

# Sleep Hygiene Behaviour in Students: An Intended Strategy to Cope with Stress?

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## Abstract.

**Background:** Sleep is a central factor for a healthy lifestyle and thus a health-related resource.

**Objectives:** The present study clarifies the origin and importance of sleep hygiene behaviour as a possible coping strategy of students and examines the extent to which students use sleep to cope with stress.

**Methods:** For this purpose, in this longitudinal study a total of  $N=145$  students reported on sleep hygiene behaviour in everyday study life, health-related intention formation, subjective experience of stress and sleep quality over a period of two weeks. Multiple regression and moderation analyses were calculated.

**Results:** Intentions to enact sleep hygiene behaviour were not triggered by current stress experiences. However, significant interaction between intentions to and actually enacted sleep hygiene behaviour was found. In students with high intentions, sleep hygiene behaviour leads to decreased stress experiences.

**Conclusion:** Students' sleep hygiene behaviour supports coping with stress in students with high intentions. Further research must identify specifics of sleep hygiene behaviour and ways of increasing intention to use it as coping strategy in students' health-promotion.

Keywords: Stress, coping, sleep, sleep hygiene, intention, behaviour, students

## INTRODUCTION

Sleep contributes fundamentally to the regeneration of body, mind and soul and is an important health resource [1]. In contrast, non-restful sleep can lead to health restrictions and impair mental and physical performance as well as participation in professional and social life [2]. Therefore, a lack of sleep combined with persistent stress represents an important health risk.

While the negative influence of stress on sleep has been demonstrated in research [3, 4], up to now, the influence of sleep on the experience of stress is not well investigated and less represented in the literature. Therefore, the present study aims to investigate the interplay of stress experiences and intended sleep hygiene behaviour in students and to address the role

of sleep as a health-related resource and strategy for coping with stress.

### *Student stress*

“Stress” is generally described as a state of tension, which is perceived subjectively and, according to the transactional stress model [5], arises from an imbalance of perceived environmental (or internal) demands and one's own resources. The appraisal of environmental demands as unpredictable, uncontrollable and temporally long lasting promotes stress. If additionally, individual resources are appraised to be insufficient to cope with the respective stressor, stress emerges. Lazarus [5] describes two basic forms of coping with experienced stress: the emotion-oriented coping, which involves strategies to improve one's own emotional state, and the problem-oriented coping, in which the individual actively intervenes in the situation to change the problem.

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During their studies, various stressors such as workload or time pressure affect students [6]. Factors that students associate with their personal stress are extremely diverse. The symptoms of stress vary from physical to psychological conditions such as headache, stomach pain and palpitations or mood swings, increased irritability or a lack of concentration. As a result of the increasing experience of stress, health-promoting behaviour decreases [6] as well as risk behaviour such as smoking or changes in sleep behaviour increases [7]. Insufficient recovery phases and inadequate coping mechanisms can lead to a state of exhaustion.

#### *Sleep hygiene behaviour for stress regulation*

In order to promote stress-reducing behaviour, we have to understand how such health behaviour develops: An important prerequisite for enacting health behaviour is that health is viewed as influenceable and that an intention is formed [8]. These health-related intentions arise through the active engagement of the person with their environment, i.e. in a process of weighing up the possible positive or negative consequences of health behaviour, one's risk and efficacy to cope with difficult and stressful situations. Consequently, intention are formed to increase health behaviour or to minimize risks behaviour [9].

The literature suggests that stress typically results in a decrease in sleep hygiene behaviour [10]. However, up to now, there is less literature on whether sleep and a special attention to good sleep can be understand as coping strategy [11]. Therefore, the focus of the present study is on sleep hygiene behaviour in the context of students' stress experiences. Sleep hygiene refers to behaviour that contributes to the promotion of restful sleep. The term "non-restful sleep" was introduced as an umbrella term for all sleep disorders. Non-restful sleep severely limits psychological well-being and quality of life [12]. To counteract this, we want to understand whether sleep hygiene is intended to improve sleep in times of stress. It refers to the organization of daily routines as well as behavioural recommendations for the night and the sleeping environment. The basic rules of sleep hygiene include the observance of regular bedtime and getting up times as well as a sufficient amount of sleep. Factors that interfere with falling asleep are the consumption of caffeinated or alcoholic beverages or dealing with topics, which trigger stress and anxiety [13]. These factors will be investigated in the present study.

Knowing that adequate sleep hygiene behaviour is an important health-related resource and understanding it as a strategy to improve in stress management [11, 13], the following hypotheses are formulated:

*Hypothesis 1:* Students who experience a higher amount of stress show higher intentions to show sleep hygiene behaviour.

*Hypothesis 2:* Students with higher intentions to show sleep hygiene behaviour also show increased sleep hygiene behaviour.

*Hypothesis 3:* Students who use sleep hygiene behaviour intendedly as a coping strategy experience less stress.

## MATERIALS AND METHODS

### *Design*

In this longitudinal study with two points in time at an interval of two weeks, the students were asked to report their stress experiences and their sleep hygiene behaviour in a paper and pencil questionnaire. The study was conducted in accord with the Helsinki Declaration and approved by a local ethic committee.

### *Sample*

The sample includes  $N = 145$  students from different study programs (health sciences, midwifery). The majority of  $n = 122$  were female. The average age was  $M = 27.68$  years ( $SD = 4.53$ ; range: 20-46 years). Most of the study participants were married or in a steady relationship at the time of the survey; 20% of the participants already had children.

In addition, the majority of the study participants completed trainings in the care sector, while around a quarter of the participants were trained in the field of physical and speech therapy. Around 98% of the study participants completed a full-time course, while the majority stated that they also worked part-time in addition to their studies.

### *Measuring instrument*

*Experiencing stress.* Students' stress experiences were measured at both, T1 and T2, using the German version of the Percieved Stress Questionnaire (PSQ) [14]. This standardized test uses 20 items to assess the current subjectively experienced stress. Response format was a 4-point Likert scale from 1 = "not at all" to 4 = "three or more times per week". For analysis, a total score was computed with values between 0 and

Table 1  
Multiple regression for the prediction of intention for sleep hygiene behaviour by stress experiences, controlled for age and gender

	DV: Intention T1 Avoiding stress and anxiety				DV: Intention T1 Avoiding caffeine			
	B	SE <sub>B</sub>	T	p	B	SE <sub>B</sub>	T	p
Age	-0.02	0.02	-1.09	0.28	-0.04	0.03	-1.17	0.24
Gender	-0.01	0.28	-0.02	0.98	0.73	0.40	1.80	0.07
Stress T1	-0.28	0.18	-1.54	0.13	-0.07	0.26	-0.26	0.79
$R^2$				.03				0.03
$F(3, 127)$				.29				1.56 0.20

100 (above-average level of stress) with Cronbach's alpha between 0.80 and 0.86 (Fliege et al., 2005).

*Sleep hygiene behaviour.* At t2, sleep hygiene behaviour was assessed by two items comparable to [13] (i.e. "On how many days in the past 2 weeks did you avoid anything that caused anxiety or stress before bed?/...did not drink coffee (or other beverages containing tea or caffeine) eight hours before bedtime?"). The students were asked to indicate the number of days on which they had practiced the respective sleep hygiene behaviour in the past two weeks.

*Intentions for sleep hygiene behaviour.* At T1, intentions for sleep hygiene behaviour were assessed in parallel to sleep hygiene behaviour by two single items (e.g., avoid anxiety and stress, no caffeine) on a 6-point Likert scale from 1 = "not at all" to 6 = "exactly right".

#### Statistical procedure

The hypotheses presented in the above model were tested using three multiple regression analyses. In addition to the respective predictor and criterion, age and gender, and testing hypotheses 2 and 3, also stress experiences were included as control variables in the models. Hypotheses 3 was tested by means of a moderation analyses using the PROCESS macro for SPSS [15], applying model 1 for linear regressions with two-way interactions. In case of significant interactions, it estimates and tests conditional effects of the predictor at high and low levels of the moderator. All predictors were centered around their grand mean. Since sleep hygiene behaviours seem to represent different kinds of coping (intention: Cronbach's alpha = .13, behaviour: Cronbach's alpha = .33), we decided to calculate two separate models, considering each sleep hygiene behaviour at a single item level.

## RESULTS

Students show quite stable (repeated measures  $F(1, 131) = 2.78, p = 0.09$ ) stress levels with  $M = 42.2$  ( $SD = 18.8$ ) at T1 and  $M = 39.3$  ( $SD = 17.6$ ) at T2. The intentions to practice sleep hygiene behaviour were comparatively high (avoiding stress and anxiety T1:  $M = 4.51, SD = 1.20$ ; avoiding caffeine T1:  $M = 3.52, SD = 1.74$ ). Students enacted sleep hygiene behaviour to avoid stress and anxiety on  $M = 9.5$  ( $SD = 3.8$ ) and to avoid caffeine on  $M = 7.9$  ( $SD = 5.5$ ) of the possible 14 days.

Contrary to *hypothesis 1*, whether higher perceived stress levels at T1 were associated with intentions for sleep hygiene behaviour at T1, there was no significant association between stress and intention. Age and gender were also not related to intention (see Table 1)

In line with *hypothesis 2*, the relationship between intentions at T1 and sleep hygiene behaviour at T2, there was a significant association between intention and avoiding caffeine, such that students with higher intentions at T1 more strongly avoided caffeine at T2. Contrary to *hypothesis 2*, there was no association between intention and avoiding stress and anxiety. Here, stress experiences was the strongest predictor (see Table 2).

In line with *hypothesis 3* about the relationship between intended sleep hygiene behaviour at T2 and stress at T2, there was a significant interaction of intention and enacted sleep hygiene behaviour in the prediction of stress experiences at T2 with regard to the avoidance of stress and anxiety. Conditional effects show that avoiding stress and anxiety was associated with decreased levels of stress ( $B_{cond.} = -1.96, p < 0.001$ ) in students with high intentions, whereas there was no association in individuals with low intentions ( $B_{cond.} = -0.49, p = 0.22$ ). In contrast to *hypotheses 3*, avoiding caffeine was not associated with changes in stress experiences.

Table 2  
Multiple regression for the prediction of sleep hygiene behaviour by intention, controlled for age, gender and stress experiences

	DV: Sleep hygiene T2 Avoiding stress and anxiety				DV: Sleep hygiene T2 Avoiding caffeine			
	B	SE <sub>B</sub>	T	p	B	SE <sub>B</sub>	T	p
Age	-0.08	0.07	-1.13	0.26	-0.29	0.10	-3.02	0.01
Gender	-1.81	0.84	-2.15	0.03	0.68	1.12	0.60	0.55
Stress T1	-2.08	0.55	-3.75	<.001	0.01	0.02	0.27	0.79
Intention T1	0.27	0.26	1.06	0.29	1.42	0.24	6.01	<0.001
R <sup>2</sup>				0.16				0.29
F(4, 126)				5.79	<0.001			

Table 3  
Multiple regression for the prediction of stress experiences by intention, sleep hygiene behaviour and its interaction, controlled for age, gender and stress experiences

	DV: Stress Experiences T2							
	Sleep hygiene: Avoiding stress and anxiety				Sleep hygiene: Avoiding caffeine			
	B	SE <sub>B</sub>	T	p	B	SE <sub>B</sub>	T	p
Age	0.09	0.24	0.38	0.38	0.21	0.26	0.80	0.42
Gender	3.03	2.79	1.08	0.28	4.72	3.02	1.57	0.12
Stress T1	0.56	0.06	9.95	<.001	0.64	0.06	10.80	<0.001
Intention T1	0.15	0.83	0.17	0.86	-0.65	0.74	-0.88	0.38
Sleep hygiene T2	-1.22	0.29	-4.24	<.001	-0.07	0.24	-0.30	0.76
Interaction	-0.60	0.06	-2.80	0.01	-0.06	0.13	-0.46	0.64
R <sup>2</sup>				0.59				0.29
F(6, 124)				29.14	<.001			

Note. Interaction: Intention T1 \* Sleep hygiene behaviour T2.

## DISCUSSION

The central question of this work was to what extent students use their sleep hygiene behaviour to cope with stress. Although there was no connection between the initial stress experiences and intentions, the students who reported higher intentions for sleep hygiene behaviour to avoid stress and anxiety before going to bed were able to enact it more often, which in turn was accompanied by less stress.

The results of the present study on the students' stress experiences coincide with numerous studies that were able to prove that students generally report increased stress levels [14].

Against this background that students seem to be a risk group for showing health-detrimental behaviour [6, 16], it is not surprising that in the present study, perceiving stress did not lead to the formation of health-promoting intentions, contradicting *hypothesis 1*. It is questionable whether students use sleep hygiene as a coping strategy next to other strategies to cope with stress [5, 9, 17]. Therefore, this question has to be investigated in more detail. Future studies should also consider further influencing factors on the formation of intentions. In addition, it would be interesting to compare the extent of stress at which

an increased need for sleep arises and sleep hygiene becomes relevant as a coping strategy.

As assumed in *hypothesis 2* and in line with previous research [18, 19], a significant relationship exists between intention and sleep hygiene behaviours with respect to caffeine avoidance but not with respect to avoidance of stress and anxiety triggers. Since health behaviour change models [9] also consider volitional processes to bridge the gap between intentions and behaviour [20], future studies may investigate the role of planning or action control [10] to support the enactment of sleep hygiene behaviour in students.

*Hypothesis 3* assumed sleep hygiene behaviour to be a coping strategy, intended and implemented to reduce stress experiences. Ensuring a high quality of sleep after stressful days can prevent negative effects on emotional perception and thus has a positive effect on stress management [11, 21]. Since intentions for sleep hygiene behaviour were not associated with higher amounts of stress at T1, such behaviour cannot be interpreted as being purposefully shown with the aim of stress reduction. However, for the avoidance of anxiety and stress at bedtime, students with high intention to avoid such topics and who were more able to enact respective behaviour, successfully decreasing their stress experiences.

In contrast, students, who had low intentions to avoid stress and anxiety, were not able to decrease stress, even when they tried to avoid stress and anxiety at bedtime. This suggests that intentions play a crucial role in a proper stress management. They enable a conscious and purposeful regulation of stress. Nevertheless, as discussed above, future studies should identify which sleep hygiene behaviours are appropriate to meet the needs of students and which motivational factors help to increase their intentions to use respective behaviours as coping strategies.

To sum up, students did not intend to use sleep hygiene behaviour as a coping strategy to decrease stress. However, students with higher intentions were able to enact them successfully in terms of more sleep hygiene behaviour and less stress. These results should encourage students and their consultants to understand the practice of sleep hygiene behaviour as a personal resource [1, 11] and to use them for stress regulation.

### *Limitations*

The present study is one of the first to combine the assumptions of the health behaviour change models [8, 9] and stress models [5] and investigate intended sleep hygiene behaviour as a coping strategy.

First, since the focus of the present study lay on the formation and enactment of intentions for sleep hygiene behaviour in the context of students' stress, future studies should take into account different kinds of students' sleep behaviour and sleep quality, as well. Additionally, sleep problems are also present in a number of mental disorders, future studies should also control for respective symptoms and diagnoses.

Second, the timeframe of the present study was only two weeks. On the one hand, long-term studies should reveal the intervals at which interactions between sleep, stress and sleep hygiene behaviour can be expected, on the other hand, diary studies may help to understand whether stress is a prerequisite or consequence of sleep hygiene behaviour and vice versa.

Third, in the present study, the focus was only on behaviours that take place immediately before going to bed, such as not drinking caffeinated drinks in the evening. However, since many other specific behaviours relate to sleep hygiene, it would be interesting to consider further behaviours. A more complex operationalization of sleep hygiene behaviours can be developed in order to make state-

ments about the range of sleep hygiene and a more targeted prediction of the resulting stress experiences.

Fourth, future studies should also replicate findings taking objective measures of stress into account.

Fifth, the present sample was overwhelmingly female sample, which reduces the generalizability of this study. Future studies should have a closer look on gender differences in sleep hygiene behaviour and its function for stress management.

### *Implications and outlook*

Stress experience increases within the course of studies, while the health-related behaviour of the students tends to decrease. This indicates the need to develop measures and interventions to reduce and prevent stress in students [6, 16]. The present study can contribute to the development of health promotion concepts for students. Based on the present findings, adequate sleep hygiene behaviour may be supported to increase psychological well-being and performance [1] and promotes stress management during studies [16]. Students should be made aware of the benefits of sleep hygiene behaviour and be encouraged to identify and use adequate sleep hygiene behaviours to cope with stress. Understanding specific effects of different sleep hygiene behaviours offers great potential to derive behavioural recommendations for students in order to create an optimal basis for restful sleep.

Education about adequate sleep hygiene behaviour may complement health promotion and counselling in students.

### **CONFLICT OF INTEREST**

The authors have no conflict of interest to report.

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### **REFERENCES**

- [1] Gupta R, Neubauer DN, Pandi-Perumal SR. Sleep and Neuropsychiatry. New York: Springer; 2021.
- [2] Gerlach M, Sanner B. Leitlinien in der Praxis: Die neue S3-Leitlinie "Nicht erholsamer Schlaf/Schlafstörungen" –

- Kapitel "Schlafbezogene Atmungsstörungen" [Guidelines in Practice: The New S3 Guideline "Sleeping Disorders - Sleep-Related Abnormal Breathing"]. *Laryngo Rhino Otol.* 2017;96:685-690.
- [3] Hefez A, Metz L, Lavie P. Long-term effects of extreme situational stress on sleep and dreaming. *Am J Psych.* 1987;144:344-347.
- [4] Van Reeth O et al. Physiology of sleep—Interactions between stress and sleep: from basic research to clinical situations. *Sleep Med Rev.* 2000;4:201-219.
- [5] Lazarus RS, Folkman S. Stress, appraisal, and coping. New York: Springer; 1984.
- [6] Voltmer E, Kötter T, Spahn C. Perceived medical school stress and the development of behavior and experience patterns in German medical students. *Medical Teacher* 2012;34:840-847.
- [7] Maslach C, Leiter MP. The truth about burnout. San Francisco, CA: Jossey-Bass; 1997.
- [8] Ajzen I, Fishbein M. Understanding attitudes and predicting social behavior. Englewood Cliffs, N.J.: Prentice-Hall; 1980.
- [9] Schwarzer R editor. *Lehrbuch der Gesundheitspsychologie [Health psychology: A textbook]*. 2nd rev. ed. Göttingen, Germany: Hogrefe; 1997.
- [10] Sedeh A, Keinan G, Daon K. Effects of stress on sleep: the moderation role of coping style. *Health Psychol.* 2004;23:542-5.
- [11] Pedersen ER et al. Increasing Resilience through Promotion of Healthy Sleep among Service Members. *Mil Med* 2015;180:4-6.
- [12] Chokroverty S. *Sleep Disorders Medicine*. 4th ed. New York: Springer; 2017.
- [13] Mairs L, Mullan B. Self-Monitoring vs. Implementation Intentions: a Comparison of Behaviour Change Techniques to Improve Sleep Hygiene and Sleep Outcomes in Students. *Int J Behav Med.* 2015;22:635–644.
- [14] Fliege H et al. The Perceived Stress Questionnaire (PSQ) Reconsidered: Validation and Reference Values From Different Clinical and Healthy Adult Samples: *Psychosomatic Medicine.* 2005;67:78-88.
- [15] Hayes AF. Introduction to mediation, moderation, and conditional process analysis: A regression-based approach. New York, NY: Guilford Press; 2013.
- [16] Heuse S, Dietze C, Fodor D, Voltmer E. Understanding stress experiences of health care students – a survey study on demands and resources in education. *J Med Psychol.* 2020;22:59-65.
- [17] Rae T. *Strictly stress*. 3<sup>rd</sup> ed. London: SAGE; 2007.
- [18] Armitage CJ, Conner M. Efficacy of the Theory of Planned Behaviour: A meta-analytic review. *British Journal of Social Psychology.* 2001;40:471-499.
- [19] Sutton S. Predicting and Explaining Intentions and Behavior: How Well Are We Doing?...*Journal of Applied Social Psychology* 1998;28:1317-1338.
- [20] Sheeran P. Intention-Behavior Relations: A Conceptual and Empirical Review. *Eur Rev Soc Psychol.* 2002;12:1-36.
- [21] Flueckiger L, Lieb R, Meyer AH, Witthauer C, & Mata J. The importance of physical activity and sleep for affect on stressful days: Two intensive longitudinal studies. *Emotion.* 2016;16:488-497.