Methods**: A total of 59 emerging adults ages 18 to 25 (37 males, 22 females) who had a BMI within the overweight or obese categories (BMI ≥25) completed self-report measures of eating and sleep behavior. Participants completed a Go/NoGo behavioral task to evaluate their inhibitory control when presented with images of high- and low-calorie foods.

**Results**: In general, our hypotheses regarding sex differences were not supported by this study. We did not find a significant association between sleep duration and food-related inhibitory control, nor did we find a significant association between sleep quality and inhibitory control. We did find that poorer sleep quality was associated with greater loss of control eating ($p = 0.001$).

**Conclusion**: Our findings suggest that sleep quality has notable impacts on food-related inhibitory control. The findings from our study could be utilized in future research towards understanding the complex relationship between sleep duration and quality, inhibitory control, and eating behaviors.



Keywords: eating, obesity, sleep, sex differences, and inhibitory control

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# Sleep, Eat, Repeat: An Examination of the Influence of Sleep and Biological Sex Eating-Related Inhibitory Control in Overweight Emerging Adults

Inhibitory control is a function of cognitive restraint that allows one to suppress actions that are not desired or appropriate in a given environment. The function of inhibitory control has often been compared to a muscle, which can be strengthened to some extent through regular use and can become weakened when not utilized routinely (Levitan et al., 2014). In the context of eating behaviors, this construct is known as loss of control eating. It has been shown in prior research that individuals with stronger inhibitory control were less likely to overeat, less likely to experience eating binges, and more likely to have health body mass (Liu et al., 2023; Preuss et al., 2017). Furthermore, stronger inhibitory control has been shown to correlate with increased levels of body image satisfaction and self-esteem (Nederkoorn et al., 2010; Rahimi-Ardabili et al., 2017). Lower inhibitory control has been associated with higher levels of anxiety, depression, and obesity (Brosschot et al., 2016). This association may be due to inhibitory control being the ability suppress or restrain a thought, action, or feeling, therefore meaning that individuals with lower inhibitory control have higher levels of difficulty with practicing self-control and restraint across the various settings of their life. In prior research on inhibitory control's relationship to obesity, results have indicated that lower inhibitory control is seen more often in individuals who engage in overeating, binges, snacking throughout the day (Adams et al., 2021). Obesity in adolescence is associated with a decreased ability to resist eating impulses during inhibitory control processing (Chen et al., 2018). More specifically, obesity in adolescents and emerging adults can lead to the development of poor inhibitory control and self-restraint, which can influence other aspects of life throughout the lifespan such as decision making, engaging in risky behaviors, and maintaining healthy relationships (Datar & Chung, 2018; Xu, 2021). A common

example of how the ability to inhibit eating impulses are measured are food related go/no-go tasks. In food related go/no-go tasks, individuals are typically presented with two categories of pictures; healthy versus unhealthy foods (Price et al., 2015). Individuals are asked to press buttons for one category and withhold response for the other category (Price et al., 2015). The individual differences in decision making during situations where higher amounts of inhibitory control effort were required might provide an explanation for overeating behaviors in overweight and obese adolescents and emerging adults (Atalayer, 2018; Moore et al., 2023). Individual's inhibitory control has been observed to progressively increase from childhood until young adulthood, followed by stabilization of inhibitory control in which that ability becomes for stable throughout the lifetime (Carriedo et al., 2016). Gaining a better understanding of inhibitory control can provide insight into how loss of control eating and eating patterns begin to solidify in emerging adulthood as this is a period of life when individuals gain more independence and autonomy.

**Sleep**

Sleep is an important predictor of inhibitory control. Sleep is notably important in emerging adulthood because it influences the development of health risk and reward related behaviors, which are behaviors that assess the risk of situations or actions to the prospective reward that may come from it (Telzer et al, 2013). Individuals are typically poor judges of their subjective need to sleep, often assuming that they need lesser amounts of sleep to function properly than they truly need (Mantua et al., 2020). In a study conducted on sleep deprived individuals, prior to their sleep deprivation, participants were asked to complete a survey about their perceived subjective sleep needs. This study found that those who predicted having a lesser need for sleep actually performed poorer on the psychomotor vigilance tasks and cognitive tasks

(Mantua et al., 2020). A similar study regarding perceived sleep needs was conducted with adolescents. Adolescents ranked their perceived subjective sleep need as lower during week days when they had to awaken early for school but ranked their sleep need considerably higher during weekends when they had the opportunity to recuperate their sleep debt (Shen et al., 2021). During the week when adolescents were not obtaining adequate sleep, their reported mood and school performance was lower than their reports of functioning over the weekend when they obtained adequate sleep (Shen et al., 2021). These studies illuminate an important consideration; people's perception of their need for sleep and their actual need for sleep often do not align, which can lead to suboptimal sleep behavior.

Sleep can also affect inhibitory control as well as weight status and metabolism (Guimarães et al., 2021). The Center for Disease Control and Prevention (CDC) recommends that adolescents aged 13 to 18 years old obtain between eight to ten hours of sleep per night, and that emerging adults aged 18 to 25 years old should receive seven to nine hours per night (CDC, 2022). It is estimated that around 70% of emerging adults do not receive adequate sleep in both duration and quality (Rishi & Gurubhagavatula, 2019). It appears that overall, most adolescents and emerging adults are not receiving adequate amounts of sleep, which can then influence their development in decision making, inhibitory control, and weight status.

Poor sleep quality can have both short- and long-term impacts on individuals. In otherwise healthy individuals, some short-term negative impacts of poor sleep quality include increased stress response, subjective reports of reduced quality of life, emotional distress, and inhibited decision making (Manasse et al., 2022; Medic et al., 2017). An individual with an increased stress response is more likely to act impulsively and struggle to inhibit responses (Voight et al., 2022). When individuals are subjected to stressful situations either physically or

emotionally, it has been shown that they display lower levels of inhibitory control than a baseline of normal functioning (Voight et al., 2022). When adding in an additional layer of sleep deprivation, it creates almost an additive effect in which individuals who are have poor sleep quality are more sensitive to stress situations, which then has the potential to lower their levels of inhibitory control even further.

Sleep is also vital for the brain to function properly. During REM sleep, the brain is able to repair neural connections and maintain cognitive efficiency (Magnuson et al., 2022). When individuals do not receive adequate sleep, slower neural processing and lower inhibitory control may result (Magnuson et al., 2022). Even a single night of sleep deprivation has been found to impair cognitive functioning and inhibitory control the following day (Pesoli et al., 2021). Considering the current research which posits that poor sleep quantity and quality can cause lowered inhibitory control at a neural level, it is clear that sleep plays a significant role in one's inhibitory control. Recalling a previous statistic, it is estimated that around 70% of emerging adults are not receiving adequate amounts of sleep (Rishi & Gurubhagvatula, 2019). If majority of emerging adults are not receiving adequate sleep duration and quality on a regular basis, their inhibitory control may also be impaired in this population as a result.

**Biological Sex**

An additional facet that may moderate the relationship between inhibitory control and sleep is biological sex. When comparing men and women, women on average tend to have poorer sleep quality and duration compared to men (Hartmann et al., 2020; Mallampalli & Carter, 2014). Hormones are a significant component of the sleep differences between men and women. Women experience more frequent shifts in hormones which can cause sleep disturbances and therefore, decrease the quality and duration of sleep (Bezerra et al., 2022).

Common causes for hormonal shifts in women are menstruation, birth control, pregnancy, and menopause. As discussed above, inadequate sleep duration and quality can negatively impact inhibitory control and therefore can impact eating habits and weight status.

When considering biological sex differences in inhibitory control, some research on discrepancies in inhibitory control between genders finds that females typically display lower levels of inhibitory control, which has been seen when comparing males and females as early as pre-school (Levitan et al., 2014). However, it is important to acknowledge there are some research studies that posit biological sex does not directly impact inhibitory control. Some researchers believe that while there have been documented differences in inhibitory control between male and female participants, they feel that the current data is too limited to be able to generalize to all males and females (Galliard et al., 2020). Our study aims to contribute to the current body of research and provide further insight into whether there are differences in inhibitory control by biological sex.

**Hypotheses**

After considering the existing gaps in the literature, this study was designed to evaluate whether sleep duration and sleep quality impact inhibitory control, whether this association is moderated by biological sex, and how sleep quality and duration can impact loss of control eating habits. First, we hypothesized that, in the full study sample, poorer sleep duration would be associated with lower inhibitory control measured using a go/no-go task as well as poorer sleep quality being associated with lower inhibitory control. Next, we hypothesized that biological sex would moderate the association between sleep duration/quality and inhibitory control such that females would show a greater decline in inhibitory control after experiencing

shorter sleep or poorer quality sleep relative to males. Finally, we hypothesized that individuals with poorer sleep quality/duration would display more loss of control eating symptoms.

## Method

### Participants

Data for this study were extracted from a larger investigation that examined brain processes and eating behavior in emerging adults. A total of 67 participants completed the study while 59 participants had interpretable go/no-go data and were included in analyses for the current study. A malfunction with the button box that participants were instructed to press during the go/no-go task prevented data collection for the 8 participants who were not included in the sample for analysis. Study recruitment was conducted via physical and digital flyers that were posted on BYU campus, community centers, high schools, and community Facebook groups. This study received IRB approval from the authors' institution.

Participants were expected to meet the following inclusion criteria; between the ages of 18 and 25 years old, right-handed, and must classify as overweight or obese using the BMI calculations of height and weight (BMI ≥25). Body mass index classification was accomplished by measuring height with a standard stadiometer and weight using a digital scale then calculating the participants body mass index (BMI) percentile for age and biological sex following United States Centers for Disease Control and Prevention (CDC) guidelines. If potential participants had undergone weight loss surgery, been diagnosed with binge eating disorder, had ever taken medication for weight loss, or had a gluten allergy, they were ineligible to participate.

**Table 1**

***Demographic Characteristics of Participants***

| | |
|---|---|
| **Gender** | |
| Female | 22 |
| Male | 37 |
| **Age** | |
| 18-19 | 9 |
| 20-21 | 18 |
| 22-23 | 21 |
| 24-25 | 7 |
| Did not respond | 4 |
| **BMI** | |
| Overweight | 42 |
| Obese | 17 |
| **Yearly Household Income** | |
| >30,000 | 16 |
| 30,000-74,999 | 13 |
| 75,000+ | 26 |
| Did not respond | 4 |
| **Ethnicity** | |
| White, not Hispanic | 37 |
| Black, not Hispanic | 1 |
| Hispanic | 14 |
| Asian or Asian-American | 4 |
| Other | 2 |

## Measures

### *Eligibility*

An eligibility survey was administered via Qualtrics to determine whether potential participants met criteria to participate in the study. Questions asked about height, weight, eating habits, sleeping habits, and general demographics. If the participants did not violate any of the exclusion criteria, they were deemed eligible.

### *Inhibitory Control*

The behavioral go/no-go task requires participants to respond to certain stimuli and withhold a response for other stimuli (Filipčíková & McDonald, 2023). The go/no-go task aims to measure one's ability to appropriately regulate and withhold responses. Reported aggregate reliabilities range from r = .20 to r= .76 (Williams & Kaufmann, 2012). Another study found that the correlations between commission errors across two instances of go/no-go trials were r = .51–.56, which indicates that there is moderate construct validity (Schulz et al., 2007). The current study employed a food related go/no-go task where participants were asked to press a button when presented with pictures of foods they considered healthy and withhold a response when presented with foods they considered to be unhealthy. Participants were scored on their total number of correct scores, which also denoted when omissions and commissions occurred. Reactions times were also recorded and analyzed for the speed that the participants were able to correctly press the button on go trials. Higher scores of error on the go/no-go task represent lower inhibitory control.

### *Loss of Control Eating*

The Loss of Control Over Eating Scale (LOCES) was used to measure loss of control eating. This 24-item self-report questionnaire is designed to assess the number of times over the past 4 weeks that the respondent lost control while eating, feelings of distress related to eating, and the respondent's attitude towards eating. It is rated on a 5-point Likert scale. The LOCES has a Cronbach's alpha = .96 which demonstrates strong internal consistency (Latner et al., 2014). Higher scores indicate greater level of loss of control eating. The LOCES has been shown to be significantly associated with loss of control eating, eating disturbances, and functional impairment (Latner et al., 2014; Stefano et al., 2016).

### *Sleep Quality*

The Pittsburgh Sleep Quality Index is a self-report questionnaire that was used to assess sleep duration and sleep quality within the past month. It contains 19 response items that group into 7 categories: sleep duration, sleep disturbance, sleep latency, daytime dysfunction due to lack of sleep, sleep efficiency, overall quality of sleep, and use of sleep medication (Zhong et al., 2015). The 7 components equate to a global score which is meant to represent overall sleep quality of the individual. A higher global score indicates poorer sleep quality. The PSQI global score has a McDonald's omega value of 0.705 and Cronbach's alpha (0.702) (Zak et al., 2022). For the scope of our hypotheses, we both evaluated sleep duration on its own as well as the overall sleep quality which was measured by the global score.

## Experimental Design and Procedure

The Institutional Review Board of the first author's academic institution approved all study procedures. At the first study visit, participants completed a survey for eligibility before having their height and weight recorded in order to calculate BMI. The research assistant administered MRI screening safety forms as well as demographics, the PSQI to evaluate sleep duration and a survey of impulsivity. Participants were required to fast for 4 hours to standardize hunger and to refrain from exercise and caffeine for 24 hours preceding the assessment. Participants completed the go/no-go task by pressing a button when viewing images of healthy foods and withholding a response when presented with images of unhealthy foods.

## Design and Analysis

Our data analysis plan utilized regression analyses to explore the relationships between sleep quality, sleep duration, inhibitory control, loss of control eating, and the potential moderating effects of biological sex. Outliers remained in the original data set to maintain

integrity of data as a concern is that removing outliers would not only reduce the variability within the data but could potentially overinflate the significance of results.

For our first aim that examined the relationship between sleep duration and inhibitory control, a regression analysis was utilized. In this analysis, duration was measured as a continuous variable. For our second aim that evaluated the relationship between sleep quality and inhibitory control, a regression analysis was used. Additionally, we evaluated the relationship between both sleep quality and sleep duration on the reaction time of correct Go trials via regression analysis. Our third aim was interested in evaluating if biological sex would act as a moderator on the relationship between sleep quality and duration on inhibitory control, which was conducted through regression analysis. For our final aim, we investigated the relationship between sleep quality and loss of control eating patterns which was done via a regression analysis. This analysis aimed to understand if sleep duration predicted the variance in loss of control eating patterns.

## Results

### Sleep Duration and Inhibitory Control

We first examined the association between sleep duration, as measured by the Pittsburgh Sleep Quality Index (PSQI), and inhibitory control as measured by mean accuracy on the go/no-go task. Our hypothesis posited that shorter sleep duration would be associated with lower inhibitory control. To test this hypothesis, regression analyses were conducted examining the number of accurate responses for both the No-Go and the Go trials. The regression analysis displayed no significant association between sleep duration and accuracy on the No-Go trials ($F(4, 54) = 0.72$, $p = 0.659$, $df = 58$). Eta-squared values, similar to Cohen's d, indicated small effect sizes for sleep duration on inhibitory control ($\eta^2 = 0.011$).

When examining mean accuracy on Go trials, the regression analysis displayed no significant association between sleep duration and accuracy on Go trials ($F(4, 54) = 1.82$, $p = 0.708$, $df = 58$). Eta-squared values suggested small effect sizes for sleep duration on inhibitory control ($\eta^2 = 0.043$).

Although reaction time is a less informative measure of inhibitory control than accuracy, we also analyzed whether sleep duration impacted inhibitory control as measured by reaction time on correct Go trials. Findings indicated no significant association between sleep duration and reaction time ($F(3, 55) = 1.31$, $p = 0.224$, $df = 58$) and effect size was minimal ($\eta^2 = 0.015$).

**Sleep Quality and Inhibitory Control**

We also examined the association between sleep quality, as measured by the Pittsburgh Sleep Quality Index (PSQI) global score, and inhibitory control as measured by mean accuracy on the go/no-go task. Our hypothesis was that poorer sleep quality would be associated with lower inhibitory control. The regression analysis did not support a significant association between sleep quality and accuracy on No-Go trials ($F(4, 54) = 0.54$, $p = 0.268$, $df = 58$, $\eta^2 = 0.003$). Similarly, we found no significant association between sleep quality and accuracy on Go trials ($F(4, 54) = 1.56$, $p = 0.512$, $df = 58$, $\eta^2 = 0.005$).

We also evaluated whether sleep quality was associated reaction time on correct Go trials. Results suggest that there was a significant association between sleep quality and reaction time for correct Go trials, indicating that individuals with poorer quality of sleep displayed longer reaction times ($F(3, 55) = 2.25$, $p = 0.046$, $df = 58$, $\eta^2 = 0.035$).

**Table 2**

***Results of Analyses Examining Sleep Quality/Duration and Inhibitory Control***

| Hypothesis | F | DF | *p* | Eta-Squared |
|---|---|---|---|---|
| Sleep Duration on No/Go Accuracy | .72 | 58 | .659 | .011 |
| Sleep Duration on Go Accuracy | 1.82 | 58 | .708 | .043 |
| Sleep Duration on Reaction Time | 1.31 | 58 | .224 | .015 |
| Sleep Quality on No/Go Accuracy | 0.53 | 58 | .268 | .003 |
| Sleep Quality on Go Accuracy | 1.56 | 58 | .512 | .005 |
| Sleep Quality on Reaction Time | 2.25 | 58 | .046 | .035 |

**Effects of Sleep on Inhibitory Control by Biological Sex**

Next, we examined whether biological sex moderated the relationship between sleep **duration** and inhibitory control. Specifically, we hypothesized that females with lower sleep duration would show a greater decline in inhibitory control compared to males. The interaction of sex and sleep duration on accuracy on No-Go trials was not significant ($F(4, 54) = 0.72$, $p = 0.197$, $df = 58$, $\eta^2 = 0.030$). Similarly, the interaction of sex and sleep duration on Go trial accuracy was not significant ($F(4, 54) = 1.82$, $p = 0.337$, $df = 58$, $\eta^2 = .017$).

Furthermore, we hypothesized that females with poorer sleep **quality** would show a greater decline in inhibitory control compared to males with poorer sleep quality. The interaction of sex and sleep quality on accuracy on No-Go trials was not significant ($F(4, 54) = 0.54$, $p = 0.356$, $df = 58$, $\eta^2 = 0.016$).The interaction of sex and sleep duration on Go trial accuracy was also non-significant ($F(4, 54) = 1.56$, $p = 0.15$, $df = 58$, $\eta^2 = .038$).

**Table 3**

***Results of Sex-Specific Analyses***

| Hypothesis | F | DF | *p* | Eta-Squared |
|---|---|---|---|---|
| Sleep Duration by Sex on No/Go Accuracy | 0.72 | 58 | .197 | .030 |
| Sleep Duration by Sex on Go Accuracy | 1.82 | 58 | .337 | .017 |
| Sleep Quality by Sex on No/Go Accuracy | 0.54 | 58 | .356 | .016 |
| Sleep Quality by Sex on Go Accuracy | 1.56 | 58 | .150 | .038 |

**Sleep Quality and Duration on Loss of Control Eating Patterns**

Finally, we conducted a separate regression analysis examining whether sleep duration was associated with loss of control eating as assessed by the Loss of Control Eating Survey (LOCES), with sleep duration as the predictor and loss of control eating as the dependent variable. The association between sleep duration and loss of control eating patterns was non-significant ($F(2, 56) = 1.97$, $p = 0.314$, $df = 58$, $\eta^2 = 0.018$).

For sleep quality, our hypothesis suggested that individuals with greater sleep quality and longer sleep duration would display less loss of control eating. When analyzing the potential association between sleep quality and loss of control eating, the regression analysis was significant, meaning that those with poorer sleep quality displayed more loss of control eating behaviors ($F(2, 56) = 10.19$, $p = 0.001$, $df = 58$). Effect sizes for the effect of sleep quality on inhibitory control were moderate ($\eta^2 = 0.230$).

**Table 4**

***Results of Analyses of Sleep Quality/Duration and Loss of Control Eating***

| Hypothesis | F | DF | *p* | Eta-Squared |
|---|---|---|---|---|
| Sleep Duration and Loss of Control Eating | 1.97 | 58 | .314 | .018 |
| Sleep Quality and Loss of Control Eating | 10.19 | 58 | .001 | .229 |

## Discussion

This study examined potential influences of sleep duration and sleep quality on inhibitory control, with an additional focus on exploring whether biological sex moderates the relationship between these variables. Understanding the impact of sleep duration and quality on inhibitory control could shed light on the development of habitual eating patterns for emerging adults. This age period is especially crucial to understand because it is a time in life when lifestyle habits are forming and becoming more solidified. The inclusion of biological sex as a moderator stems from some conflicting findings in previous research regarding the role of biological sex in relation to differences in inhibitory control. By evaluating these factors, this study sought to contribute useful insights into the complex relationship between sleep, inhibitory control, and the potential moderating effect of biological sex on this relationship.

Our first set of hypotheses posited a relationship between sleep quality as well as sleep duration, measured via the Pittsburgh Sleep Quality Index (PSQI), and inhibitory control assessed through a go/no-go task. Previously studies have highlighted the crucial role of sleep in shaping inhibitory control, which is a function essential for decision-making and risk assessment (Telzer et al., 2013). Contrary to our expectations, we did not find a significant association between sleep duration and inhibitory control in No/Go nor in Go trials. The same non-significant result was found when examining sleep quality and inhibitory control in terms of

accuracy. These findings indicate that sleep quality and duration, as measured by the PSQI, might not have had a significant influence on inhibitory control performance in our sample. Our findings from differ from Telzer's findings that sleep quality directly influences inhibitory control, (2013) but they do align with studies that suggest that subjective perception of sleep quality and overall need for sleep may not directly translate to actual performance on measures of inhibitory control (Mantua et al., 2020). Similarly, previous studies have highlighted potential discrepancies between perceived and actual sleep needs among adolescents and emerging adults (Shen et al., 2021). The concept of sleep needs is a compilation of many factors such as age, genetics, lifestyle, quality of sleep, and environmental factors. Sleep quality and duration are the facets of sleep needs that we focused on in this study. This discrepancy between perceived and actual sleep quality may have influenced the results of study when considering that we only utilized a self-report measure to evaluate sleep quality and duration and did not utilize objective measures. While our results did not support our hypothesis that sleep has a direct relationship on inhibitory control, it does align with the research that explores the importance of perceived versus observed data.

Although there were no significant findings when evaluating potential associations between sleep quality/duration and inhibitory control accuracy, we did find a significant association when evaluating the association between sleep quality and reaction time. Given that reaction time can only be calculated for correct go trials, this finding suggests slower processing speed for individuals who are poorly rested. Previous studies have found that individuals with higher sleep quality having faster reaction time when responding to stimuli and inversely that poorer sleep quality is associated with slower reaction times (Rezasoltani et al., 2019; Saksvik et al., 2021). While this finding is less informative regarding the relationship between sleep quality

and inhibitory control, it provides support for previous research suggesting that adequate sleep promotes optimal processing speed in adolescents.

Our second set of hypotheses proposed that females who reported lower sleep duration on would show a greater decline in inhibitory control when receiving shorter sleep relative to males. We also proposed that females who reported lower sleep quality would show a greater decline in inhibitory control compared to males. The findings from our analysis displayed non-significant results. We found that there was not a notable sex-specific effect on inhibitory control during Go trials or during No/Go trials when comparing females and males. While previous research has highlighted potential sex-specific differences in sleep patterns, with women often reporting having poor sleep quality and shorter sleep duration compared to men (Hartmann et al., 2020; Mallampalli & Carter, 2014), it does not appear that the female participants in our study with shorter sleep duration or poorer sleep quality had significant impacts on their inhibitory control.

The final set of hypotheses we put forth were that individuals with greater sleep quality/duration as would display less loss of control eating. There are numerous studies that have explored the relationship between inhibitory control and eating patterns, many of which emphasize the importance of inhibitory control in regulating food consumption, reducing overeating tendencies, and maintaining a healthy weight (Liu et al., 2023; Pruess et al., 2017). While the currently body of literature specifically examining the association between sleep and loss of control eating, there are several previous studies that show significance in the association. In a previous study that utilized self-reports and sleep actigraphy devices, researchers found that children and adolescents who had shorter sleep duration had a stronger association with loss of control eating habits (Manasse et al., 2022). A similar study that utilized self-reports and

actigraphy devices found that children with shorter sleep duration and later waketimes reported higher levels of loss of control eating habits (Parker et al., 2021).

This relationship between inhibitory control and eating patterns is so widely studied in part due to the nature of inhibitory control. Inhibitory control is often thought of as if it were a muscle that can be strengthened or weakened based on use, which can therefore be used to suppress cravings and loss of control eating (Levitan et al., 2014). Previous studies have highlighted how sleep can impact inhibitory control, which can therefore impact ability to suppress eating-related urges. (Telzer et al., 2013). Lower inhibitory control has been linked to an increase of loss of control eating, such as overeating behaviors, snacking tendencies, and obesity prevalence among adolescents and emerging adults (Chen et al., 2018; Datar & Chung, 2018). Additional studies have found that adolescents who displayed lower levels of inhibitory control on self-report measures had significant higher levels of loss of control eating (Van Malderen et al., 2018; Van Malderen et al., 2020). S

Similar to previous research which has identified links between sleep quality and loss of control eating (Parker et al., 2021; Weng et al., 2022), our findings did reveal a significant relationship between reported sleep quality and loss of control eating. However, we did not find a significant relationship between sleep duration and loss of control eating. These findings suggest that overall sleep quality is a stronger predictor of food-related inhibitory control among individuals with obesity relative to sleep duration. The complexity and multifaceted nature of sleep may contribute to the variations of impact on inhibitory control and eating patterns between sleep duration and sleep quality. It is important to note that the sleep quality score on the PSQI was a global score, meaning that it was the sum of the seven component scores on the measure. Thus, our operationalization of sleep quality provides a more comprehensive assessment of

overall sleep. It is possible that sleep duration is less predictive of food-related inhibitory control because it does not account for other important components of sleep health such as sleep efficiency, sleep regularity, etc.

**Limitations**

Our findings should be considered in the context of several limitations. First, the sample size was modest, consisting of 59 participants. Our limited sample size may restrict the generalizability of the findings and potentially impede the detection of more nuanced effects. Second, our study recruited individuals aged 18-25, and excluded those who did not fall within that range. This limits the generalizability of our findings to those who fall outside of the age range. Additionally, our participant sample had limited diversity, predominantly comprising White, non-Hispanic participants. About 62% of the participants in the sample identified as White, non-Hispanic, which limits the generalizability of our findings to more diverse populations. Lastly, this study measured loss of control eating habits and sleep duration through participant self-report. This has the potential of biasing the dataset due to subjective interpretations, reliance of participant memory, and the potential for participants to respond in a manner that they viewed as more favorable or socially acceptable.

**Implications for Future Research**

The findings from our study could be utilized in future research exploring the complex relationship between sleep duration, inhibitory control, and eating behaviors. Our study highlights the need for more refinement when creating or selecting measurement tools. We encourage future studies to consider more objective measures for assessing sleep quality and duration, potentially including an objective sleep monitoring method such as sleep trackers that collect data on heart rate, respiration, snoring, time awake, time sleeping, sleep interruptions, and

body temperature. When considering the complex and multifaceted nature of eating patterns, future research could incorporate multimethod approaches that also measure physiological, environmental, and psychological factors that may impact eating patterns.

An additional area that future research is encouraged to expand upon is the participant demographics. Expanding the scope of the study to recruit individuals with more diversity of both age and racial/ethnic diversity could greatly increase the generalizability of future findings. While many of our hypotheses were not supported, it is also possible that we were only measuring a small, racially homogenous sample that did not encapsulate what is seen in the general population. Collaboration with researchers and across research centers could improve sample size and demographics, which would improve the generalizability of findings.

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