Spring 2022

The Importance of Sleep for Flexibly Coping with Daily Stress

Calissa Leslie-Miller
William & Mary - Arts & Sciences

The Importance of Sleep for Flexibly Coping with Daily Stress

Calissa J. Leslie-Miller

Washington, District of Colombia

Bachelor of Arts, Wake Forest University, 2020

A Thesis presented to the Graduate Faculty of The College of William & Mary in Candidacy for the Degree of
Master of Science

Department of Psychological Sciences

College of William & Mary

May 2022

APPROVAL PAGE

This Thesis is submitted in partial fulfillment of
the requirements for the degree of

Master of Science

Calissa J. Leslie-Miller

Approved by the Committee April 2022

Committee Chair
Meghan Quinn, Assistant Professor, Psychological Sciences
College of William & Mary

Adrian Bravo, Assistant Professor, Psychological Sciences
College of William & Mary

Madelyn Labella, Assistant Professor, Psychological Sciences
College of William & Mary

COMPLIANCE PAGE

Research approved by

William & Mary Protection of Human Subjects Committee

William & Mary Protection of Human Subjects Committee

Protocol number(s): PHSC-2021-01-26-14691-mequinn

PHSC-2021-07-23-15104-mequinn

Date(s) of approval: 2/4/2021

8/17/2021

ABSTRACT

Coping flexibility, the ability to match coping strategy choice to the demands of a situation, has been found to diminish the effects of daily stress. Despite the importance of high levels of coping flexibility, little research has explored factors that can predict one's ability to demonstrate coping flexibility. One promising avenue for such research is the role of sleep. This research aims to explore the importance of sleep as a predictor of daily coping flexibility across two studies.

Study one consists of one hundred and fifty college student participants who were recruited in the Spring 2021 semester at the College of William & Mary and asked to complete 14 days of diaries. For each entry, participants were asked about the most stressful event they experienced that day and were asked to complete a sleep quality indicator and the Coping Flexibility Questionnaire. Study two consists of eighty-seven participants who were recruited in the Fall 2021 semester at the College of William & Mary. Participants were asked to wear a Phillips Respironics Actiwatch band that uses an accelerometer to measure sleep for one week. Participants were asked to wear their band continuously and complete self-report daily diaries assessing their sleep and coping flexibility.

In study one, we did not find a significant relationship between self-report sleep quality and coping flexibility. In study two, we again did not find a significant relationship between self-report sleep quality and coping flexibility. Additionally, in study two, we did not find significant relationships between actigraphy measures (i.e., onset latency or awake periods) and coping flexibility. In exploratory analyses examining whether sleep quality predicted delayed coping flexibility, we found that awake periods predicted coping flexibility a day later than initially hypothesized, such that as awake periods increased, coping flexibility decreased. Overall, our studies fail to demonstrate self-reported sleep quality, onset latency, or awake periods as a predictor of next-day strategy-situation fit coping flexibility, but does explore potential delayed effects.

TABLE OF CONTENTS

ACKNOWLEDGEMENTS

This writer wishes to express their appreciation to Professor Quinn, under whose guidance this investigation was conducted, for their patience, guidance, and criticism throughout the investigation. The author is also indebted to Professors Bravo and Labella for their careful reading and criticism of the manuscript. It is through this support and guidance that this Thesis has reached its highest potential.

This author also wishes to extend their appreciation for the assistance provided by the Stress & Emotion Lab, especially Research Assistants Rachel Li, Lilly McClendon, Andre Bizier, Sarah Baldwin, Anta Gueye, Caroline Buttz, Sarah Nosrat, Cassandra Eaton, and Emilee Grossi. Finally, the writer is sincerely grateful for their friends and family for providing continuous support throughout this process.

LIST OF TABLES

LIST OF FIGURES

The Importance of Sleep for Flexibly Coping with Daily Stress

Any change that causes physical, emotional, or psychological strain is considered a stressor (Selye, 1956). Stressors can be good, in that they can help you stay alert, motivated, and ready to engage or avoid danger. However, constant long-term exposure to stressors can cause wear and tear on the body, which can lead to a suppressed immune system (Dhabhar, 2014), decreased memory and cognitive abilities (Sapolsky, 1996), and even accelerated biological aging (Aschbacher et al., 2013). Stressors are particularly maladaptive when the appraisal of the stressor surpasses the individual's analysis of their available resources (Folkman & Lazarus, 1984). Coping strategies are thoughts or behaviors that an individual uses with the intent of managing their stressors (Lazarus & Folkman, 1984). This transactional process leads to an individualized experience of stress and coping strategy selection, which can predict psychological distress (Littleton et al., 2007), anxiety (Mahmoud et al., 2012), and depression (Joormann et al., 2006).

Coping Flexibility

Recent research suggests that *coping flexibility* may be more important than the ability to use any one coping strategy (Bonanno & Burton, 2013). Coping flexibility has been defined in a variety of different ways, which includes five major conceptualizations: broad repertoire, balanced profile, cross-situational variability, strategy-situation-fit, and perceived ability (Cheng et al., 2014). There have been demonstrated benefits of higher coping flexibility using each of these different conceptualizations of coping flexibility, but studies report drastically different effect sizes when examining the link between coping flexibility and psychological adjustment (Cheng et al., 2014). Strategy-situation fit (i.e., the ability to match coping strategy choice to the demands of a stressor) and perceived ability (i.e., an individual's perception of their strategy effectiveness) reveal effect sizes larger than other conceptualizations of coping flexibility (Cheng et al., 2014).

Cheng (2001; 2003; 2014) explains the process of coping flexibility through three stages: the planning stage, the execution stage, and the feedback stage. In the planning stage, individuals analyze the stressor and their resources, and decide which strategies to employ. In this stage, it is helpful to evaluate situational characteristics than can help distinguish which types of coping strategies may be most adaptive for the given context. Once an individual has planned to use a coping strategy, an individual implements this strategy in the execution stage. In the feedback stage, an individual should evaluate the effectiveness of their coping strategy selection and adapt their behavior as seen fit (Kato, 2015). This evaluation and strategy change can occur after or concurrently with the execution stage (Cheng et al., 2014; Kato, 2012).

Purposeful changes in coping strategies are adaptive when necessary to meet the demands of the stressor. However, change is not adaptive if the current coping strategy is a good fit for the stressor. Since the experience of stress is a transactional process that leads to an individualized experience of stress (Lazarus & Folkman, 1984), individuals should be monitoring their coping strategy selection as the demands of their daily stressors change. Thus, the strategy-situation fit conceptualization allows for this dynamic process of coping to take place with the end goal being identification and implementation of a coping strategy that is ideally suited to allow an individual to deal with the stressor.

In order to understand which strategies are a good fit for a stressor, it is essential to consider types of strategies that may be used as well as contextual elements of the stressor. Coping strategies are often separated into *problem-focused* or *emotion-focused* subcategories. Emotion-focused coping strategies are those intended to change how you feel about the situation, such as taking a bath, giving yourself a pep talk, taking a walk, or meditating. Problem-focused coping is aimed at altering the stressor itself, such as making a to-do list, working on managing time, asking for help, or establishing healthy boundaries (Folkman & Lazarus, 1984). Watanabe, Iwanaga, and Ozeki (2002) identified the controllability of a stressor as a key situational characteristic influencing the effectiveness of the coping strategy selection, and therefore, the *strategy-situation fit*. Typically, problem-focused coping is a better fit for situations in which individuals have high levels of control because the source of the stress may be altered. In contrast, emotion-focused coping is a better fit for situations in which individuals have low levels of control because the emotional response to the stressor is all that can be manipulated (Lazarus, 1999).

Effective matching of a strategy to the stressor implies the use of cognitive resources. Indeed, the transactional theory of coping (Lazarus & Folkman, 1984) suggests that cognitive processes are needed to simply deploy a coping strategy. Additional cognitive resources are needed to cope effectively (Neufeld, 1999). For example, an individual's cognitive ability, contributing to the ability to appropriately appraise the demands of the stressor, may account for differences in the effectiveness of deployed strategies (Mischel & Shoda, 1995). Thus, to engage in coping flexibility, cognitive resources are necessary.

Previous research has shown that individuals who demonstrate more coping flexibility experience less anxiety, fewer psychosomatic symptoms, and fewer stress-related symptoms, including worry and exhaustion (Cheng et al., 1999; Fresco et al., 2006). Coping flexibility also has been associated with decreases in depressed mood and increases in quality of life (Cheng, 2003; Cheng et al., 2007). Despite the importance of high levels of coping flexibility to decrease the negative effects of stress, little research has explored factors that can predict one's ability to demonstrate coping flexibility. One promising avenue for such research is the role of sleep.

Sleep

An average person spends one third of their lifetime asleep. This period of time is vital to physical and psychological health (Perry et al., 2013). Historically, sleep quantity, the amount of time someone sleeps, was prioritized in research. However, research has begun to recognize that quality, not quantity, is a more valuable sleep index (Bassett et al., 2015; Kohyama, 2021; Weaver et al., 2016). Poor sleep quality has been associated with cardiovascular morbidity, glucose intolerance, and heart disease (Altevogt & Colten, 2006). There are a variety of components of sleep that determine sleep quality, that is, how well someone is sleeping. Although there are various components of sleep quality, there are a few that have been linked to coping ability and its requisite cognitive abilities. These include onset latency, which is how quickly someone falls asleep, as well as measures of fragmented sleep like periods awake after falling asleep.

Previous research has found relationships between measures of fragmented sleep and basic neurological performance, such as fragmented sleep predicting symbol-digit substitution test scores (Sadeh et al., 2002). Fragmented sleep has been found to be associated with higher risk of adverse cognitive outcomes (Wennberg et al., 2017). Additional research has found fragmented sleep to be associated with impaired attention, processing, memory, and executive functioning (S. Naismith et al., 2004; Rogers et al., 2003). Across all age groups, Wilcken and colleagues (Wilckens et al., 2014) found less fragmented sleep, that is, higher sleep continuity, to be associated with better cognitive performance on several measures. In young adults, they found additional associations for higher sleep continuity with better working memory and inhibitory control.

Additionally, previous research has found associations between longer onset latency and poorer working memory (Steenari et al., 2003). Longer onset latency has also been found to be associated with higher risk of cognitive impairments in a cross-sectional study on older women using actigraphy (Blackwell et al., 2006). Additionally, increased onset latency is negatively correlated with cognitive flexibility, in addition to inhibitory control, mental planning, and sustained attention (Rey et al., 2020). Although much of the research linking cognitive ability and sleep quality is correlational, the consensus is that better sleep quality contributes to improved cognitive ability.

Possibly as a result of sleep-related improvements in cognitive ability, one of the many benefits of sleep is improved coping with stress. Although notably bidirectional, research on the role of sleep quality in relation to coping with stress has demonstrated that increased self-reported sleep quality is associated with decreased use of maladaptive forms of coping, like rumination (Thomsen et al., 2003), disengagement coping (Zhang et al., 2018), and alcohol-related coping behaviors (Kenney et al., 2014). Even though some research has explored the relationship between sleep and specific coping strategies, to our knowledge, there is no previous research linking sleep and coping flexibility. Based on evidence that sleep may contribute to the cognitive abilities necessary for coping flexibility, the purpose of the present study was to directly examine whether sleep is associated with coping flexibility.

The Current Research

Considerable research has explored the negative consequences of insufficient sleep and its relation to certain coping behaviors; however, to my knowledge, no previous research has explored the effects of sleep quality on coping flexibility. We anticipate that sleep quality will predict coping flexibility due to the previous research on the relationship between sleep and cognition, since cognitive ability is required to match the fit of the coping strategy to the stressor (Cheng, 2003b). The present research focused on subjective sleep quality, as well as objective measures of onset latency and awake periods. Additionally, we were interested in the strategy-situation fit conceptualizations of coping flexibility using stressor controllability as the situational characteristic of interest. We aimed to explore the importance of sleep for college students in the U.S. as a predictor of coping flexibility through two studies.

Study one took place in the Spring of 2021, in which one hundred and fifty college student participants were recruited. Participants were asked to complete 14 days of daily diaries. For study one, we hypothesized that better sleep quality would predict greater coping flexibility the next day. Study two took place in the Fall of 2021, in which eighty-seven participants were recruited. Participants were asked to complete seven to ten days of daily diaries and wear a Phillips Respironics Actiwatch band during the same time period. For study two, we hypothesized that, in addition to self-report sleep quality, objective measures of onset latency and awake periods would predict coping flexibility.

Importantly, this research focuses on college student participants, who are twice as likely than the general population to report negative sleep outcomes (Buboltz Jr et al., 2001). Since college students are particularly vulnerable to sleep concerns (Jensen, 2003), and with the spread of COVID-19 beginning in early 2020, college students in the United States experienced heightened levels of stress. Students were facing novel campus closures, increased isolation, decreased resources, and extreme levels of uncertainty. This extensive period of stress affected everyday life for most Americans, but particularly college students: as many continued to live in close quarters or moved home, transitioned to online school, and experienced overall higher levels of perceived stress (Knepple Carney et al., 2021). Additionally, since college-aged individuals are still experiencing developmental transitions, they are particularly vulnerable to negative life events (Cohen et al., 1987), making it even more important to study factors that influence coping in college students.

Study One

Study one was designed to test the relationship between sleep quality and coping flexibility through 14 days of daily diaries. Participants were recruited in the spring 2021 semester at the College of William & Mary and were compensated with course credit for their introductory psychology courses.

Method

Participants

One hundred and fifty college student participants were recruited. All participants were between the ages of 18 and 22 (*M* = 19.13, *SD* = 1.05). The sample was 58.8% female, 40.4% male, and 0.7% nonbinary. Additionally, 57% identified as White or Caucasian, 16% as Asian or Asian American, 8% Latino or Hispanic, 14% Black, African American, or African, 2% American Indian, Native American, or Alaska Native, 2% Middle Eastern or Arab, and 1% as Native Hawaiian or Other Pacific Islander.

Materials

Coping Flexibility Questionnaire (CFQ; Duhachek & Kelting, 2009). The CFQ is a seven-item scale that measures participants' perceived control of their greatest stressor of the day and their coping strategy usage. The first part of this item asks participants to describe the most stressful or irritating event that happened to them that day and then asks three questions about the event. The second part asks participants to describe the coping strategies they used to cope with the event, give details for one strategy, and answer two additional follow-up questions on the main coping strategy (i.e., strategy effectiveness). Coping strategies are broken into either problem-focused or emotion-focused coping strategies. Discriminant validity has been shown through a sample of undergraduate students (Duhachek & Kelting, 2012). We were particularly interested in the stressor controllability ratings and coping strategy distinctions (i.e., problem-focused or emotion-focused) for strategy-situation fit.

Sleep Quality Index. Sleep quality is assessed via single item indicator, in which participants are asked "How would you rate the quality of your previous night's sleep?" from 1 (very good) to 4 (very bad).

Procedure

All study procedures were Institutional Review Board approved. Informed consent was received from all participants prior to completing any portion of the study. Participants were asked to complete 14 days of daily diaries, each evening, as close to 7PM as possible. For each entry, participants were asked about the most stressful event they experienced that day and were asked to complete the Coping Flexibility Questionnaire and the sleep quality indicator.

Data Analysis

To evaluate whether daily sleep quality predicted daily changes in coping flexibility, multilevel models were conducted. Models fit by maximum likelihood estimation were estimated with SPSS v28.0. All independent variables were person-centered, as we were particularly interested in within-person fluctuations (i.e., how well a person slept in relation to how well this person sleeps on average). The strategy-situation fit scores were generated for each stressor by comparing the controllability ratings to the coping behaviors (i.e., use of emotion-focused or problem-focused coping). If the match was adaptive (i.e., emotion focused coping for low control stressors or problem focused coping for high control stressors), the score would range from 1 to 3, based on the range of adaptive controllability scores. Thus, if problem focused coping was used and a rating of 5 for controllability on the seven-point scale would be a 1 goodness-of fit score, while a rating of a 7 on controllability would be a 3 on goodness-of fit scores. Maladaptive matches would range from -1 to -3, based on the strength of the relationship. If the controllability was rated a 4, which is neither low nor high control, the goodness-of fit was identified as zero.

Results

Participants were asked to complete 14 days of daily diaries, with 55% completing all 14 (*M*=7.50, *SD*=4.03). Data for 862 daily diaries were analyzed. Descriptive statistics for the daily diary data are presented in Table 1 and Table 2 (person-centered). Participants demonstrated fairly even use of emotion-focused and problem-focused coping (see Figure 2). The proportion of variance that was within person is as follows: sleep quality 75% and coping flexibility 92%. Results from MLM analyses are presented in Table 3. Contrary to our hypothesis, we did not find evidence for self-reported sleep quality as a predictor of coping flexibility.

Study One Discussion

The results of study one did not support our hypothesis of sleep quality as a predictor of coping flexibility. Given previous research showing the link between subjective sleep quality and other measures of coping (Hicks et al., 1991; Kohyama, 2021; Kozusznik et al., 2021), as well as neurological performance (De Koninck et al., 1989; Sadeh et al., 2002; Steenari et al., 2003), these findings are surprising. It is possible that improved sleep quality does not encourage coping flexibility and that there may be other factors that contribute to one’s ability to demonstrate coping flexibility.

Alternatively, we may not have measured the aspects of sleep quality that may be related to coping flexibility. Evidence of correlation between self-report sleep and objective sleep measures is lacking. Previous research has found PSQI (global score) responses are not significantly correlated with actigraphy measures of wake after sleep, sleep onset, or total sleep time. (Girschik et al., 2012). It is possible that self-report sleep quality and objective components of sleep are not correlated because they are measuring notably different aspects of sleep quality. For example, two individuals may rate their sleep quality as low while one experiences poor sleep continuity and the other latent sleep onset (Krystal & Edinger, 2008). Given that self-report and objective measures of sleep quality appear to tap into distinct components of sleep quality, we may not be able to fully understand the relationship between sleep and coping flexibility through self-report measures alone. Indeed, it is possible that more specific and objective measures of sleep quality may be necessary to observe a relationship between sleep quality and coping flexibility. Study two seeks to expand upon study one by distinguishing between different components of sleep quality, and to do so through objective measures.

Study Two

Study two was designed to test the relationship between sleep quality and coping flexibility through 7-10 days of daily diaries. Participants were recruited in the fall 2021 semester at the College of William & Mary and were compensated with course credit for their introductory psychology courses. Study two improves upon study one by using objective components of sleep quality, in addition to subjective sleep quality.

Method

Participants

Eighty-seven college student participants were recruited in the fall 2021 semester. All participants were between the ages of 17 and 26 (M = 18.82, SD = 1.24). The sample was 57.3% female, 33.7% male, and 3.4% nonbinary. Additionally, 57.3% identifying as White or Caucasian, 28.1% as Asian or Asian American, 9% Latino or Hispanic, 11.2% Black, African American, or African, 1.1% American Indian, Native American, or Alaska Native, 3.4% Middle Eastern or Arab, and 1.1% other.

Materials

Coping Flexibility Questionnaire (CFQ; Duhachek & Kelting, 2009). The CFQ is a seven-item scale that measures participants' perceived control of their greatest stressor of the day and their coping strategy usage. The first part of this item asks participants to describe the most stressful or irritating event that happened to them today and then three questions about the event. The second part asks participants to describe the coping strategies they used to cope with the event, give details for one strategy, and answer two additional follow-up questions on the main coping strategy. Coping strategies are broken into either problem-focused or emotion-focused coping strategies. Discriminant validity has been shown through a sample of undergraduate students (Duhachek & Kelting, 2012). We were particularly interested in the stressor controllability ratings and coping strategy distinctions (i.e., problem-focused or emotion-focused) for strategy-situation fit.

Sleep Quality. Self-report sleep quality was assessed by single item indicator. Participants are asked "How would you rate the quality of your previous night's sleep?" from 1 (very good) to 4 (very bad).

Actigraphy. Participants wore a Phillips Respironics Actiwatch 2, which is a wrist band device that records accelerometry data. The Actiwatch 2 is 16-grams and 43 mm x 23 mm x 10mm. It uses a piezoelectric sensor to monitor vertical accelerations spanning 0.5-2.0 g and has a sampling rate of 32 Hz. The battery life is approximately 22 days at our epoch setting, so participants did not need to remove the band for charging. The Actiwatch 2 band also can be immersed in water for up to 30 minutes between 15 cm to 1 m in depth (*Actiwatch 2 Activity Monitor*), but participants were asked to remove their watch for swimming or showing as a precaution.

Procedure

All study procedures were Institutional Review Board approved. Informed consent was received from all participants prior to completing any portion of the study. Participants were asked to complete up to 7-10 days of daily diaries, each morning, as close to waking up as possible. Day number ranged to provide scheduling ease for participants. For each entry, participants were asked about the most stressful event they experienced the previous day and were asked to complete the Coping Flexibility Questionnaire and sleep quality indicator. Additionally, participants were asked to wear a Phillips Respironics Actiwatch band that uses an accelerometer to measure sleep for one week. Participants were asked to wear their band continuously, with the exception of situations in which it would be submersed in water or potentially damaged (i.e., wrestling).

Data Analysis

To evaluate whether daily sleep characteristics would predict daily changes in coping flexibility, multilevel models were conducted. Models fit by maximum likelihood estimation were estimated with SPSS v28.0. All independent variables were person-centered, as we were particularly interested in within-person fluctuations. Additionally, since diaries were completed in the morning and asked about the previous day, coping flexibility variables were shifted to reflect behaviors after the night of sleep. Self-report sleep quality was not shifted due already reflecting the most recent night of sleep.

Similar to study 1, the strategy-situation fit scores were created based on the range of goodness of fit. For adaptive matches, the score would range from 1 to 3, based on the range of adaptive controllability scores. Thus, if problem focused coping was used and a rating of 5 for controllability on the seven-point scale would be a 1 goodness-of fit score, while a rating of a 7 on controllability would be a 3 on goodness-of fit scores. Maladaptive matches would range from -1 to -3, based on the strength of the relationship. If the controllability was rated a 4, which is neither low nor high control, the goodness-of fit was identified as zero.

Phillips Respironics Actiwatch 2 data were scored using software 6.1.2 (*Actiware*). Data were collected in 15-second epochs and via activity only logging mode. Each epoch was scored as either wake or sleep using the algorithm: $\mathrm{A} = (0.04^{*}\mathrm{E}^{-2}) + (0.2^{*}\mathrm{E}^{-1}) + \mathrm{E} + (0.2^{*}\mathrm{E}^{1}) + (0.04^{*}\mathrm{E}^{-2})$, in which A is the sum of the activity counts for the individual and surrounding epochs, E is the activity for the individual epoch, and E^{n} is the activity count 10 minutes before and after the individual epoch. If A is greater than 40, the epoch is marked as a wake period, while if it is less than 40, the epoch is marked as sleep. If participant self-reported removal of the watch (via daily diary) and that period was calculated as sleep time, the researcher manually removed that portion of the data. Actigraphy variables of interest were onset latency and number of epochs awake after sleep onset.

Results

Participants were asked to complete up to 7-10 days of daily diaries, with the range varying for scheduling ease (i.e., some participants were asked explicitly for 7). On average, participants completed 6.76 diaries (*SD* = 1.39). Data for 657 daily diaries were analyzed. Due to limited supply, not all participants were instructed to wear an Actiwatch (*n* = 63 wore an Actiwatch). Data for 430 days of actigraphy were analyzed. Descriptive statistics for the daily diary data and Actigraphy are presented in Table 4 and Table 5 (person-centered). The proportion of variance that was within person is as follows: sleep quality 81%, onset latency 88%, awake periods 71%, and coping flexibility 92%. Results from MLM analyses for self-report sleep quality, onset latency, and awake periods are presented in Table 6. Contrary to our hypotheses, we did not find any evidence for self-report sleep quality, onset latency, or awake periods as a predictor of coping flexibility.

Exploratory Analyses: Lagged effect

To explore whether sleep quality would predict delayed coping flexibility, we ran similar MLM analyses for coping flexibility one day later. Descriptive statistics are presented in Table 7 and results from MLM analyses are presented in Table 8. We did not find self-report sleep quality or onset latency as predictors of coping flexibility. However, interestingly, we found that awake periods predicted coping flexibility, such that as the number of epochs awake increased, coping flexibility decreased.

Study Two Discussion

The purpose of study two was to add objective measures of sleep quality as predictors of coping flexibility, which are better able to parse out components of sleep quality. We continued to not see self-report sleep quality as a significant predictor of coping flexibility. Surprisingly, this null result was also true for objective measures of sleep quality. We did not find a significant relationship between onset latency and coping flexibility, despite previous research demonstrating that longer sleep onset is associated with poorer cognition (Blackwell et al., 2006). We also did not find a significant relationship between awake periods and coping flexibility, which is inconsistent with previous research demonstrating that higher number of awakenings is related to higher risk of cognitive impairments (Blackwell et al., 2006; Rey et al., 2020).

Although the addition of objective measures of sleep quality allowed for evaluation of different aspects of sleep quality, there are still a variety of limitations associated with use of actigraphy. Actigraphy is fairly well-supported as being advantageous for obtaining sleep parameters (Martin & Hakim, 2011), but its evaluation of sleep onset and night-time awake periods may be under counted (Krystal & Edinger, 2008). Additionally, similar to self-report sleep quality, there are inconsistencies regarding definitions of objective sleep characteristics. Although onset latency or awake periods may appear to have a solidified definition, there are varying algorithms for data analysis and interpretation that may be fairly different from researcher to researcher (Fekedulegn et al., 2020). This means that although actigraphy provides more nuanced measures of sleep quality, the measures have limitations which could obscure potential associations between sleep quality and other constructs like coping flexibility.

General Discussion

The purpose of the present research was to explore sleep quality as a predictor of the strategy-situation fit conceptualization of coping flexibility. In study one, we did not find a significant relationship between self-report sleep quality and coping flexibility. In study two, we again did not find a significant relationship between self-report sleep quality and coping flexibility. Additionally, in study two, we did not find significant relationships between onset latency or awake periods and coping flexibility. To the best of our knowledge, our studies are the first to explore sleep quality in relation to coping flexibility. However, given the substantial support for the benefits of sleep quality on cognition, these results are unexpected.

It is possible that factors other than sleep quality are more important in predicting coping flexibility. The present research was based on the idea that poor sleep impairs cognitive abilities, which leads to a reduced ability to flexibly cope with stress. It may be that individuals who do not evidence coping flexibility do not lack the cognitive capacities to cope flexibly, but rather, lack the knowledge of how to best match coping strategies to the demands of the stressor. Previous research on teaching coping flexibility skills as an intervention found significant improvements in coping flexibility by increasing knowledge of fit. Participants were taught to distinguish emotion-focused and problem focused coping and to recognize strategy-situation fit based off of stressor controllability (Cheng et al., 2012). Thus, the impact of sleep quality on coping flexibility may only be evident for individuals who already have a certain level of knowledge on how to best match strategies to situations.

An alternative explanation for the null results is that there is a relationship between sleep quality and coping flexibility, but we did not target the correct temporal association. Previous research regards sleep deprivation as accumulating neurobiological consequences over time (Van Dongen et al., 2003). Although there is not consensus on the number of days needed to recover to full performance after sleep restriction or poor sleep, there is evidence that cognition recovers after two full nights of sleep (Dinges et al., 1997). However, there is also sleep restriction research demonstrating that a full week of recovery is insufficient to reach baseline functioning

(Ochab et al., 2021). Although contradicting, both studies support the idea that poor sleep hinders cognitive functioning the next day, as well as at least the following day. Given some indication of delayed effects of sleep, we explored whether sleep quality predicted coping flexibility, one day later than originally hypothesized. In other words, we evaluated whether sleep quality on day one predicted coping flexibility on day three and so on. While we did not find sleep quality or onset latency to be significantly related to coping flexibility one day later, we did find a significant effect of awake periods. Indeed, it is possible that the number of awake epochs has a delayed effect on cognitive abilities, and therefore effects coping flexibility one day later. Notably, these findings are exploratory, and therefore, need to be replicated in additional research.

Our research focused on within-person design to account for intraindividual variability. By person-centering our independent variables, we were looking to target an individual's behavior in relation to how they normally behave (i.e., each day's sleep quality compared to their average sleep quality). This means that our exploratory analyses do not simply reveal that high sleep quality predicts coping flexibility one day later, but that having higher than your own average sleep quality predicts coping flexibility one day after. Sleep behavior is not necessarily stable within individuals, therefore, day to day variation in sleep quality may be an important indicator of subsequent cognitive abilities. Since we found effects for our within-person exploratory analyses, it is possible that sleeping better (i.e., fewer awakenings) two nights before a stressor, helps an individual cope more flexibility by selecting a coping strategy more suitable for the demands of the stressor.

Notably, we were interested in the goodness of fit conceptualization of coping flexibility; the ability to adaptively match the coping strategy choice to the demands of the stressor. Results of the present study may not generalize to other conceptualizations of coping flexibility. It is possible that sleep differentially affects an individual's cross-situational variability and ability to shift coping strategies or alternatively, an individual's perception of their ability to cope with the stressor. Additionally, our research focused on perceived controllability, which is only one potential stressor characteristic that informs which coping strategies may be most adaptive in a given situation. There are many potential characteristics that could help determine strategy-situation fit, such as the predictability of the onset, the duration, the timing, and the frequency. Thus, to obtain a robust measure of flexibility, additional characteristics may need to be considered.

Limitations and Future Directions

Our studies include a variety of limitations, such as potentially inflated Type I and Type II errors due to modeling a fixed slope (Aarts et al., 2015; Barr et al., 2013; Schielzeth & Forstmeier, 2009), which was necessary due to the data structure. Our sample also consists only of college students; therefore, our results may not be generalizable to younger children or older adults. Additionally, this influenced the types of stressors participants were facing daily (see Figure 1).

To avoid respondent burden and criterion contamination commonly associated with multiple item scales (Fisher et al., 2015), we opted to use a single item indicator for sleep quality. Due to the repetitive demands of longitudinal studies, this design may particularly benefit from use of single-item indicators (Fu, 2005). We were concerned by criterion contamination since sleep quality can include so many different components of sleep, and therefore only focused on “sleep quality” directly. However, since individuals may rate their sleep quality as similarly low while experiencing different low components of sleep (i.e., poor sleep continuity versus latent sleep onset), we still may be inevitably encompassing various components (Krystal & Edinger, 2008).

Although we still consider a single-item indicator a weakness of this study, a variety of previous research has successfully used single-item measures to access social supports (Blake & McKay, 1986), job insecurity (Sverke et al., 2002), job satisfaction (Dolbier et al., 2005), bullying (Sawyer et al., 2008), self-esteem (Robins et al., 2001), life satisfaction (Cheung & Lucas, 2014), and symptoms of stress exposure (Elo et al., 2003). Additionally, recent research has identified restfulness as an important indicator of sleep quality (Kohyama, 2021), which was not explicitly included in our studies.

Conclusion

Overall, our studies fail to demonstrate self-reported sleep quality, onset latency, or awake periods as a predictor of next-day strategy-situation fit coping flexibility, but does explore potential delayed effects. In particular, we found that awake periods may predict coping flexibility one day later. To the best of our knowledge, our studies are the first to explore sleep in relation to coping flexibility. Although previous research has demonstrated the benefits of coping flexibility (Cheng et al., 1999; Cheng, 2003; Cheng et al., 2007; Fresco et al., 2006), very little research has explored factors that can predict one’s ability to demonstrate coping flexibility. Our research provided valuable insight on the relationship between sleep and coping flexibility that can inform the future research looking to understand factors that influence coping flexibility.

Tables and Figures

Tables for Study One

Table 1

Daily diary descriptive statistics.

Variable	*M*	*SD*	Range
Sleep quality	1.98	.87	1 to 4
Coping Flexibility	-.22	1.59	-3 to 3

Note. Sleep quality is not reverse coded (such that higher scores means worse sleep). Additionally, the distribution of coping flexibility scores is as follows: 35.3% negative, 21.2% zero, and 43.5% positive.

Table 2

Daily diary descriptive statistics person-centered.

Variable	*M*	*SD*	Range
Sleep quality	.00	.72	-1.71 to 2.36
Coping Flexibility	-.22	1.59	-3 to 3

Note. Sleep quality is person-centered and is not reverse coded (such that higher scores means worse sleep).

Table 3

Results from MLM analyses modeling daily associations between self-report sleep quality and coping flexibility.

Variable	$\hat{\beta}$	*SE*	*t*	*p*	*95% CI*	
Sleep Quality					Lower	Upper
Intercept	-.28	.08	-3.34	.001	-.45	-.11
Sleep Quality	-.02	.07	-.35	.728	-.16	.11

Tables for Study Two

Table 4

Daily diary and actigraphy descriptive statistics.

Variable	*M*	*SD*	Range
Sleep Quality	2.07	.83	1 to 4
Onset Latency	38.82	56.96	0 to 611.50
Awake Periods	46.90	22.41	0 to 241
Coping Flexibility	.31	2.01	-3 to 3

Note. Onset latency is in minutes. Additionally, the distribution of coping flexibility scores is as follows: 36.3% negative, 14.6% zero, and 49.1% positive.

Table 5

Daily diary and actigraphy descriptive statistics person-centered.

Variable	*M*	*SD*	Range
Sleep Quality	.00	.69	-1.87 to 2.29
Onset Latency	.00	49.73	-118.39 to 485.11
Awake Periods	.00	17.62	-48.50 to 155.43
Coping Flexibility	.31	2.01	-3 to 3

*Note. S*leep quality, onset latency and awake periods are person-centered. Onset latency is in minutes.

Table 6

Results from MLM analyses modeling daily associations between sleep and coping flexibility.

Variable	$\hat{\beta}$	*SE*	*t*	*p*	*95% CI*	
Sleep Quality					Lower	Upper
Intercept	.32	.10	3.04	.003	.11	.52
Sleep Quality	-.01	.12	-.10	.921	-.24	.22
Onset Latency						
Intercept	.34	.11	3.13	.003	.12	.55
Onset Latency	.00	.00	-.56	.577	-.01	.00
Awake Periods						
Intercept	.36	.10	3.43	.001	.15	.56
Awake Periods	.01	.01	1.18	.238	.00	.02

Table 7

Exploratory self-report and actigraphy descriptive statistics.

Variable	**M**	**SD**	**Range**
Sleep Quality	.00	.69	-1.87 to 2.29
Onset Latency	.00	50.06	-132.69 to 470.81
Awake Periods	.00	17.56	-46.57 to 155.43
Coping Flexibility	.31	2.02	-3 to 3

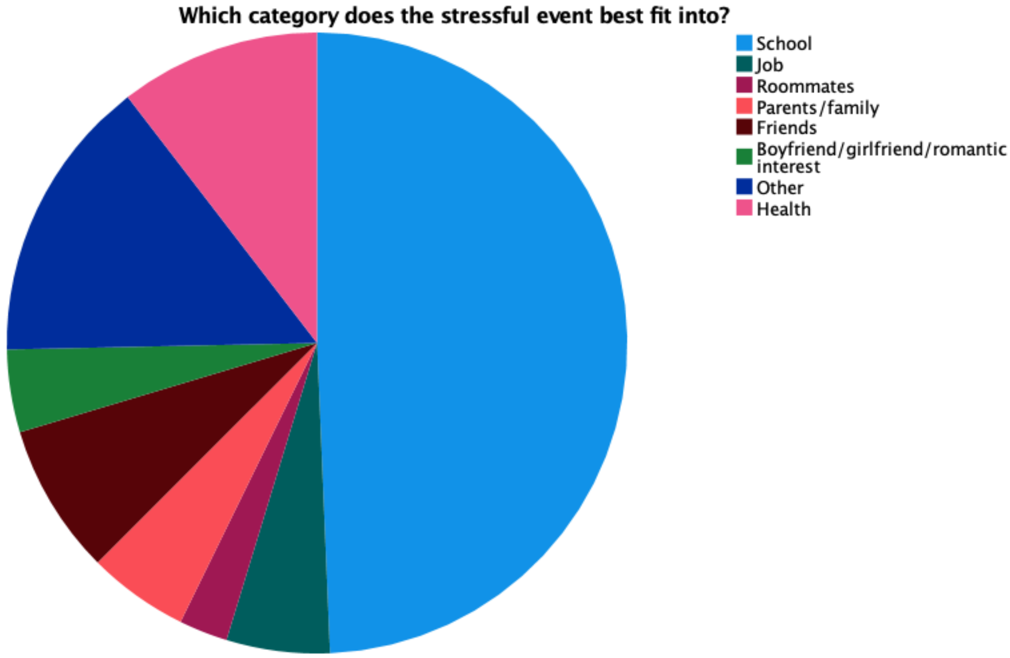
*Note. S*leep quality, onset latency and awake periods are person-centered. Onset latency is in minutes.

Table 8

Results from MLM analyses modeling lagged-daily associations between sleep and coping flexibility.

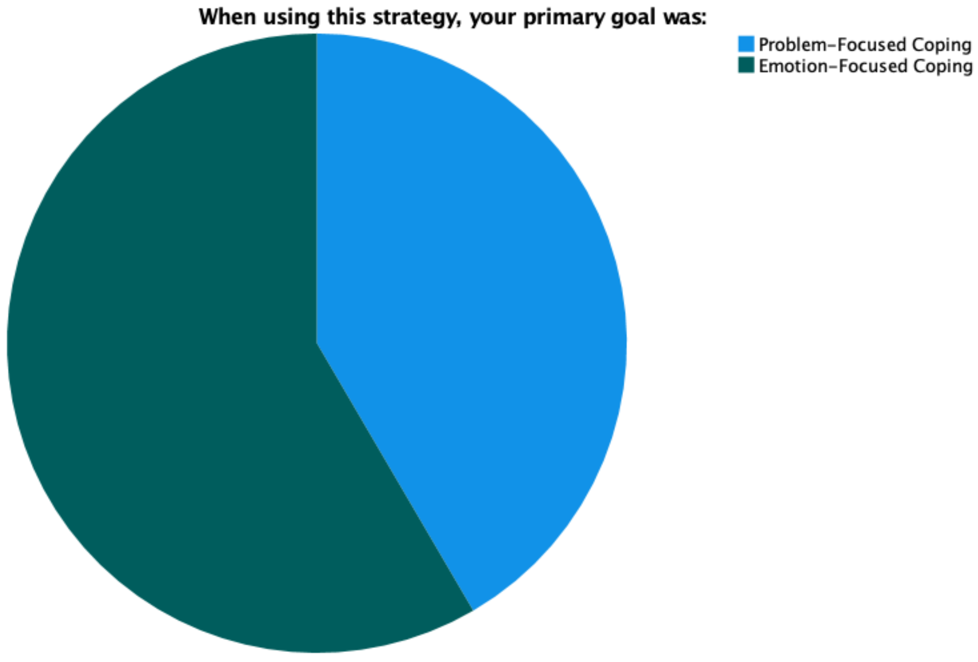
Variable	$\hat{\beta}$	*SE*	*t*	*p*	*95% CI*	
Sleep Quality					Lower	Upper
Intercept	.30	.11	2.77	.007	.09	.52
Sleep Quality	-.01	.13	-.08	.933	-.26	.24
Onset Latency						
Intercept	.34	.12	2.92	.005	.11	.57
Onset Latency	.00	.00	-.33	.744	-.00	.00
Awake Periods						
Intercept	.34	.11	2.99	.004	.11	.56
Awake Periods	-.01	.01	-2.17	.031	-.02	.00

Figure 1



Note. This chart shows the types of stressors participants reported on each day, as reflected in study 1.

Figure 2



Note. This chart demonstrated the split between types of strategies used.

References

Aarts, E., Dolan, C. V., Verhage, M., & van der Sluis, S. (2015). Multilevel analysis quantifies variation in the experimental effect while optimizing power and preventing false positives. *BMC Neuroscience*, *16*(1), 1–15.

Actiware | Philips. (n.d.). Retrieved March 25, 2022, from https://www.usa.philips.com/healthcare/sites/actigraphy/solutions/actiware

Actiwatch 2 Activity monitor | Philips Healthcare. (n.d.). Retrieved March 25, 2022, from https://www.usa.philips.com/healthcare/product/HC1044809/actiwatch-2-activity-monitor

Altevogt, B. M., & Colten, H. R. (2006). *Sleep disorders and sleep deprivation: An unmet public health problem*.

Aschbacher, K., O'Donovan, A., Wolkowitz, O. M., Dhabhar, F. S., Su, Y., & Epel, E. (2013). Good stress, bad stress and oxidative stress: Insights from anticipatory cortisol reactivity. *Psychoneuroendocrinology*, *38*(9), 1698–1708. https://doi.org/10.1016/j.psyneuen.2013.02.004

Barr, D. J., Levy, R., Scheepers, C., & Tily, H. J. (2013). Random effects. *Annual Conference of the Cognitive Science Society*, 197–202.

Bassett, S. M., Lupis, S. B., Gianferante, D., Rohleder, N., & Wolf, J. M. (2015). Sleep quality but not sleep quantity effects on cortisol responses to acute psychosocial stress. *Stress*, *18*(6), 638–644.

Blackwell, T., Yaffe, K., Ancoli-Israel, S., Schneider, J. L., Cauley, J. A., Hillier, T. A., Fink, H. A., & Stone, K. L. (2006). Poor sleep is associated with impaired cognitive function in older women: The study of osteoporotic fractures. *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences*, *61*(4), 405–410.

Blake, R. L., & McKay, D. A. (1986). A single-item measure of social supports as a predictor of morbidity. *J Fam Pract*, *22*(1), 82–84.

Bonanno, G. A., & Burton, C. L. (2013). Regulatory Flexibility: An Individual Differences Perspective on Coping and Emotion Regulation. *Perspectives on Psychological Science*, *8*(6), 591–612. https://doi.org/10.1177/1745691613504116

Buboltz Jr, W. C., Brown, F., & Soper, B. (2001). Sleep habits and patterns of college students: A preliminary study. *Journal of American College Health*, *50*(3), 131–135.

Cheng, C. (2001). Assessing coping flexibility in real-life and laboratory settings: A multimethod approach. *Journal of Personality and Social Psychology*, *80*(5), 814–833. https://doi.org/10.1037//0022-3514.80.5.814

Cheng, C. (2003). Cognitive and motivational processes underlying coping flexibility: A dual-process model. *Journal of Personality and Social Psychology*, *84*(2), 425–438. https://doi.org/10.1037/0022-3514.84.2.425

Cheng, C., Hui, W., & Lam, S. (1999). Coping style of individuals with functional dyspepsia. *Psychosomatic Medicine*, *61*(6), 789–795.

Cheng, C., Kogan, A., & Chio, J. H. (2012). The effectiveness of a new, coping flexibility intervention as compared with a cognitive-behavioural intervention in managing work stress. *Work & Stress*, *26*(3), 272–288. https://doi.org/10.1080/02678373.2012.710369

Cheng, C., Lau, H.-P. B., & Chan, M.-P. S. (2014). Coping flexibility and psychological adjustment to stressful life changes: A meta-analytic review. *Psychological Bulletin*, *140*(6), 1582–1607. https://doi.org/10.1037/a0037913

Cheng, C., Yang, F.-C., Jun, S., & Hutton, J. M. (2007). Flexible coping psychotherapy for functional dyspeptic patients: A randomized, controlled trial. *Psychosomatic Medicine*, *69*(1), 81–88.

Cheung, F., & Lucas, R. E. (2014). Assessing the validity of single-item life satisfaction measures: Results from three large samples. *Quality of Life Research*, *23*(10), 2809–2818. https://doi.org/10.1007/s11136-014-0726-4

Cohen, L. H., Burt, C. E., & Bjorck, J. P. (1987). Life stress and adjustment: Effects of life events experienced by young adolescents and their parents. *Developmental Psychology*, *23*(4), 583.

De Koninck, J., Lorrain, D., Christ, G., Proulx, G., & Coulombe, D. (1989). Intensive language learning and increases in rapid eye movement sleep: Evidence of a performance factor. *International Journal of Psychophysiology*, *8*(1), 43–47.

Dhabhar, F. S. (2014). Effects of stress on immune function: The good, the bad, and the beautiful. *Immunologic Research*, *58*(2), 193–210. https://doi.org/10.1007/s12026-014-8517-0

Dinges, D. F., Pack, F., Williams, K., Gillen, K. A., Powell, J. W., Ott, G. E., Aptowicz, C., & Pack, A. I. (1997). Cumulative sleepiness, mood disturbance, and psychomotor vigilance performance decrements during a week of sleep restricted to 4-5 hours per night. *Sleep*, *20*(4), 267–277.

Dolbier, C. L., Webster, J. A., McCalister, K. T., Mallon, M. W., & Steinhardt, M. A. (2005). Reliability and Validity of a Single-Item Measure of Job Satisfaction. *American Journal of Health Promotion*, *19*(3), 194–198. https://doi.org/10.4278/0890-1171-19.3.194

Duhachek, A., & Kelting, K. (2012). *Coping Flexibility Questionnaire* [Data set]. American Psychological Association. https://doi.org/10.1037/t11042-000

Elo, A.-L., Leppänen, A., & Jahkola, A. (2003). Validity of a single-item measure of stress symptoms. *Scandinavian Journal of Work, Environment & Health*, 444–451.

Fekedulegn, D., Andrew, M. E., Shi, M., Violanti, J. M., Knox, S., & Innes, K. E. (2020). Actigraphy-Based Assessment of Sleep Parameters. *Annals of Work Exposures and Health*, *64*(4), 350–367. https://doi.org/10.1093/annweh/wxaa007

Fisher, G., Matthews, R., & Gibbons, A. (2015). Developing and Investigating the Use of Single-Item Measures in Organizational Research. *Journal of Occupational Health Psychology*, *21*. https://doi.org/10.1037/a0039139

Fresco, D. M., Williams, N. L., & Nugent, N. R. (2006). Flexibility and Negative Affect: Examining the Associations of Explanatory Flexibility and Coping Flexibility to Each Other and to Depression and Anxiety. *Cognitive Therapy and Research*, *30*(2), 201–210. https://doi.org/10.1007/s10608-006-9019-8

Fu, Y. (2005). Measuring personal networks with daily contacts: A single-item survey question and the contact diary. *Social Networks*, *27*(3), 169–186.

Girschik, J., Fritschi, L., Heyworth, J., & Waters, F. (2012). Validation of self-reported sleep against actigraphy. *Journal of Epidemiology*, *22*(5), 462–468.

Hicks, R. A., Marical, C. M., & Conti, P. A. (1991). Coping with a major stressor: Differences between habitual short-and longer-sleepers. *Perceptual and Motor Skills*, *72*(2), 631–636.

Jensen, D. R. (2003). Understanding sleep disorders in a college student population. *Journal of College Counseling*, *6*(1), 25–34.

Kato, T. (2012). Development of the Coping Flexibility Scale: Evidence for the coping flexibility hypothesis. *Journal of Counseling Psychology*, *59*(2), 262–273. https://doi.org/10.1037/a0027770

Kato, T. (2015). Testing of the coping flexibility hypothesis based on the dual-process theory: Relationships between coping flexibility and depressive Symptoms. *Psychiatry Research*, *230*(2), 137–142.

Kenney, S. R., Paves, A. P., Grimaldi, E. M., & LaBrie, J. W. (2014). Sleep Quality and Alcohol Risk in College Students: Examining the Moderating Effects of Drinking Motives. *Journal of American College Health*, *62*(5), 301–308. https://doi.org/10.1080/07448481.2014.897953

Knepple Carney, A., Graf, A. S., Hudson, G., & Wilson, E. (2021). Age moderates perceived COVID-19 disruption on well-being. *The Gerontologist*, *61*(1), 30–35.

Kohyama, J. (2021). Which Is More Important for Health: Sleep Quantity or Sleep Quality? *Children*, *8*(7), 542.

Kozusznik, M. W., Puig-Perez, S., Kożusznik, B., & Pulopulos, M. M. (2021). The Relationship Between Coping Strategies and Sleep Problems: The Role of Depressive Symptoms. *Annals of Behavioral Medicine*, *55*(3), 253–265.

Krystal, A. D., & Edinger, J. D. (2008). Measuring sleep quality. *Sleep Medicine*, *9*, S10–S17.

Lazarus, R. S., & Folkman, S. (1984). *Stress, appraisal, and coping*. Springer publishing company.

Martin, J. L., & Hakim, A. D. (2011). Wrist Actigraphy. *Chest*, *139*(6), 1514–1527. https://doi.org/10.1378/chest.10-1872

Mischel, W., & Shoda, Y. (1995). A cognitive-affective system theory of personality: Reconceptualizing situations, dispositions, dynamics, and invariance in personality structure. *Psychological Review*, *102*(2), 246.

Naismith, S., Winter, V., Gotsopoulos, H., Hickie, I., & Cistulli, P. (2004). Neurobehavioral functioning in obstructive sleep apnea: Differential effects of sleep quality, hypoxemia and subjective sleepiness. *Journal of Clinical and Experimental Neuropsychology*, *26*(1), 43–54.

Neufeld, R. W. (1999). Dynamic differentials of stress and coping. *Psychological Review*, *106*(2), 385.

Ochab, J. K., Szwed, J., Oleś, K., Bereś, A., Chialvo, D. R., Domagalik, A., Fąfrowicz, M., Ogińska, H., Gudowska-Nowak, E., Marek, T., & Nowak, M. A. (2021). Observing changes in human functioning during induced sleep deficiency and recovery periods. *PLOS ONE*, *16*(9), e0255771. https://doi.org/10.1371/journal.pone.0255771

Perry, G. S., Patil, S. P., & Presley-Cantrell, L. R. (2013). Raising Awareness of Sleep as a Healthy Behavior. *Preventing Chronic Disease*, *10*, E133. https://doi.org/10.5888/pcd10.130081

Rey, A. E., Guignard-Perret, A., Imler-Weber, F., Garcia-Larrea, L., & Mazza, S. (2020). Improving sleep, cognitive functioning and academic performance with sleep education at school in children. *Learning and Instruction*, *65*, 101270. https://doi.org/10.1016/j.learninstruc.2019.101270

Robins, R. W., Hendin, H. M., & Trzesniewski, K. H. (2001). Measuring global self-esteem: Construct validation of a single-item measure and the Rosenberg Self-Esteem Scale. *Personality and Social Psychology Bulletin*, *27*(2), 151–161.

Rogers, N. L., Dorrian, J., & Dinges, D. F. (2003). Sleep, waking and neurobehavioural performance. *Front Biosci*, *8*(6), s1056–s1067.

Sadeh, A., Gruber, R., & Raviv, A. (2002). Sleep, neurobehavioral functioning, and behavior problems in school-age children. *Child Development*, *73*(2), 405–417.

Sapolsky, R. M. (1996). Why Stress Is Bad for Your Brain. *Science*, *273*(5276), 749–750. https://doi.org/10.1126/science.273.5276.749

Sawyer, A. L., Bradshaw, C. P., & O'Brennan, L. M. (2008). Examining ethnic, gender, and developmental differences in the way children report being a victim of "bullying" on self-report measures. *Journal of Adolescent Health*, *43*(2), 106–114.

Schielzeth, H., & Forstmeier, W. (2009). Conclusions beyond support: Overconfident estimates in mixed models. *Behavioral Ecology*, *20*(2), 416–420.

Selye, H. (1956). *The stress of life*.

Steenari, M.-R., Vuontela, V., Paavonen, E., Carlson, S., Fjallberg, M., & Aronen, E. (2003). Working Memory and Sleep in 6- to 13-Year-Old Schoolchildren. *Journal of the American Academy of Child and Adolescent Psychiatry*, *42*, 85–92. https://doi.org/10.1097/00004583-200301000-00014

Sverke, M., Hellgren, J., & Näswall, K. (2002). No security: A meta-analysis and review of job insecurity and its consequences. *Journal of Occupational Health Psychology*, *7*(3), 242.

Thomsen, D. K., Mehlsen, M. Y., Christensen, S., & Zachariae, R. (2003). Rumination—Relationship with negative mood and sleep quality. *Personality and Individual Differences*, *34*(7), 1293–1301.

Van Dongen, H. P. A., Maislin, G., Mullington, J. M., & Dinges, D. F. (2003). The Cumulative Cost of Additional Wakefulness: Dose-Response Effects on Neurobehavioral Functions and Sleep Physiology From Chronic Sleep Restriction and Total Sleep Deprivation. *Sleep*, *26*(2), 117–126. https://doi.org/10.1093/sleep/26.2.117

Wang, Y., & Yip, T. (2020). Sleep Facilitates Coping: Moderated Mediation of Daily Sleep, Ethnic/Racial Discrimination, Stress Responses, and Adolescent Well-Being. *Child Development*, *91*(4), e833–e852. https://doi.org/10.1111/cdev.13324

Watanabe, S., Iwanaga, M., & Ozeki, Y. (2002). Effects of controllability and desire for control on coping and stress responses. *Japanese Journal of Health Psychology*, *15*(1), 32–40. https://doi.org/10.11560/jahp.15.1_32

Weaver, A. L., Stutzman, S. E., Supnet, C., & Olson, D. M. (2016). Sleep quality, but not quantity, is associated with self-perceived minor error rates among emergency department nurses. *International Emergency Nursing*, *25*, 48–52.

Wennberg, A. M. V., Wu, M. N., Rosenberg, P. B., & Spira, A. P. (2017). Sleep Disturbance, Cognitive Decline, and Dementia: A Review. *Seminars in Neurology*, *37*(4), 395–406. https://doi.org/10.1055/s-0037-1604351

Wilckens, K. A., Woo, S. G., Kirk, A. R., Erickson, K. I., & Wheeler, M. E. (2014). Role of sleep continuity and total sleep time in executive function across the adult lifespan. *Psychology and Aging*, *29*(3), 658.

Zhang, Y., Peters, A., & Bradstreet, J. (2018). Relationships among sleep quality, coping styles, and depressive symptoms among college nursing students: A multiple mediator model. *Journal of Professional Nursing*, *34*(4), 320–325. https://doi.org/10.1016/j.profnurs.2017.12.004