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Sleep and Self-Efficacy: The Role of Domain Specificity in Predicting Sleep Health

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Abstract

Objectives: Although a number of empirically supported sleep interventions exist, sleep-related beliefs remain largely unexplored as clinical tools for enhancing existing interventions. The present study aimed to determine the differential associations between general and sleep self-efficacy with sleep health among a sample of adults

Participants: Participants were 3,284 adults (Mean Age = 43 years, 48.5% female, 6.4% other-identifying, 80.8% white).

Measurements: Participants completed measures of self-efficacy (general and sleep self-efficacy) and sleep health as part of their involvement in a larger online study. General self-efficacy and sleep self-efficacy were measured with the General Self-Efficacy and Sleep Self-Efficacy scales respectively. Sleep was assessed with the RegUlarity, Satisfaction, Alertness, Timing, Efficiency, Duration (RU-SATED) scale. A structural equation model was conducted to determine the associations between measures of general and sleep self-efficacy and sleep health, represented by two-factors derived from the RU-SATED measure.

Results: The structural model evidenced adequate to good fit to the data and indicated that both general and sleep self-efficacies were directly associated with the latent sleep quality/quantity and circadian rhythm outcomes. Higher general and sleep self-efficacies were positively associated with sleep regularity, timing, and alertness. Higher sleep self-efficacy and lower general self-efficacy were associated with higher sleep satisfaction, duration, and efficiency.

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Conclusions: Findings highlight the importance of domain specificity in the association between self-efficacy and sleep health outcomes. There is a need for more research into and application of interventions targeted toward increasing sleep self-efficacy as a potential avenue to improve sleep health.

Keywords

sleep; self-efficacy; sleep health

The prevalence of sleep disturbance is high across the lifespan with approximately 35% of Americans reporting poor sleep (1–4). Chronic sleep disturbance is associated with a multitude of outcomes such as poor emotion recognition (5), cognitive functioning impairments (6–7), and worse cardiovascular health (3). Nonetheless, sleep is a daily, salient, highly modifiable behavior that remains relatively plastic regardless of age. Much sleep research to date has embodied a deficit model approach, attending solely to markers of dysfunctional sleep or factors believed to characterize the absence of good sleep. Sleep health has emerged as a multidimensional, holistic approach to conceptualizing sleep which focuses on sleep across a continuum rather than sleep disturbance exclusively. Buysse (36) posits that sleep health is inclusive of sleep regularity, satisfaction, alertness, timing, efficiency, and duration. As such, there is a need to further explore and identify modifiable targets related to the continuum of sleep including healthy sleep.

Although a number of empirically supported interventions exist (e.g., CBT-I, stimulus control, sleep restriction; 8–9), sleep-related beliefs, such as sleep self-efficacy, remain largely unexplored as clinical tools for enhancing existing interventions. Sleep-related cognitions have surfaced as predictors of interest in the study of sleep. Specifically, dysfunctional beliefs about sleep (e.g., "It is impossible to attain good sleep") show promise as predictors of both insomnia and general sleep disturbance. Maladaptive cognitions related to sleep have also been shown to promote poor sleep outcomes due to their impact on broader sleep health (10–11). Indeed, several health behavior theories, including the theory of planned behavior (TPB; 12), the transtheoretical model (TTM; 13), and the health beliefs model (HBM; 14) identify cognitive factors contributing to behavioral outcomes, including sleep. For example, research utilizing the TPB suggests that better sleep-related attitudes significantly predict increased intentions to engage in healthy sleep behaviors (15). In another example, use of the TTM in sleep research has shown that determination of and intervention upon the Stages of Change are strongly associated with sleep disorder treatment adherence (16). Further, research applying the HBM to sleep behavior suggests that health beliefs, perceived barriers, and cues to action are all factors which significantly contribute to achieving healthy sleep (e.g., treatment adherence for obstructive sleep apnea; 17).

Although health behavior theories have identified some cognitive factors associated with sleep outcomes, self-efficacy is understudied in relation to sleep despite being a powerful predictor of other health behaviors. A longstanding body of literature has identified self-efficacy beliefs as important for a myriad of health behaviors and outcomes, including cardiovascular disease burden (18), diabetes disease self-management (19), and exercise program adherence and maintenance (20). Although self-efficacy beliefs have been the target of research across many areas of health behaviors, they have rarely been investigated in the domain of sleep. Limited studies to date have examined self-efficacy and sleep, however there is no research examining the unique role of sleep self-efficacy or sleep health as a broader outcome (21–22).

Social cognitive theory (SCT; 23–24) offers an additional comprehensive framework through which to further contextualize and investigate the role of self-efficacy in sleep outcomes. SCT posits that human behaviors are driven by personal, behavioral, and environmental determinants which are individually imposed, selected, or constructed. Self-efficacy beliefs, a key component of Bandura's (23–24) SCT, broadly refer to an individual's perception of their own ability to produce intended outcomes. General self-efficacy refers to the extent to which an individual believes that they can produce intended outcomes generally. Domain specific self-efficacy, taking into account this variability, refers to an individual's perception that they can produce intended outcomes within a *specific area*, such as health-related behaviors. Importantly, individuals' perceptions of their abilities to produce desired outcomes across situations and domains is more likely to be variable than a uniform trait (24). According to SCT, an individual's expectations of their own efficacy influences their interests, intentions, activity selection, outcome expectancies, and, ultimately, behavioral performance outcomes (23–24). Individuals with higher self-efficacy beliefs are more likely to successfully engage in target behaviors, including exercising more frequently (20), taking medication more regularly (25), and eating healthier (26). Whether such statements hold true for application of SCT across the sleep continuum remains unknown. Notably, Mead and Irish (27) discuss the importance not of both the application of theories of health behavior change (e.g., SCT) in sleep research and of investigation into how specific components of these theories impact sleep health. Investigating the role of one integral piece of SCT, self-efficacy, can help to identify specific theoretical components of health behavior change theory important for sleep.

An extensive body of research has examined the varying contributions of general self-efficacy versus domain specific self-efficacy, largely reporting the superiority of domain specific self-efficacy in explaining behavior. For example, in a study of perceived self-efficacy in health behaviors, although general self-efficacy beliefs (e.g., "I can solve most problems if I invest the necessary effort") were not predictive of smoking cessation, smoking specific self-efficacy beliefs were (e.g., "If you tried, how likely is it that you would succeed in giving up smoking?"). Although general self-efficacy across domains and smoking self-efficacy were highly correlated, only one's perceived self-efficacy to quit smoking was significantly associated with smoking cessation (28). Research using domain specific self-efficacy as a predictor of target health outcomes shows similar results across exercise (20), arthritis management (29), and pain control (30) domains. A small body of evidence points to the utility of focusing on specific sleep self-efficacy beliefs.

Low perceived sleep self-efficacy has been found to be a significant predictor of insomnia severity, with authors suggesting it may be an important target for the behavioral treatment of insomnia (21). A single study (31) has examined both general and domain-specific self-efficacies, across numerous health domains (e.g., positive affect, exercise, and sleep), and reported that both general and domain specific self-efficacies demonstrate significant associations with sleep quality. However, no known research has yet examined whether domain specific sleep self-efficacy adds significant information above-and-beyond general self-efficacy beliefs for sleep. According to SCT (23), self-efficacy is a means by which an individual can act as an agent with influence over outcomes. As such, sleep self-efficacy can serve as an index of the extent to which an individual believes that they are capable of exerting influence over their own sleep behavior to achieve healthy sleep. There are other important roles for self-efficacy in promoting higher acceptance of and adherence to behavioral treatments (21–22). Therefore, individuals with higher sleep self-efficacy may be more likely to accept a behavioral approach to treating insomnia versus solely a medicated approach. Additionally, lower levels of domain specific sleep self-efficacy may indicate a higher presence of dysfunctional beliefs about sleep that can contribute to insomnia symptomatology (21–22). Self-efficacy has been shown to have significant associations with an array of daily health behaviors (e.g., exercise, smoking, pain management) and sleep is an additional daily health behavior in which self-efficacy may play a meaningful role.

The current study aims to contribute to research on the importance of cognitive factors for sleep outcomes. Specifically, the current study aims to expand the present body of research on health behavior change and sleep health by empirically testing the hypothesis that domain specific self-efficacy beliefs about sleep will be more predictive of actual sleep behavior than general self-efficacy beliefs. As Bandura (23–24) clarified in his explanation(s) of SCT, self-efficacy cannot be expected to be uniform across domains. Thus, studies utilizing solely general self-efficacy do not take variability into account. For instance, an individual may feel generally capable on average, yet experience lower self-efficacy in certain domains. Focusing solely on general self-efficacy without considering domain variability represents an obstacle to (1) pinpointing which domains of efficacy are linked with behaviors and (2) determining which domains are tied to general or domain specific self-efficacy overall. As such, the current study seeks to establish the differential strength of associations between domain specific sleep self-efficacy and general self-efficacy and sleep. Furthermore, given the calls for better understanding of predictors of healthy sleep, we explored the relative benefits of general versus domain specific self-efficacy in relation to healthy sleep. It was expected that both general and sleep self-efficacies would emerge as significant predictors of sleep health, whereby higher general and sleep self-efficacies would be associated with better sleep. It was further expected that sleep self-efficacy would have stronger associations with sleep health than general self-efficacy.

Methods

Participants

Secondary data analyses were conducted utilizing data from the Investigating Sleep Longitudinally Across Normal Development (ISLAND) study, a web-based study broadly investigating intergenerational sleep and health (see 6 and 32 for previous reports from this study). Although a total of $N = 4,298$ individuals participated in the ISLAND study, only individuals with complete data on target measures were included in the final sample. The final sample of participants included 3,284 adults (45% male, 48.5% female, and 6.4% other-identifying) with an average age of 43 years ($SD = 16.72$ years) who were predominantly white (80.8%) and college-educated (63.3%). Further, participants reported average sleep health overall ($M = 7.59$, $SD = 2.69$), with a majority, 63.2%, of participants falling within the average to good range (scoring between 7 and 12 on the RU-SATED measure of sleep health). Refer to Table 1 for participant characteristics.

Procedure

The ISLAND study was approved by the Virginia Commonwealth University Institutional Review Board. ISLAND study data was collected via Amazon Mechanical Turk (MTurk). MTurk is an online platform which provides opportunities for study participation and compensation for interested individuals who meet set inclusion criteria. MTurk has been evidenced to be a reliable method of data collection (33). Inclusion criteria for the present study was limited to age 18 years or older and residence in the United States. Study recruitment aimed to acquire an equal number of men and women across the lifespan. Two items were included to check participant consistency and validity. Participants who did not pass both consistency and validity checks were excluded from the dataset. All participants were required to provide informed consent prior to study participation and were compensated 0.50 USD for their time. Previous research has shown that compensation amounts do not affect data quality in MTurk (33). Following providing informed consent, participants completed demographic and psychosocial wellness self-report measures alongside measures of general health, sleep health, general self-efficacy, and sleep self-efficacy.

Instruments

General self-efficacy—The General Self-Efficacy Scale (GSE; 34) is a 10-item scale assessing participants' beliefs in their general ability to influence desired outcomes. Responses are made on a 4-point Likert scale (1 = Not at all true; 4 = Exactly true) to such items as, "I can always manage to solve difficult problems if I try hard enough" and "I am confident that I could deal efficiently with unexpected events." Higher scores indicate higher levels of perceived general competence and ability to implement/achieve behaviors across goal-oriented scenarios broadly. Cronbach's alpha for the GSE in the present sample was .92.

Sleep self-efficacy—The Sleep Self-Efficacy Scale (SES; 35) is a 9-item scale assessing participants' beliefs in their ability to engage in productive sleep behaviors. Responses to the scale are made on a 5-point Likert scale to such items as, "[Rate your ability to] not allow a poor night's sleep to interfere with daily activities" and "[Rate your ability to] wake after a poor night's sleep without feeling upset about it." Higher scores indicate higher self-perceptions of ability to achieve good sleep. Internal consistency of the sleep self-efficacy (SSE) measure in the present sample was $\alpha = .88$.

Sleep health—The RegUlarity, Satisfaction, Alertness, Timing, Efficiency, Duration Scale (RU-SATED; 36) is a 6-item measure of general sleep health across six key dimensions: sleep regularity (daily sleep/wake time consistency); satisfaction with sleep; wake time alertness (oftenness of staying awake without dozing); sleep timing (oftenness of sleeping/trying to sleep between 2:00am and 4:00am); sleep efficiency (oftenness of spending less than 30 minutes awake nightly); and sleep duration (oftenness of sleeping between 7 and 9 hours per night). Responses are made on a 3-point Likert scale (0 = Rarely/Never; 2 = Usually/Always) to such items as, "Are you satisfied with your sleep?" In the present study, RU-SATED was divided into two separate factor outcomes in line with previous research which has investigated and confirmed this two-factor structure (32). Consequently, the two latent sleep outcome variables were represented by RU-SATED measure items indicating sleep quality/quantity (satisfaction, efficiency, duration; items 2, 5, and 6) and circadian rhythm (regularity, alertness, timing; items 1, 3, and 4).

The RU-SATED has demonstrated good initial psychometric properties (32). Higher scores indicate better sleep health. Cronbach's alpha for the RU-SATED scale in the present sample was .64. Descriptive statistics for all sleep health dimensions included in the RU-SATED measure are included in Table 2.

Data Analyses

SPSS v.27 and AMOS v.27 (37) softwares were utilized for all analyses. A structural equation model (SEM) was used to evaluate the direct pathways between general self-efficacy, sleep-self efficacy, and sleep. Specifically, GSE and SSE were included in the model as latent variables composed of their respective measure items and sleep health was conceptualized as two latent outcome variables representing a continuum of sleep health assessed by the RU-SATED. The direct effects of GSE and SSE on sleep health were assessed using 2,000 bootstrapped samples and a 95% bias-corrected confidence interval.

Prior to running the SEM analysis, data were assessed for multivariate outliers utilizing the Mahalanobis D^2 statistic, with a cutoff of 18.47. Only 14 out of 3,284 cases were assessed to be above this cutoff point, approximately .43% of the total cases. As outliers comprised less than 1% of the total data, outlier cases were not transformed and were retained for data analyses. Utilizing cutoffs recommended by Tabachnick and Fidell (38), univariate normality tests revealed that the distributions of the remaining measured variables were not significantly skewed or kurtotic. Mardia's coefficient of 2.99 (compared to a critical ratio of 12.367) further suggested that the data do not significantly deviate from multivariate normality. There were no missing data among target variables.

First, a measurement model was conducted in order to determine the extent to which the chosen indicator variables represented the latent general self-efficacy, sleep self-efficacy, and sleep health constructs as well as to evaluate the strength of paths within the model (38). Goodness of Fit for the SEM was established utilizing recommended guidelines for fit indices, including RMSEA (≤.08; 90% CI [.03, .08]), RMR (<.05), and CFI, GFI, AGFI, NFI, IFI, and TLI indices (≥.95; 39). The structural model was then assessed. As there is evidence to suggest that a bi-directional relationship exists between general- and realm-specific self-efficacies (28; general self-efficacy and sleep self-efficacy were allowed to correlate in the SEM analysis. Correlations between study variables are presented in Table 3.

Results

Measurement Model

Regarding fit for the measurement model, the χ^2 test was statistically significant, $\chi^2(269)$ = 5,028.69, $p = .00$, suggesting that the model failed to fit the data. However, the significance of the χ^2 is known to be overly sensitive to large sample sizes (38). All other fit indices suggested adequate model fit. NFI, IFI, CFI, GFI, RFI, TLI, and AGFI were all >.85. Additionally, the RMSEA also indicated good model fit at .07. Overall, these indices suggest that the measurement model fit the data adequately. No modifications were conducted to improve the model. Further, As fit indices indicated adequate to good overall model fit, examination of the structural model was justified (38).

Structural Model

As both measurement and structural models utilized the same parameters, fit indices for the structural and measurement models were identical. The structural model revealed that general self-efficacy had a significant, direct association with the sleep quality/quantity ($\beta = -.08$, $p < .001$) and circadian rhythm ($\beta = .18$, $p < .001$) RU-SATED factors. . Thus, higher levels of general self-efficacy were associated with worse sleep quality/quantity, while higher levels of general self-efficacy were also associated with better circadian rhythm sleep health factors. Further, sleep self-efficacy surfaced as a significant predictor of both sleep quality/quantity (β=.88, p<.001) and circadian rhythm ($\beta = .44$, $p < .001$) RU-SATED factors. Specifically, higher sleep self-efficacy was associated with better sleep quality/quantity and circadian rhythm sleep health factors. Notably, sleep self-efficacy showed stronger associations with sleep health factors compared to general self-efficacy. The SEM is presented in Figure 1 below.

Additionally, all manifest indicators (scale items) showed significant associations with their higher-order latent factors (General Self-Efficacy and Sleep Self-Efficacy) suggesting that these items were representative of general and sleep self-efficacies in the current model. See Figures 2 and 3 below.

Discussion

The current study examined the unique roles of general and sleep self-efficacies in predicting sleep health outcomes. As hypothesized, both general and sleep self-efficacies emerged as significant predictors of sleep health. Specifically, results suggest that (1) greater general and sleep self-efficacies are associated with better sleep alertness, regularity, and timing and (2) higher levels of sleep self-efficacy and lower levels of general sleep self-efficacy are associated with better sleep satisfaction, efficiency, and duration.

The inverse and low positive associations between general self-efficacy and quality/quantity and circadian rhythm sleep health factors, respectively, are consistent with prior research failing to show strong or significant associations between general self-efficacy and a host of health behaviors (20, 28–29), establishing sleep as an additional domain in which attention to domain specificity is an important consideration. The findings of the current study further confirm Bandura's (23–24) assertion that domain specificity is important when considering the role of self-efficacy in performance outcomes. Although sleep is a universal, daily behavior, the present results suggest that there is something unique about beliefs about one's ability to engage in behaviors producing healthy sleep, compared to beliefs about one's general competence, for sleep outcomes. Indeed, general self-efficacy directed interventions may not be ideal for improving sleep health outcomes and may even decrease subjective sleep quality and quantity. The present study positions sleep self-efficacy as an important factor to consider when conceptualizing sleep health.

This is the first study to identify the unique importance of domain specific sleep self-efficacy for the sleep health continuum and adds to existing research establishing the importance of domain specificity in other health domains (18–19). Through establishing a link between sleep self-efficacy and sleep functioning, there is the potential to translate theory into practice. By looking at other studies that have explored the utility of self-efficacy based interventions for other health conditions, the potential for sleep self-efficacy becomes evident.

For example, in an intervention study on short-term breastfeeding outcomes, participants were given workbooks containing sections based on Bandura's (23–24) sources of self-efficacy information (e.g., performance accomplishments/mastery experiences, vicarious experience, and verbal persuasion) and were asked to journal their thoughts throughout their participation. Importantly, women reporting higher levels of self-efficacy breastfed significantly longer and more frequently compared to women in the control group (39). The aforementioned study may offer a template for incorporating domain sleep self-efficacy into interventions to promote healthy sleep. For example, such a sleep self-efficacy intervention may incorporate: exploring and incorporating past successful skills into future sleeping behaviors (mastery experiences); listening to/reading about others' sleep obstacles and resiliencies (vicarious experiences/social modeling); and generating encouraging self- and other- statements to bolster self-confidence and social support(s) utilization (verbal persuasion exercises), along with discussion of emotional and physiological states (23, 39). Utilizing Bandura's (23–24) self-efficacy framework, increased sleep self-efficacy would translate into heightened positive sleep behavior outcome expectations, further translating into engagement in and adherence to recommended sleep behaviors. Such a sleep self-efficacy targeted intervention may be incorporated into existing empirically supported interventions for sleep disturbance, such as CBT-I (8–9), or for sleep health promotion efforts to bolster short- and long-term treatment benefits.

The present study is not without limitations. The current investigation was limited in that it relied exclusively on self-report measurement (i.e., two sleep health factors formed the latent sleep variable). Future investigations may employ a combination of self-report and actigraphic sleep indices to formulate a more complete sleep health picture. Study data were also collected via an internet platform, increasing the chance that data may have been influenced by environmental factors (e.g. temperature, background noise) more readily controlled for in structured lab environments. Additionally, Mturk may produce biased samples. Indeed, alongside requiring internet access to view and complete studies, a majority of individuals residing within the United States completing studies via Mturk identify as female with an average age of 30 years old. However, Mturk remains a valid data collection tool (33). Importantly, the overall reliability of the sleep health scale utilized in the present study was fairly low. Low reliability of this scale may reflect (1) a limited number of items assessing sleep health domains and (2) the wide array of behaviors assessed under the general term of sleep health. Nonetheless, the use of scale assessing multiple components of sleep adds to our understanding of overall sleep health. Further, data utilized for the current study are cross-sectional, thus preventing evaluation of causality and/or longitudinal associations between target variables. The present study examined self-efficacy from the larger umbrella of constructs comprising SCT. Future investigations may consider utilizing the theoretical framework in its entirety to determine whether SCT has promise in further expanding our understanding of and interventions for sleep health.

The current study presents a novel investigation into the roles of general and sleep self-efficacies in sleep, further highlighting the prominence of domain specificity in the study of self-efficacy and sleep health. Findings suggest that self-efficacy based intervention principles may show promise as intervention components for improving individuals' sleep health. As such, findings support continued research into sleep self-efficacy with a long-term goal of developing and testing intervention techniques geared toward improving sleep self-efficacy as a means to produce positive sleep behavior changes.

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Appendix

Table 1.

Sample demographic characteristics (*N*=3,284).

Demographic Characteristics		Frequency	%
Race			
	White	2,652	80.8%
	Black	263	8.0%
	Native American	52	1.6%
	Asian	208	6.3%
	Pacific Islander	15	0.5%
	Latino	216	6.6%
	Other Race Identity	55	1.7%
Education			
	Less than high school	20	0.6%
	High school graduate	238	7.2%
	GED or high school equivalent	96	2.9%
	Some college	853	26.0%
	2-year Associate degree	387	11.8%
	4-year Bachelor's degree	1,171	35.7%

Demographic Characteristics		Frequency	%
	2-year post-Bachelor's degree (Master's)	372	11.3%
	4-year post-Bachelor's degree (Doctorate)	147	4.5%

Notes: Participants were allowed to endorse more than one race(s).

Table 2.

Descriptive statistics for RU-SATED sleep health dimensions (*N*=3,284).

Dimension	M (SD)
Regularity	1.37 (.73)
Satisfaction	1.05 (.73)
Alertness	1.40 (.73)
Timing	1.59 (.66)
Efficiency	1.09 (.84)
Duration	1.10 (.84)

Table 3.

Descriptive statistics and bivariate correlations between target variables (*N*=3,284).

	M (SD)	1.	2.	3.	4.
1. Age	42.74(16.72)	--			
2. RU-SATED	7.59 (2.69)	.14**	--		
3. GSE	30.27(5.33)	.10**	.29**	--	--
4. SSE	29.32(8.13)	.13**	.62**	.41**	–

Notes: RU-SATED= RegUlarity, Satisfaction, Alertness, Timing, Efficiency, Duration; GSE= General Self-Efficacy Scale; SSE= Sleep Self-Efficacy Scale.

** p<.001.

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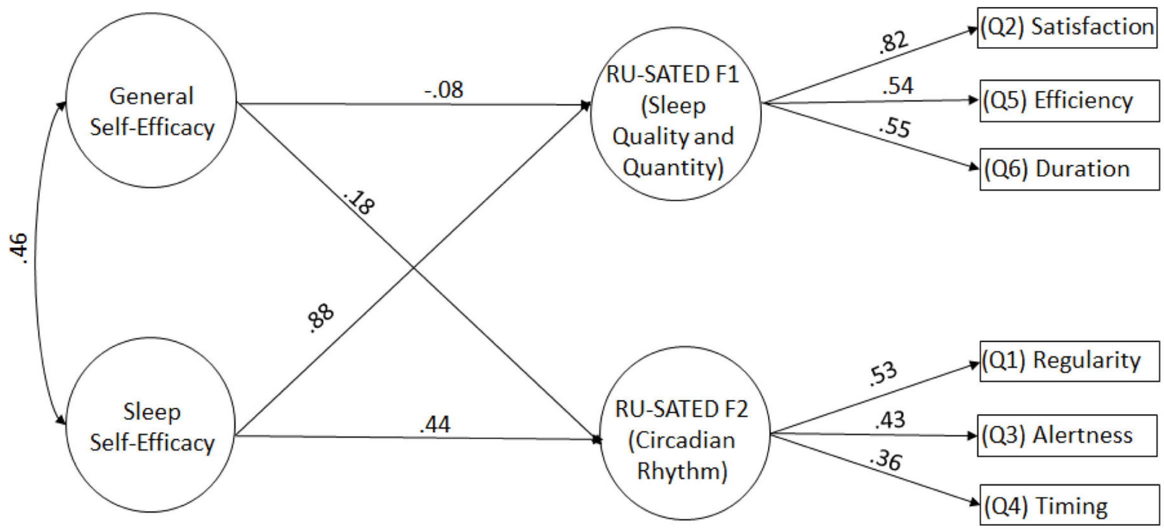

Figure. 1.
Structural equation model. Latent variables are represented with circles and manifest variables are represented with rectangles. Values are standardized regression weights. (RU-SATED= RegUlarity, Satisfaction, Alertness, Timing, Efficiency, Duration; F1= Factor 1; F2= Factor 2; all included standardized regression weights are significant at $p < .001$)

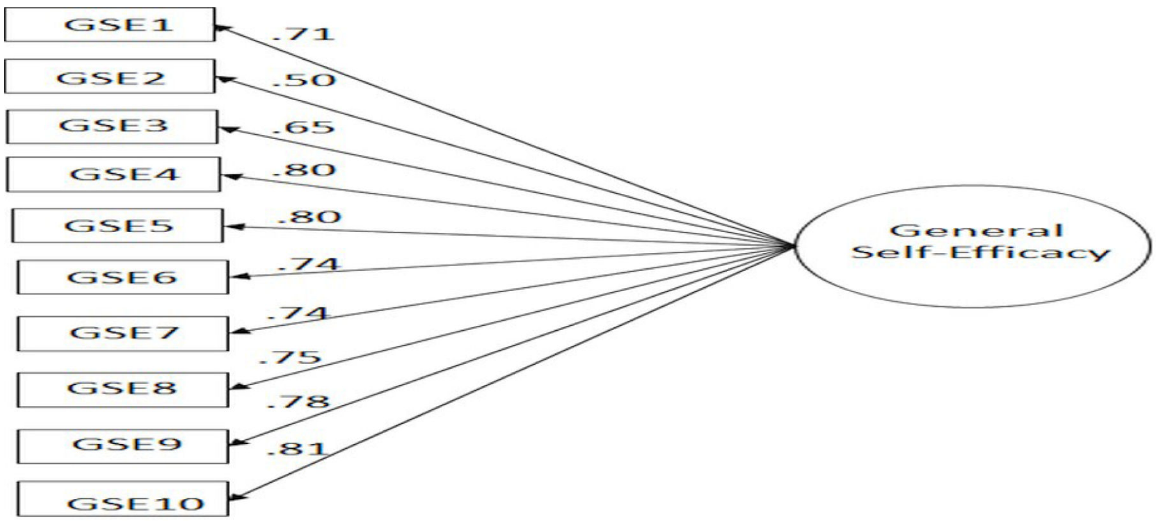

Figure. 2.

Structural equation model of General Self-Efficacy Scale item loadings (GSE#= General Self Efficacy Scale item number). Latent variables are represented with circles and manifest variables are represented with rectangles. Values are standardized regression weights. All included standardized regression weights are significant at $p < .001$.

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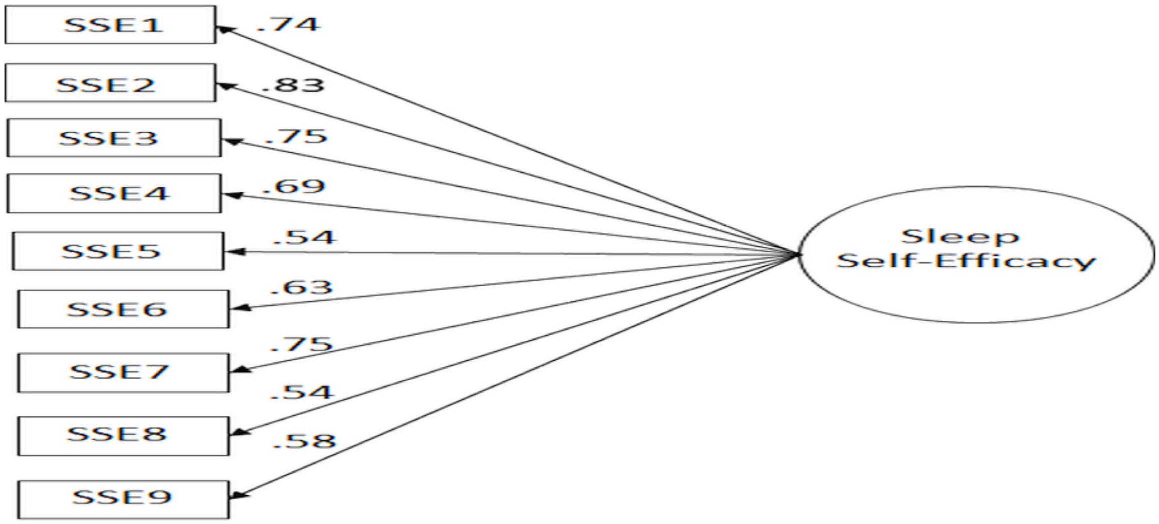

Figure. 3.
Structural equation model of Sleep Self-Efficacy Scale item loadings (SSE#= Sleep Self Efficacy Scale item number). Latent variables are represented with circles and manifest variables are represented with rectangles. Values are standardized regression weights. All included standardized regression weights are significant at $p < .001$.