Abstract

Sleep health is a concern among college students, yet message strategies that effectively motivate healthy sleep remain understudied. This study experimentally tested how depictions of self-efficacy and barriers within a health testimony, and the order of information presented, influence behavioral intentions toward healthy sleep among men and women. A 2 (barriers: high vs. low) × 2 (efficacy: high vs. low) × 2 (order: efficacy first vs. barriers first) x 2 (gender: men vs. women) between-subjects online experiment was conducted with 318 college students. No significant differences were found for the main message manipulations; however, there were significant interactions involving information order and gender. Presenting efficacy information first accompanied with weak sleep barriers was most effective. However, men reported the highest sleep intentions in the strong barriers and low self-efficacy condition, a pattern not found among women. Findings underscore the importance of both message content and sequencing in sleep communication and suggest gender-specific processing patterns.

Keywords: college student sleep, health belief model, gender effects, ordering effects, online experiment

Barriers, Beliefs, and Bedtime: Message and Gender Effects on College Students' Sleep Intentions

College students frequently experience insufficient sleep, with estimates suggesting that 60–70% have poor sleep quality (Buboltz & Soper, 2001; Gardani et al., 2022; Hershney & Chervin, 2014). The immediate and sustained consequences of poor sleep are severe. In addition to immediate concerns of reduced mental health, immune function, and academic success (Gao & Scullin, 2024; Hassan et al., 2025; Lueke & Assar, 2024; Vestergaard et al., 2024), prolonged sleep issues are associated with economic burdens, cancer, and neuro- and cardiometabolic disorders, such as diabetes (Lim et al., 2023). For example, Parrilla et al. (2025) found that college students who reported fewer than 7 hours of sleep per night exhibited lower executive function, which is associated with reduced cognitive control and diminished goal-directed behavior. Despite extensive research documenting the risks of poor sleep, the issue remains globally underprioritized (Lim et al., 2023), prompting calls for targeted interventions, particularly among college students (Gardani et al., 2022; Hassan et al., 2025; Parrilla et al., 2025; Saruhanjan et al., 2021).

The health belief model (HBM) has demonstrated effectiveness in predicting student sleep intentions (Alamir et al., 2022; Yao et al., 2025) and offers multiple avenues for health messaging. Although the model encompasses several key perceptual variables (e.g., perceived severity; Champion & Skinner, 2008; Rosenstock, 1974), this study focuses on perceived barriers and self-efficacy due to their relevance to college students' sleep behaviors and the feasibility of isolating their unique effects. According to the HBM, messages that directly address common obstacles while demonstrating that they can be overcome may reduce perceived barriers and strengthen confidence in adopting healthier sleep practices. Accordingly, we

examine the direct and interactive effects of these two HBM-based message strategies, as well as potential moderators, including gender and message sequencing. The findings aim to advance theoretical understanding of how HBM-based sleep messages are processed and to inform more effective communication strategies for promoting sleep health.

Literature Review

Perceived Barriers of Healthy Sleep

Perceived barriers refer to the costs, obstacles, or difficulties individuals anticipate when adopting a recommended behavior, and they are considered a central determinant of whether people take action (Champion & Skinner, 2008). Supporting the importance of this construct, a meta-analysis of 18 longitudinal studies found that perceived barriers were among the strongest and most consistent predictors of subsequent health behavior (Carpenter, 2010). In a sleep context, perceived barriers reflect the obstacles and competing demands that make it difficult to carry out healthy sleep practices, and they tend to operate as a negative influence, such that greater perceived barriers are associated with poorer sleep-related outcomes (Alamir et al., 2022; Knowlden & Sharma, 2014; Robbins & Niederdeppe, 2014; Yao et al., 2025). Academic and work-related stress, misconceptions about weekend “catch-up” sleep, environmental disruptions, and nighttime technology use are common barriers among college students (Nawlin et al., 2025; Owen et al., 2017; Wang et al., 2023; Weeraman & Wasala, 2025). Despite the strong correlational evidence linking perceived barriers and sleep-related outcomes, there is a lack of research experimentally testing the causal relationship.

Even so, prior research offers a solid foundation for anticipating a negative association, in alignment with the HBM’s prediction that higher perceived barriers should hinder behavioral adoption (Rosenstock, 1974). In sleep research, students who perceive more obstacles to healthy

sleep tend to report poorer sleep-related outcomes. For instance, Knowlden and Sharma (2014) found that perceived barriers significantly and negatively predicted sleep behavior among employed college students, and Yao et al. (2025) likewise reported that greater perceived barriers were associated with poorer sleep quality. Similar patterns have emerged in other health contexts involving college student populations. Donadiki et al. (2014) found that female university students who perceived greater barriers, including both general and vaccination specific barriers, were more likely to remain unvaccinated. Likewise, H. Kim et al. (2012) showed that perceived barriers significantly predicted lower behavioral intention for healthy eating among college students. Collectively, this body of work suggests that when students see stronger obstacles to carrying out a health behavior, their motivation to engage in that behavior may diminish. In the sleep context, then, heightening the salience of barriers to good sleep may reduce students' intentions to improve their sleep habits:

> **H1:** Messages indicating weak barriers to sleep will be more effective than those featuring strong barrier in prompting sleep behavioral intentions.

Self-Efficacy of Healthy Sleep

Although self-efficacy was not initially proposed within early conceptions of the HBM, it was later incorporated (Rosenstock et al., 1988) and has since been supported across a wide range of health contexts (Sheeran et al., 2016; Strecher et al., 1986). Defined as a person's belief in their capability to perform a behavior, self-efficacy has been linked to behavior adoption and maintenance in areas such as healthy eating, smoking cessation, weight control, exercise, contraception, and alcohol use reduction (see Strecher et al., 1986 for review). Past research supports a positive association between self-efficacy and sleep outcomes. In correlational work, higher self-efficacy has been linked to better subjective sleep quality and greater sleep efficiency

(Byun, 2019). For example, Zhang et al. (2020) found in a longitudinal study that action self-efficacy positively predicted maintenance self-efficacy, which in turn predicted action planning and coping planning for sleep hygiene behavior. Research additionally highlights the importance of domain specificity, such that sleep-specific self-efficacy may be a more proximal predictor of sleep-related outcomes than general, trait-like efficacy beliefs (Ghose, 2022).

Together, these findings suggest that self-efficacy plays an important role in whether people intend to engage in health-promoting behavior. Given this evidence, we hypothesize that strong depictions of sleep-related self-efficacy will encourage behavioral intention by successfully demonstrating and modeling the behavior. In other words, when exposed to messages that feature or make salient others with high self-efficacy, or capability, in combating the sleep issues, we expect audiences to be more moved than when low efficacy is presented:

H2: Messages modeling high self-efficacy will be more effective than those featuring low self-efficacy in prompting sleep behavioral intentions.

Interaction Between Barriers and Self-Efficacy

Perceived barriers and self-efficacy are often treated as independent cognitive predictors in the HBM (Knowlden & Sharma, 2014; Robbins & Niederdeppe, 2014; Yao et al., 2025); however, research in other frameworks have identified relationships between the two constructs (Bossard & Song, 2018; Bulger & Mellor, 1997; Swanson & Woitke, 1997). For example, in a study of HPV preventive behaviors, Bossard and Song (2018) found a significant association between perceived barriers and self-efficacy, such that individuals who reported lower perceived barriers also reported higher self-efficacy. When information targeting both beliefs is presented within a single message, the two constructs may further interact to influence behavioral intentions.

As previously discussed, perceived barriers reflect the obstacles that hinder behavioral adoption, whereas self-efficacy reflects individuals' subjective assessment of their ability to perform a recommended behavior. When individuals encounter messages depicting sleep-related barriers as either strong or weak, the depicted ability to address those challenges may shape how the information is interpreted. Stated differently, individuals may evaluate barrier information in relation to efficacy cues, and vice versa, ultimately influencing message outcomes. We could expect, for instance, that a message portraying minimal challenges and high efficacy for achieving healthy sleep would encourage behavioral intentions more than a message depicting sleep as highly challenging and difficult to overcome. Given the limited research on the combined influence of efficacy and barrier information on behavioral intentions, both generally and in the context of sleep, we pose the following research question:

RQ1: Do depicted barriers and self-efficacy information interact to influence sleep behavioral intentions?

Message Sequencing

The persuasive impact of message sequence is an important yet underexamined issue in health communication. To date, no prior research appears to have directly tested whether the order of self-efficacy and barrier information shapes persuasive outcomes in sleep intentions. Still, related work on the sequencing of threat and coping information suggests that message order can meaningfully influence how individuals respond to health appeals. Often grounded in protection motivation theory (Rogers, 1975) and the extended parallel process model (Witte, 1992), prior work suggests the arrangement of message components affect both defensive processing and persuasive effectiveness. For example, Prentice-Dunn et al. (2001) examined message order in breast cancer communication and found that sequence altered maladaptive

coping responses. Specifically, when threat information was presented first, the high threat message produced less hopelessness and less reliance on religious faith than when coping information was presented first. The same study also found that exposure to coping-first messages reduced fear-based defensive responses while preserving persuasive effects (Prentice-Dunn et al., 2001). Although that study did not show an overall advantage of one sequence across all outcomes, it demonstrated that message order can shape how recipients cope with threatening health information. Likewise, Brown and West (2015) found that the effects of sequence depended on message characteristics. In their anti-alcohol experiment, presenting the behavioral recommendation before the threat component increased persuasion when the message included highly distressing imagery, in part because that sequence reduced attentional avoidance of the threat content. At the same time, the traditional threat first sequence was more persuasive when the imagery was less distressing.

These findings suggest that message sequence can influence persuasive outcomes, but that its effects may vary across contexts and message designs. Applied to sleep communication, presenting self-efficacy information first may help students feel more capable of handling sleep-related obstacles before encountering barrier-focused content, whereas presenting barriers first may heighten defensiveness or reduce receptivity. Because this possibility has not been directly examined in the present context, we address it as a research question:

RQ2: Does the order of message components (self-efficacy first vs. barriers first) influence the effects of the message on sleep behavioral intentions?

Gender Effects

A final objective was to investigate whether gender differences exist in the impact of the message. The rationale for including gender as a potential factor in how sleep messages are

received stems not only from extensive research documenting gender differences in sleep disorders and behaviors (e.g., Lin et al., 2008; Tsai & Li, 2004) but also from similar findings in the broader health communication literature (e.g., Gabbard-Alley, 1995; Scull et al., 2022). For example, Kim and Chua (2022) found in a study on cigarette warning labels that women were more influenced by gender-specific low-threat messages than high-threat messages, whereas this pattern was not observed for men. Another study found that women responded more favorably to a prevention-focused exercise message (i.e., vigilant delivery), whereas men rated a promotion-focused message (i.e., eager delivery) as more effective (Jacks & Lancaster, 2015).

Related to the present study, no known research has outlined gender differences for specific HBM constructs related to sleep. Although Alamir et al. (2022) reported gender as the only demographic variable significantly associated with HBM-related outcomes, the specific constructs responsible for this relationship were not detailed. Research in other behavioral domains has documented gender differences in HBM construct scores; however, findings have not revealed a consistent pattern. For example, Zetu et al. (2014) found that women reported higher self-efficacy and lower perceived barriers toward maintaining oral health compared to men. In contrast, Sheng et al. (2023) found that Chinese men reported lower perceived barriers and higher self-efficacy toward exercise than women. Thus, while there is suggestive evidence that men and women differ in how they perceive and respond to health messages, the lack of sleep-specific research and inconsistent findings across other behavioral domains do not allow specific predictions. The last research question is thus asked:

RQ3: Does gender influence the effects of the message on sleep behavioral intentions?

Method

Participants and Procedure

A 2 (efficacy strength: strong vs. weak) x 2 (barrier strength: strong vs. weak) x 2 (order: efficacy vs. barriers information first) x 2 (gender: woman vs. man) between-subjects, online experiment was conducted with U.S. college students (*N*=318). An a priori power analysis using G*Power determined a sample size of 351 participants was required for detecting a small effect size (f=.15) with 80% power at an alpha level of .05. Initially, 400 participants were recruited by the Prolific research panel; however, 82 were removed due to data quality concerns (i.e., survey completed in less than one minute; failed at least two attention checks; spent less than one second on stimuli).

An equal distribution of men (51.6%) and women (48.4%) was recruited. Participants were, on average, 27.91 years old (*SD*=9.00) and mostly reported being undergraduate students (90.2%). The sample self-identified as white (51.8%), Black/African American (25.6%), Asian (12.5%), American Indian (2.1%), Arab or Middle Eastern (0.9%), Native Hawaiian/Pacific Islander (0.6%), and other/preferred not to disclose (2.7%). Forty-seven participants (14.3%) identified as Hispanic or Latino/a. Most participants lived in some form of non-university housing (79.0%). Lastly, nearly all U.S. states and territories were represented (excluding Hawaii, New Hampshire, Puerto Rico, South Dakota, Vermont, and Wyoming). California (11.9%), Florida (10.7%), and Texas (10.4%) were the most represented states.

After providing informed consent and completing some demographic items (college student status, gender, and race), participants were randomly assigned to read a health testimonial that varied in its depiction of testimony source gender, efficacy strength, barrier strength, and information order. After reading the testimonial, participants responded to manipulation checks assessing their retention and perceptions of the story, and completed

outcome, covariate, and remaining demographic questions. Participants were lastly compensated and debriefed.

Stimuli

Four testimonials (297–300 words) were created to depict a college student's sleep struggles, varying in efficacy and barrier strength, as well as message sequencing and source gender. To simplify the design, avoid potential effects from viewing messages delivered by a different gender (Embacher et al., 2017), and leverage the benefits of gender-matched designs (K. Kim & Chua, 2022), the source in each testimonial was matched to participants' self-disclosed gender. Women participants read about a student named Elizabeth, whereas men participants were given a testimony about Daniel. No other differences to the testimony were made except regarding the manipulations, i.e., only the names and pronouns were altered, but not any other characteristics of the source. Figure 1 presents the testimonial stimuli and highlights the manipulated content.

[FIGURE 1]

The strength of sleep barriers was manipulated by varying the level of responsibilities and impediments described. In the strong-barrier condition, the student faced numerous demands (e.g., a heavy course load and persistent time pressure), whereas in the weak-barrier condition, the student had sufficient time to focus on coursework.

The strength of efficacy was manipulated by depicting the student as either highly capable of engaging in healthy sleep practices (strong self-efficacy condition) or as struggling to perform these behaviors (weak self-efficacy condition). For example, in the strong self-efficacy condition, the student maintained a consistent sleep schedule, meditated, and limited caffeine intake; in the weak self-efficacy condition, the student had difficulty sustaining these habits.

The order of manipulations was manipulated such that half of the participants were randomly exposed to the efficacy information first, while the others were exposed first to the barrier information. Testimonials were constructed to remain coherent and logical regardless of order.

Stimuli Pilot Test

The stimuli were pilot tested with a separate college sample (N=173) to ensure successful manipulation and consistency in understandability. Participants were asked two questions regarding the students' efficacy in the situation (e.g., "Daniel/Elizabeth feels confident that he/she can improve his/her sleep quality") and two items related to the perceived barriers (e.g., "Daniel/Elizabeth is facing challenges getting sleep") using 5-point Likert scales (1=*strongly disagree*; 5=*strongly agree*). The items were combined into two separate scores, respectively reflecting efficacy (r=.75, p<.01; M=3.74, SD=0.86) and barriers (r=.68, p<.01; M=4.00, SD=0.93). Participants also used 5-point semantic differential scales to rate the testimony's understandability (i.e., 1=*hard to understand, confusing, and poorly written*; 5=*easy to understand, clear, and well written*), which was condensed into a single item (α=.84, M=4.54, SD=0.59). Lastly, because the testimony featured a student's perspective that could be defined as a narrative, two important narrative mechanisms were measured: transportation, defined as how immersed participants became in the story, and perceived similarity with the depicted student (Chen et al., 2024). Transportation was measured using five items adapted from Appel et al. (2015) (α=.75, M=3.77, SD=0.66), and perceived similarity was measured using four items adapted from McCroskey et al. (1975) (α=.89, M=3.54, SD=1.02). Both constructs were assessed on 5-point Likert scales (1=*strongly disagree*, 5=*strongly agree*). As intended, independent samples t-tests found that those in the strong self-efficacy condition perceived the student as

having greater self-efficacy (M=4.09, SD=0.61) than the weak self-efficacy condition (M=3.41, SD=0.93), $t(171)=5.66$, $p<.001$. Likewise, those in the strong barrier condition perceived the student as having greater barriers (M=4.19, SD=0.76) than the weak barrier condition (M=3.81, SD=1.04), $t(171)=2.72$, $p = .004$. Understandability of the testimony, narrative transportation, and perceived similarity were not significantly different between the efficacy ($p_{understandability}$=.50, $p_{transportation}$=.17; $p_{similarity}$=.46), barrier ($p_{understandability}$=.45; $p_{transportation}$=.06; $p_{similarity}$=.98), and order ($p_{understandability}$=.46; $p_{transportation}$=.49; $p_{similarity}$=.06) conditions.

Measures

Behavioral intentions to improve sleep quality were measured using three items assessing how likely participants would be to try the two actions discussed in the testimonial and "other" behaviors to improve their sleep quality (1=*extremely unlikely*; 5=*extremely likely*). The items were combined into a single item (α=.65, M=3.85, SD=0.84).

Participants' current sleep issues, labelled sleep factors, were measured using eight dichotomous items (yes/no) assessing whether, in the past month, they engaged in or met criteria that may affect sleep (e.g., alcohol consumption, having children). Responses were summed to create an index ranging from 0–8, with higher scores indicating more disruptive sleep factors (M=3.06, SD=1.40).

Other demographic covariates included age, current cumulative grade point average (1=0.0–12=4.0), whether participants currently live in university housing (=1; non-university house=0), race (1=white; 0=not white), ethnicity (1=Hispanic/Latino/a, 0=not Hispanic/Latino/a), and whether they were an undergraduate student (=1; 0=graduate student).

Results

A preliminary linear regression was conducted to identify significant predictors of sleep behavioral intentions within the sample. Undergraduate status, GPA, ethnicity, age, and living situation were nonsignificant predictors of behavioral intentions (p>.05) and were therefore excluded from subsequent analyses. As a result, only sleep factors and race (1=white) were controlled for in the main analysis. A univariate analysis of covariance (ANCOVA) was conducted to examine the direct and interaction effects of gender and the message manipulations on sleep behavioral intentions. See Table 1 for ANCOVA test results and Table 2 for descriptive statistics for each experimental condition.

[TABLE 1]

[TABLE 2]

H1 and H2 predicted significant main effects of the barrier and self-efficacy conditions on behavioral intentions. Participants in the strong self-efficacy and low-barrier conditions reported higher behavioral intentions toward improving sleep, but these differences were not statistically significant. H1 and H2 were rejected.

RQ1 asked whether there would be an interaction between the self-efficacy and barrier manipulations on subsequent behavioral intentions. Although participants in the high-efficacy and low-barrier condition reported the highest behavioral intentions following exposure to the testimonial, the interaction effect was not statistically significant.

RQ2 and RQ3 asked whether message sequencing and gender would impact message effectiveness. Two significant effects emerged: a two-way interaction between barrier and order and a three-way interaction between gender, barrier, and self-efficacy. For the barrier x order interaction, pairwise comparisons found that behavioral intentions were strongest if the efficacy information was presented first (M=4.03, SE=.09) in the low barrier condition (p=.017). This

condition was significantly different than in the barriers first conditions (*M*=3.72, *SE*=0.09) and the high barrier conditions (*M*=3.74, *SE*=0.09). For the gender x barrier x self-efficacy three-way interaction, pairwise comparisons found in the strong self-efficacy and high barrier condition, men (*M*=3.54, *SE*=0.13) had significantly lower behavioral intentions compared to women (*M*=4.08, *SE*=0.13; *p*=.003). On the other hand, men's behavioral intentions were highest in the high barrier and low self-efficacy (*M*=3.90, *SE*=0.13), which was significantly higher than men in the high barrier/strong self-efficacy condition (p=.047).

Although the univariate test did not indicate an overall gender x efficacy interaction effect, it is worth noting that pairwise comparisons revealed a significant difference in means for women compared to men in the high efficacy condition (*p*=.006). Specifically, when exposed to high-efficacy messages, women subsequently reported greater intentions to practice healthy sleep practices (*M*=4.03, *SE*=0.09) compared to men (*M*=3.68, *SE*=0.09).

Discussion

This study tested the effects of a health testimonial differing in depicted barriers and self-efficacy toward getting sleep for college students. To our knowledge, this is the first time a study has experimentally manipulated barriers and self-efficacy toward sleep to see their direct influences on subsequent behavioral intentions in this population. To better understand the processing and effects of the testimonials, we additionally tested the impact of message sequence (i.e., differing the order of information presented) and gender. Although the strength of the sleep barrier and self-efficacy manipulations did not significantly influence behavioral intentions, notable interactions emerged for message sequence and gender, offering insights for both the HBM and sleep communication literatures.

Among participants in the low-barrier conditions, significant differences emerged depending on whether self-efficacy information was presented first. Regardless of whether the efficacy information depicted high or low ability, being primed to consider a student's capability to address sleep challenges influenced subsequent message acceptance, particularly when the barriers depicted were weak. These findings contribute to ongoing theoretical discussions about the role of information order in persuasive messages, which have largely focused on the sequencing of threat and self-efficacy information (Brown & West, 2015; Hall et al., 2006; Prentice-Dunn et al., 2001). Health communication research generally recommends a threat-to-efficacy format, in which the health consequences are presented before the recommended behavior (Brown & West, 2015). This perspective is consistent with drive-reduction models, whereby aroused fear or defensive processing of health messages may be reduced once individuals are provided with actionable steps to address the threat (Hall et al., 2006). On the other hand, some research suggests that the opposite approach – presenting efficacy information first – may be more effective for individuals already engaging in the undesirable behavior (Keller, 1999) or for audiences in highly distressing situations (Brown & West, 2015), as the recommendations may temper or reduce initial defensiveness and attention to the threatening content.

The present findings suggest that when messages depict relatively low barriers to achieving healthy sleep, and therefore potentially signal a lower level of external threat, participants respond more positively when first introduced to content describing how others are actively addressing the issue (i.e., self-efficacy cues). In these cases, efficacy information may prime individuals to interpret subsequent barrier information as manageable rather than discouraging, or at minimum as something worth attempting to overcome. However, when

barriers were depicted as high, potentially signaling a more threatening or constrained situation, the order of information no longer influenced behavioral intentions. In such contexts, the perceived difficulty of the behavior may dominate message interpretation. Although this pattern deviates from some previous findings suggesting that a recommendation-threat sequence may be most effective in highly distressing situations (Brown & West, 2015), it may be explained by the nature of sleep, where barriers are often structural or lifestyle-related rather than acute health threats eliciting fear. Additionally, it is possible that in the specific context of sleep, barrier information does not register as a threat and therefore does not trigger the defensive processing assumed in much of the message sequencing literature (Brown & West, 2015; Hall et al., 2006; Keller, 1999; Prentice-Dunn et al., 2001). Assessing participants' emotional reactions to the messages, such as whether fear or concern is elicited, may help clarify the mechanisms at play. Regardless, these results highlight the importance of message sequencing in sleep communication, particularly when barrier and self-efficacy information are both included.

Gender was also found to interact with self-efficacy and sleep barrier information. Specifically, men reported the highest behavioral intentions after viewing the testimonial depicting high sleep barriers and low self-efficacy. Women did not show this pattern; instead, they reported the highest behavioral intentions in the low-barrier, high-efficacy condition, which aligns more closely with HBM expectations (Champion & Skinner, 2008; Rosenstock, 1974). These results suggest that men and women may interpret health information differently, particularly in contexts where challenges and personal capability are emphasized. Some prior research has found that men are more likely to select challenging tasks than women in workplace settings (De Pater et al., 2009; Lyness & Schrader, 2006). Relatedly, other studies have found men to report higher self-efficacy than women in health contexts (Bonsaksen et al., 2019;

Samulowitz et al., 2022). It is possible that when confronted with difficult situations, characterized here as high barriers and low self-efficacy, men may interpret sleep challenges as problems to overcome and therefore feel motivated by the difficulty of the situation. In contrast, women may respond more strongly when they perceive the behavior as achievable, making efficacy cues more influential. These interpretations are speculative and future research is encouraged to further examine how men and women interpret sleep-related communication and what motivations may drive behavioral adoption in each group.

Lastly, the primary barrier and self-efficacy manipulations were not found to have significant direct effects on behavioral intentions. These null findings may suggest that the messages were not strong enough to meaningfully influence participants' own perceptions of barriers or efficacy related to sleep. In other words, although participants were able to correctly identify the manipulations within the testimonial (e.g., that the student experienced high barriers to achieving optimal sleep), reading about another student's experiences may not have been sufficient to alter participants' personal perceptions of sleep barriers or self-efficacy. Because the study employed a one-shot, online experimental design, the observed effects may also be weaker than those expected from more immersive interventions or sustained communication campaigns. Future research should continue exploring the dynamic influence of barrier and self-efficacy information on college students' sleep intentions, particularly given the challenging and constraint-filled environments in which many students attempt to maintain healthy sleep habits.

Practical Implications

The results have several practical implications. First, this research provides preliminary evidence that presenting efficacy-based information before addressing sleep challenges are more effective when the barriers to healthy sleep are relatively low. Many sleep interventions

incorporate multiple components within their educational and intervention materials (Chandler et al., 2022). In such cases, careful attention should be paid to the order in which information is presented, as message sequencing may influence how audiences interpret and respond to the content, as evidenced by the present findings. Second, for men, framing sleep as a challenge to overcome may represent an effective messaging strategy, as has been used in other contexts (Brownell & Felix, 1987; Zhou et al., 2025). Finally, the present study integrated sleep barrier and self-efficacy information within a brief testimonial describing another college student's experience. This approach did not produce direct changes in behavioral intentions, suggesting that more intensive or alternative formats may be more effective for targeting sleep-related barrier and self-efficacy beliefs.

Limitations

This study has limitations that should be noted. First, the study employed a single testimonial stimulus, which may not fully capture the range of sleep communication messages that vary in barrier and self-efficacy content. Future research should examine additional message formats and variations, including different scenarios, narrative styles, and persuasive appeals. Second, although participants were confirmed to be college students through multiple screening mechanisms, the average age of the sample was somewhat higher than what might be expected of a traditional undergraduate population. The focus on college students in this study was not about age, but the shared life context and challenges associated with this population. Relatedly, given the increasing trend of nontraditional and older students in higher education (Snyder et al., 2019), this limitation may be less consequential. Nonetheless, future research may benefit from applying age restrictions to better capture the experiences of more traditional undergraduate populations. Finally, the behavioral intentions item demonstrated modest internal consistency.

This may be due to the measure capturing intentions for multiple sleep practices that, although included in the testimonial, may not naturally cohere as a single construct. Future work should refine the measurement of sleep-related intentions by using more behavior-specific indicators and, where possible, incorporating direct behavioral outcomes.

Conclusion

The present study examined how variations in barrier and self-efficacy information, as well as message order, influence sleep-related behavioral intentions among college students. Although no direct effects of the manipulations were observed, interactions with message sequence and gender underscore the importance of how health information is structured and interpreted, rather than content alone. Specifically, sequencing efficacy and barrier information appears to shape the effectiveness of a message, particularly when barriers are perceived as manageable. Gender differences further suggest that individuals may respond differently to challenge- and efficacy-based messaging, highlighting the need for more tailored communication strategies. Overall, these findings contribute to the health communication literature by demonstrating that the effectiveness of barrier and self-efficacy information depends not only on message content, but also on its order and receiver characteristics. Future research should continue to examine the interplay between message content, sequencing, and audience characteristics to inform more effective sleep health interventions.

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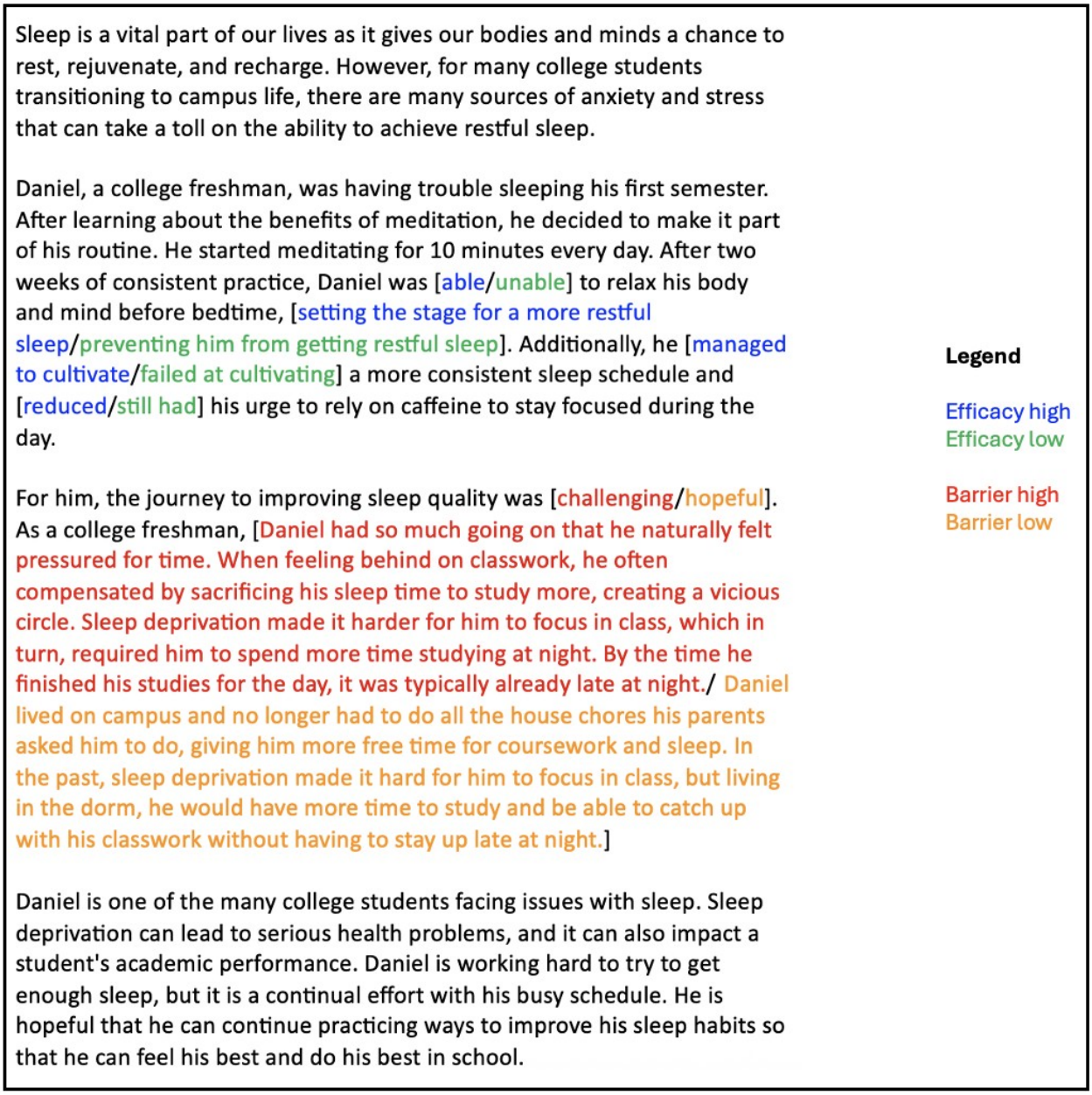
Figure 1

Example Narrative Differentiating Between Self-Efficacy and Barrier Information Provided



*Note***.** This narrative presents efficacy information first. For stimuli that introduced barriers first, the corresponding paragraph was placed second. The first and last paragraphs remained fixed in position across all conditions. Only one text per category (e.g., high efficacy or low efficacy) was included. The name was changed to “Elizabeth” for those identifying as women.

Table 1

Univariate Test Statistics for Behavioral Intentions to Improve Sleep Quality Among U.S College Students (N = 318)

Predictors	*F*	*p*	η^2
Intercept	832.10	<.001	.74
Direct Effects			
Order (1 = barrier first)	0.60	.440	.00
Barrier (1 = strong barriers)	0.32	.572	.00
Efficacy (1 = strong efficacy)	0.02	.899	.00
Gender (1 = women)	5.58	.019	.02
Interaction Effects			
Barrier x efficacy	0.24	.628	.00
Order x efficacy	1.65	.200	.01
Order x barrier	6.86	.009	.02
Order x gender	2.10	.148	.01
Efficacy x gender	2.44	.120	.01
Barrier x gender	0.00	.950	.00
Efficacy x barrier x gender	4.39	.037	.01
Efficacy x barrier x order	0.29	.592	.00
Efficacy x gender x order	0.27	.605	.00
Barrier x gender x order	0.15	.696	.00
Efficacy x barrier x gender x order	0.71	.399	.00
Covariates			
Sleep factors	24.36	<.001	.08
Race (1 = white)	8.99	.003	.03

Note. Corrected model: $F(17,318) = 3.27$, $p < .001$, adjusted $r^2 = .11$

Table 2

Means and Standard Deviations of Behavioral Intentions to Improve Sleep Quality by Condition (N = 318)

Gender	Order Condition	Barriers Condition	Efficacy Condition	Behavioral Intentions M(SD)	n
Women	Barrier first	High	High	4.04 (0.67)	19
		High	Low	3.83 (0.61)	20
		Low	High	3.70 (1.03)	19
		Low	Low	3.95 (0.83)	20
	Efficacy first	High	High	4.09 (0.63)	19
		High	Low	3.70 (0.72)	19
		Low	High	4.25 (0.67)	19
		Low	Low	3.98 (0.83)	19
Men	Barrier first	High	High	3.75 (0.85)	21
		High	Low	4.08 (0.68)	21
		Low	High	3.73 (0.89)	22
		Low	Low	3.65 (0.78)	20
	Efficacy first	High	High	3.48 (1.40)	18
		High	Low	3.56 (0.90)	20
		Low	High	3.98 (0.91)	21
		Low	Low	3.81 (0.85)	21