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## Pilot study of a sleep health promotion program for college students



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### ABSTRACT

**Objectives:** We conducted a pilot study of a sleep health promotion program for college students. The aims of the study were to (1) determine the feasibility of the program and (2) explore changes in sleep knowledge and sleep diary parameters.

**Design:** Open trial of a sleep health promotion program for college students.

**Setting:** A small liberal arts university in southwestern Pennsylvania.

**Participants:** University students (primarily female).

**Intervention:** Active intervention components included individualized e-mail feedback based on each participant's baseline sleep diary and an in-person, group format presentation on sleep health.

**Measurements:** Participants completed online questionnaires and sleep diaries before and after the health promotion intervention. Online questionnaires focused on sleep knowledge and attitudes toward sleep, as well as Patient Reported Outcomes Measurement Information System sleep and psychosocial assessments.

**Results:** Of participants who completed some aspects of the study, 89% completed at least one intervention component (in-person lecture and/or sleep diary). Participants reported significant improvement in sleep knowledge and changes in sleep diary parameters (decreased sleep onset latency and time spent in bed, resulting in greater sleep efficiency). Sleep duration also increased by 30 minutes among short sleepers who obtained <7 hours sleep at baseline.

**Conclusions:** Preliminary evaluation of a brief program to promote sleep health suggests that it is feasible and acceptable to implement, and that it can favorably alter sleep knowledge and behaviors reported on the sleep diary in college students. Controlled trials are warranted.

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### Introduction

Sleep and circadian functioning are essential to good health<sup>1</sup> and undergo dramatic changes in adolescence and during the transition to college. During adolescence, normative biological changes are accompanied by psychosocial and environmental changes, including increasing autonomy and reduced parental involvement, growing role of peers, increasing academic demands, substance use (including evening intake of alcohol and stimulants such as caffeine), and pervasive use of technology.<sup>2–5</sup> The combination of biological and social/environmental influences leads to delayed sleep times, weekend oversleep, and restricted sleep. Bedtimes become further delayed in first-year college students as compared with high school seniors.<sup>6</sup>

Disturbed and insufficient sleep is prevalent among college students. In one report, college students reported obtaining an average of 7 hours of sleep across the week,<sup>6</sup> which is at the lowest end of the 7 or greater hours recommended for young adults,<sup>7,8</sup> and 25% obtained less than 6.5 hours of sleep per night.<sup>6</sup> Only 34% of students reported good sleep quality (ie, <5 on the Pittsburgh Sleep Quality Index<sup>9</sup>) and 25% reported significant levels of daytime sleepiness.<sup>6</sup> In another sample of undergraduates, three-quarters endorsed daytime sleepiness and nearly half reported fatigue, motivation problems, and concentration or memory difficulties.<sup>10</sup> In addition, insufficient sleep and sleep disorders among college students have been associated with important functional and health consequences,<sup>5</sup> including lower grades,<sup>11–13</sup> falling asleep while driving,<sup>14</sup> lower mood, and more depressive symptoms.<sup>15,16</sup>

Fortunately, increasing total sleep time among college students is associated with reduced sleepiness and fatigue, and improved attention, reaction time, mood, and measures of athletic performance.<sup>17,18</sup> Thus, recent efforts have concentrated on developing and testing sleep-health promotion programs for this population, many of

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which have focused on sleep education. Broad-based sleep education dissemination approaches have the benefit of providing all students a chance to be informed about sleep and its role in learning and physical and mental health, and, for those with sleep disorders, to gather needed information to make appropriate referrals.<sup>19</sup>

Recently developed programs aiming to improve sleep health among college students have shown preliminary success in altering sleep knowledge and sleep habits. Various formats include psychology courses supplemented with sleep-specific instruction, an e-mail–based self-help sleep health promotion program, and a sleep education program delivered via classroom lecture, Web-based self-learning, and interactive classroom discussion.<sup>20–23</sup> Although relatively little work in this area has been conducted in college student samples, much more work has examined the impact of sleep education programs among younger adolescents.<sup>24–30</sup> Participation in nearly all of these sleep education programs has been associated with an increase in knowledge about sleep, but changes in sleep parameters as a result of the program have been less consistent. Research has suggested that *individualized feedback* may be effective in promoting health behavior change (such as reducing substance use) because it makes explicit each individual's behavior and acts as a source of social comparison to motivate reevaluation of the behavior.<sup>31–33</sup> Moreover, a unique meta-analysis has shown that tailored health behavior change interventions are effective in stimulating health behavior change.<sup>34</sup> Recording sleep habits via daily diary and offering individualized feedback may improve sleep habits because of the enhanced awareness of sleep patterns when compared with other similar individuals. To our knowledge, however, no existing sleep programs have provided individualized feedback to participants based on their self-reported sleep patterns. There have, however, been calls for improving the effectiveness of sleep health promotion programs by including individual tailoring of feedback, use of techniques to increase motivation to change, and program delivery via the Internet.<sup>35</sup>

We conducted a pilot study of a sleep health promotion program for college students. The program consisted of 2 core components that we hypothesized would lead to improved sleep health behaviors: (1) *packaging* current research evidence on a health issue that is relevant and meaningful to the population of interest (delivered via an in-person presentation on sleep health), and (2) *tailoring* feedback for each participant on his or her actual sleep patterns as reported on the sleep diary to increase participants' knowledge about their specific sleep behaviors (delivered via individualized e-mail feedback based on sleep diary records). Drawing on Theory of Planned Behavior and Social Cognitive Theory,<sup>36–38</sup> the intervention provided opportunities for college students to increase their self-efficacy related to sleep health and to shift their perceived control over sleep-related behaviors, as well as calibrate themselves against their peers. Because the factors that affect sleep are likely to be unique to each individual, we presented information on a range of factors regarding the importance of sleep and the consequences of insufficient sleep that we believed to be relevant to this population. Similarly, we used technology<sup>35</sup> to feasibly deliver personalized information regarding their actual sleep patterns as reported on the sleep diary, as well as to provide the opportunity to compare one's own behavior to similar individuals (eg, knowing that one's peers obtain more sleep at night may motivate modification of sleep behavior). The aims of the study were to (1) determine the feasibility of the program and to (2) examine changes in sleep knowledge and sleep diary parameters.

## Methods

### Overall design and participants

In this pilot sleep health promotion project, we provided a didactic presentation to disseminate the latest research on sleep health to

college students, with personalized feedback to participants regarding their own sleep based on a daily sleep diary completed during the week prior to the didactic presentation. Pre-post assessments evaluated sleep knowledge, sleep diary outcomes, and changes in psychosocial function that were associated with completion of the program. A total of 110 participants completed at least one aspect of this study, with completion rates described below.

Students attending a small liberal arts university in southwestern Pennsylvania were recruited for this pilot study during the Spring 2014 semester. They were recruited over a 2-week period via advertising the study through the student Health Services Center, Resident Assistants, on-campus recruitment by study staff members in high student traffic areas (ie, near the dining hall), and word of mouth. The sample was nearly entirely female (96.4%), reflecting the gender composition of this formerly all-women's university. Any student enrolled at the university and who was at least 18 years old was eligible to participate. Although most participants ( $n = 108$ ; 98.2%) were full-time undergraduates between the ages of 18 and 22 years, the upper age range was 50.5 years, and the sample included a small proportion of part-time undergraduate students ( $n = 2$ ; 1.8%). See Supplemental Table S1 for further participant characteristics.

### Procedures

The study consisted of 2 main components over a 1-month span in the spring semester—a sleep diary and a sleep health presentation—as well as psychosocial assessments completed at baseline and after completion of the second sleep diary.

During a 2-week recruitment period, interested students were directed to a study Web site, where the study was explained in detail and electronic-informed consent was obtained. During week 1 of the actual study, consented participants were invited to complete a demographic survey and other baseline questionnaires.

During week 2, participants completed an online daily sleep diary. Each evening and morning for 1 week, participants answered questions related to sleep timing, sleep continuity, the occurrence of naps, and the number of text messages received and read before sleep. Daily reminders to complete the diary were sent via e-mail.

During the first half of week 3, participants attended an hour-long presentation on sleep health, which was followed by discussion and questions. The presentation was offered in a large group format on 4 separate occasions during the first half of this week, and it was given by one of the study investigators (P.L. Franzen). Besides conceptualizing sleep health and providing recommendations to improve sleep health (see Table 1), the presentation was intended to provide evidence for the role of sleep in promoting health from experimental and epidemiologic studies. Some of this content was specifically selected to be relevant to college students (eg, impact of sleep on academic performance, weight, and social interactions) to target motivation to change sleep behaviors.

Individualized feedback was provided to each participant via e-mail within 1 day of attending the lecture and contained a summary of each participant's sleep diary data collected over the baseline week. The e-mail contained a graphical display (Figure) of daily total time spent in bed and spent asleep, as well as sleep efficiency (the ratio of total sleep time to total time in bed), and also included weekday and weekend averages of these variables for each participant. All participants also received several paragraphs of text outlining best sleep practices that followed the RU SATED framework<sup>1</sup> and reinforced the material covered in the in-person presentation on sleep health (eg, that most people feel best sleeping between 7 and 9 hours each night, while also achieving a sleep efficiency >90%; the importance of consistency of sleep schedules, especially wake up time, and avoiding long oversleep on weekends). To help participants compare their sleep to others, we provided

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