

The benefits of sleep coaching in workplace health promotion

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Abstract

Aim In the present study, the benefits of a short-term sleep coaching intervention embedded in the workplace health promotion (WHP) program of the German Armed Forces was investigated.

Participants and methods Well-being, self-care awareness, self-care behavior and irritation of participants attending the sleep coaching ($n = 24$) and participants attending other courses offered in the WHP program ($n = 24$) were assessed before and after the intervention.

Results Participants attending the sleep coaching had a significant increase in well-being, self-care behavior and self-care awareness and a significant decrease in their irritation score after attending the sleep coaching. In the control group, no significant change in the dependent variables was observed; furthermore, participants' evaluation of the sleep coaching was positive on both affective reactions and utility judgements.

Conclusions Results show that the sleep coaching intervention evaluated is practically feasible and able to improve important indicators of employees' well-being and self-care in WHP programs.

Keywords Sleep coaching · Workplace health promotion · Evaluation · Armed forces

Introduction

Sleep is an important aspect of health and human functioning, as it aids restorative physiological processes that are beneficial for a person's productivity, efficiency, and mood. In general, low sleep quantity or quality leads to sleepiness or fatigue, which increases the risk for health problems. Although it is desirable to maintain good and sound sleep, sleep problems are prevalent in the global population—for instance, Léger et al. (2008) found prevalence rates of sleeping problems ranging from 56% in the USA over 31% in Western Europe to 23% in Japan for adults. Surprisingly, almost half of the affected individuals had not taken steps to solve their sleeping problems. Individuals are at particular risk for sleep problems if their occupation is physically or psychologically stressful. In line with this, Heinrich et al. (2015) found that in the German Armed Forces, 41% of soldiers with and 38% of soldiers without recent deployment met diagnostic criteria for sleeping problems. It is likely that the prevalence for sleep problems not meeting diagnostic criteria but, nevertheless, impairing individuals' well-being, is even higher. Given the importance of restorative sleep for the individual as well as for organizations, the present study investigated the benefits of sleep coaching for a high-risk group, that is, employees of the German Armed Forces. In the following section, we will elaborate on the link between sleep and health and discuss workplace health promotion (WHP) programs as a mean to foster good health and sleep behavior in our targeted audience.

Sleep and health

There is ample evidence that poor sleep is associated with higher risk of mortality and of cardiovascular disease (Gallicchio and Kalesan 2009; Li et al. 2014). Moreover, sleep

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restriction has a general negative effect on cognitive performance in a variety of tasks (Balkin et al. 2008). As such, sleep deprivation has deleterious effects for the entire spectrum of mental abilities ranging from basic skills such as low-level monitoring and situational awareness, to complex skills such as decision-making or innovative and flexible thinking (Harrison and Horne 2000; Lim and Dinges 2010). Sleepiness as a consequence of poor sleep is further associated with human error-related accidents (Dinges 1995), and lack of sleep or disturbed sleep is associated with unwanted work-related behavior such as workplace absences or poor task performance (Kessler et al. 2011; Salo et al. 2010). Sleep problems are furthermore associated with a variety of psychological problems such as posttraumatic stress disorder (PTSD) or depression (e.g., Picchioni et al. 2010). On top of this, the high-risk occupation of military service is accompanied with low sleep quantity and quality as well as a higher risk of sleep problems (e.g., Heinrich et al. 2015; Miller et al. 2011).

Not only severe sleep deprivations such as sustained wakefulness, but also chronically restricting time for sleep to 4–6 h per night impairs cognitive performance (Van Dongen et al. 2003). In detail, sustained wakefulness for up to 2 days and restricting sleep to 6 or 4 hours a night for 2 weeks produced equivalent cognitive performance deficits. Moreover, a mild but chronic reduction of sleep increased cognitive deficits without the conscious awareness of the affected persons, whereas perceived sleepiness was higher for participants in the total sleep deprivation group and showed a linear increase. Given that partial or mild sleep deprivation is not only quite prevalent among individuals with sleep disorders, but also among individuals without sleep disorders (e.g., because of lifestyle or work demands), this finding highlights the importance of informing the workforce about negative consequences of mild sleep hour restrictions, which applies in particular for high-risk occupations such as the military. One attempt to foster awareness of sleep problems and to develop effective coping strategies is implementing sleep coaching intervention in workplace health promotion (WHP) programs.

Workplace health promotion programs

WHP programs focus on the enhancement of employees' well-being and effectiveness at the workplace and consider aspects and resources of the individual and of the organization. Moreover, WHP programs are able to teach and train health aspects for a large audience due to their provision of a solid setting and infrastructure. Reviews have shown that WHP programs are able to support employees' overall health and reduce the number of sick leave days (Conn et al. 2009; Hutchinson and Wilson 2011). However, summarizing 17 meta-analyses and systematic reviews on the effectiveness of WHP programs, Goldgruber and Ahrens (2010) found only

WHP interventions targeting stress, physical activity, nutrition, organizational development, smoking, ergonomics and back pain, but no WHP program targeting sleep behavior. In German companies, interventions such as communication trainings, conflict management and teamwork seminars are also part of WHP programs (Ulmer and Groeben 2005). In addition, WHP programs in Germany usually focus on organizational measures such as evaluation of workplace ergonomics, hazard assessments according to the Organizational Health and Safety Law, improvement of work organization and staff surveys, but less on behavioral measures such as spine training classes or improvement of dietary habits (Plath et al. 2008).

Given the importance of sleep for the individual as well as for organizations, the present study investigated the benefits of a sleep coaching program for well-being and self-care of a high-risk group, that is, employees of the German Armed Forces. For this aim, a sleep coaching module was embedded in the pilot phase of the WHP program of the German Armed Forces, which was launched at 11 military agencies (e.g., Operations Command of the German Armed Forces) in 2015. The sleep coaching program focused on the assessment of employees' current sleep habits, educated employees on what constitutes healthy sleep and provided behavioral and environmental recommendations to improve sleep. To evaluate the benefits of the sleep coaching, the well-being, self-care behavior and irritation of participants attending the sleep coaching and that of a control group were assessed before and after the courses of the WHP program took place. These aspects of health and health-related behavior were taken as indicators of the benefits of the sleep coaching because they are important preconditions for (e.g. caring for oneself) and consequences of (e.g. good well-being and low irritation) sound sleep. These indicators are furthermore applicable to evaluate the effects of other WHP measures and allowed for a comparison between WHP measures in a separate analysis. In particular, well-being can be viewed as participant's general feeling over the last 2 weeks. We expected the well-being of participants attending the sleep coaching to increase after the coaching. Similarly, we expected that self-care should be enhanced by sleep coaching as the sleep coaching directly addressed the link between sleep hygiene, sleep-wake behavior and health. More precisely, Franke et al. (2014, p. 142) defined self-care as an "internal resource that enables individuals to protect or promote their health by dealing appropriately with job demands and fostering health-promoting working conditions". For the purpose of the present study, self-care awareness, that is employees' attention and sensitivity to job-related health issues such as strain, and self-care behavior, that is employees' engagement in behavior relevant for one's health, were investigated. In addition, irritation, defined as

employees' perceived emotional and cognitive strain at the workplace that results from an imbalance between personal resources and daily stress (Mohr et al. 2005), was expected to decrease for participants after sleep coaching. In general, we expected the positive effects of sleep coaching on well-being and self-care to be stronger compared to possible improvement in these aspects for the control group, which attended other courses of the WHP program.

Additionally, participants' impression of sleep coaching was assessed as affective reactions and utility judgments (Kirkpatrick 1998). In detail, affective reactions measure whether participants like sleep coaching and utility judgments are concerned about participants' impression of the usefulness of sleep coaching.

Method

Participants

In the experimental group, 50 members of the German Armed Forces participated in sleep coaching courses; however, due to low response rate and missing data, only data of 24 participants (8 male, 16 female) could be used. In the data set for the experimental group, three participants reported to be 29 years or younger (12.5%), four participants reported to be between 30 and 39 years old (16.7%), seven participants (29.2%) reported to be between 40 and 49 years old and ten participants (41.7%) reported to be 50 or older. Four participants reported to hold a position of leadership and 18 participants reported to not hold such a position (two participants did not provide a response). Further, 70 % of the participants reported to be civil personnel ($N = 17$) and 30 % of the participants reported to be military personnel ($N = 7$). The sample contains data from three to six participants per sleep coaching intervention group from five different military agencies.

A total sample of 334 participants was available for the control group based on a screening data set, which consisted of data from additional members of the German Armed Forces who attended WHP courses (e.g., exercise or nutrition), but not sleep coaching. Statistical matching was used to create a data set with demographic composition as close as possible to the experimental group, i.e., a data set that would result from a perfectly blocked and randomized experiment. For this goal, the R package Matchit (Ho et al. 2011) in the R environment for statistical computing (Version 3.2.5., R Core Team 2016) was used and the nearest neighbor matching was applied to the data based on age and gender of the participants. In the resulting data set for the control group ($N = 24$), the distribution of age, gender and type of employment was the same as in the experiment group. Moreover, six participants reported to have a position of leadership and 18 reported not to hold such a position.

Measures

Because of organizational constraints, only a limited number of items for each scale could be included in the screening instrument from which the control group data was obtained. Further details are provided in the description of the following scales.

Evaluation of the program Participants in the experimental group, that is participants that attended sleep coaching courses, evaluated their impression of the program using 15 items (response categories ranging from 1 = *not at all true* to 5 = *completely true*). In detail, trainees' impression of the program was assessed as affective reactions and utility judgments. Eight items assessed participants' affective reactions (e.g., "Overall, I was satisfied with the training program."; Cronbach's $\alpha = .86$) and seven items assessed participants' utility judgements (e.g., "By participating in the training program I am able to sleep better."; Cronbach's $\alpha = .75$).

Well-being The well-being of participants in the experimental group was assessed with three items (based on the WHO-5 index, Brähler et al. 2007). Response categories of the items (e.g., "In the last two weeks, I have felt calm and relaxed") ranged from 1 = *at no time* to 6 = *all of the time* and the scale reached good internal consistency at the pre (Cronbach's $\alpha = .80$) and at the post measure (Cronbach's $\alpha = .84$).

Self-care awareness and behavior In the experimental group, self-care was assessed with the self-care awareness and the self-care behavior scales from Franke et al. (2014) on a five-point rating scale (response categories ranging from 1 = *not at all true* to 5 = *completely true*). The self-care awareness scale consisted of six items (e.g., "I notice early enough when I need a break.") and reached good internal consistency at pre (Cronbach's $\alpha = .84$) and post assessment (Cronbach's $\alpha = .73$). The self-care behavior scale consisted of eight items (e.g., "I take care that I have enough support when I need it."). Internal consistencies were Cronbach's $\alpha = .62$ at pre and Cronbach's $\alpha = .79$ at post.

In the control group, one item each was used for the assessment of self-care awareness and self-care behavior. The items were chosen from the pool of items used for the experimental group and assessed on an identical five-point rating scale (response categories ranging from 1 = *not at all true* to 5 = *completely true*).

Irritation Six items (e.g., "I reply irritably although I do not want to", response categories ranging from 1 = *not at all true* to 5 = *completely true*) from the irritation scale of Mohr et al. (2005) were used to assess irritation in the experimental group. The irritation scale showed good internal consistency at pre- (Cronbach's $\alpha = .87$) and post-coaching assessment

(Cronbach's $\alpha = .87$). In the control group, three items from the irritation scale used in the experimental group were selected. This shortened irritation scale also reached good internal consistency at pre (Cronbach's $\alpha = .80$) and post-coaching assessment (Cronbach's $\alpha = .81$).

Procedure

The data collection was part of a pilot implementation of the WHP program of the German Armed Forces that was launched in 2015 at 11 military agencies (e.g., Operations Command of the German Armed Forces). The WHP program is scheduled to be systematically expanded with comprehensive coverage until 2020. In this first launch, the effectiveness of different workplace health promotion courses (e.g., coaching courses for exercising, eating, or sleep) was to be evaluated with the focus of the present study on the sleep coaching courses. Employees participating in the WHP program were entitled to choose freely between WHP courses.

In the experimental group, data collection was carried out at the beginning of the first (pre measurement) and at the end of the last (post measurement) session of the sleep coaching (for details on the indicators see section “Measures”). The screening survey from which control group data was obtained was conducted before the start of the WHP implementation (February/March 2015, pre measurement) and after WHP implementation had been completed (June 2015, post measurement). The courses of the WHP program for the experimental and control group were provided between March and May 2015.

Sleep coaching was developed by Sauter and Danker-Hopfe from the Competence Center of Sleep Medicine from the Charité Berlin (Germany) for groups of up to eight participants. To ensure a standardized implementation throughout the participating agencies, a comprehensive manual and standardized course material were compiled. Sleep coaching consisted of four 90-min sessions on a weekly basis which included education about healthy and unhealthy sleep habits, assessment of beliefs about good sleep and current sleep habits, recommendations to improve sleep behavior and a feedback loop, in which the effect of recommendations on sleep quality was observed. In detail, in the first session, participants' perception of their own sleep as well as beliefs about good and bad sleep behavior were assessed and recommendations for better sleep hygiene were given (e.g., avoid caffeine after lunch, create a pleasant atmosphere in the sleeping environment, exercise regularly, keep a regular sleep schedule). At the end of session 1, participants were instructed to keep a sleep diary to assess sleep and insomnia symptoms as daily self-reports. In session 2 of the sleep coaching, the sleep diaries of the participants were reviewed, information on insomnia was provided (e.g., definition, vicious cycle of insomnia) and information on different techniques that assist a better

sleep behavior were taught (e.g., techniques against rumination, relaxation techniques). At the end of the second sessions, participants were instructed to practice the application of the various techniques at home. The experiences that participants made in the application of the techniques were reviewed at the beginning of session 3. Afterwards, participants received information on the circadian rhythm and on inter-individual differences in chronotypes as well as on problems that might occur due to shift work. Recommendations were given as to how employees can address sleep problems due to working shifts. Similar to session 2, this session ended with the instruction to practice the application of the various techniques at home and employees' experiences were reviewed at the beginning of session 4. Moreover, session 4 included the transfer of knowledge about the possible causes of daytime sleepiness and strategies to prevent daytime sleepiness. The session ended with a short conclusion regarding the whole training. The sleep coaching was carried out by military psychologists who were responsible for psychological WHP measures in the respective military agencies.

Design

The study design was a 2 (condition: sleep coaching vs. control group, varied between) $\times$ 2 (time of measurement: pre vs. post, varied within) design.

Analysis

Three steps were taken to analyze the data. At first, participants' impressions of the sleep coaching were evaluated. Afterwards, differences between employees' well-being, self-care and irritation before and after the 4-week sleep coaching implementation for the experimental group using full scales were investigated. This allowed a pre-post comparison for participants that attended the sleep coaching courses. Subsequently, using SPSS Version 21, an ANCOVA with experimental group as between-subjects factor and well-being before and after the coaching as within-subjects factor was conducted. In the ANCOVA, there was a control for gender (contrast-coded, -1 = female, 1 = male), whether participants had a leadership position (contrast-coded, -1 = no, 1 = yes) and the type of occupation (contrast-coded, -1 = civil, 1 = military). For the ANCOVAs, only the items that were assessed in both groups (experimental and control) were investigated (see section “Measure” for details). All hypothesis tests were based on type-I error probability of .05 and we will only report results relevant for the hypotheses for conciseness. Based on the assumption of a medium effect size ($f = .25$ according to Cohen 1988) and medium correlations ($\rho = .5$) between the levels of the independent variables in the population, the design and sample size of the

experiment yielded a power ($1-\beta$) of .92 for detecting the focal interaction of the experimental group and point of measurement (power was computed with the software G*Power 3; Faul et al. 2007).

Results

Evaluation of the program

Participants' affective reactions to the sleep coaching were positive ($M = 4.59$, $SD = 0.47$) and ratings were above the mid-point of the scale [$t(17) = 14.38$, $p < .05$]. Similarly, participants' perceived the sleep coaching to be useful ($M = 4.24$, $SD = 0.48$) and this rating was above average [$t(17) = 11.06$, $p < .05$]; tested against the mid-point of the scale (3). Hence, participants liked the sleep coaching training and also perceived it to be beneficial.

Pre-post comparison for the sleep coaching participants

Box plots of well-being, self-care and irritation of study participants before and after sleep coaching are shown in Fig. 1.

Well-being The well-being of participants that received the sleep coaching significantly increased from before ($M = 3.38$, $SD = 1.02$) to after the 4-week intervention ($M = 4.52$, $SD = 0.95$), $t(20) = -4.68$, $p < .05$.

Self-care awareness and behavior Participants' self-care awareness was higher after ($M = 3.48$, $SD = 0.64$) compared to before ($M = 3.07$, $SD = 0.86$) the sleep-coaching, $t(19) = -2.80$, $p < .05$. A similar pattern occurred for their self-care behavior [pre: $M = 3.15$, $SD = 0.59$, post: $M = 3.59$, $SD = 0.61$, $t(20) = -4.06$, $p < .05$].

Irritation For participants attending the sleep coaching, the irritation score significantly decreased from pre ($M = 2.77$, $SD = 1.03$) to post ($M = 2.48$, $SD = 0.88$), $t(19) = 3.20$, $p < .05$.

Pre-post comparison for experimental group and control group

Self-care awareness and behavior In the repeated ANCOVA measurement for self-care awareness, the interaction of the experimental group and point of measurement reached significance, $F(1,41) = 4.19$, $p < .05$, $\eta^2 = .09$. In line with our assumptions, for the control group there was no difference in self-care awareness before ($M = 3.62$, $SE_M = .21$) and after ($M = 3.46$, $SE_M = .19$) the implementation of the WHP program, $F(1,41) < 1.0$, not significant (NS). In contrast, a significant difference occurred for the participants of the sleep

coaching (pre: $M = 2.96$, $SE_M = .22$, post: $M = 3.46$, $SE_M = .20$), $F(1,41) = 4.59$, $p < .05$, $\eta^2 = .10$.

For self-care behavior, results also revealed a significant interaction of the experimental group and point of measurement, $F(1,41) = 6.73$, $p < .05$, $\eta^2 = .14$. In the control group, no significant difference occurred between the two measurements (pre: $M = 3.79$, $SE_M = .24$, post: $M = 3.70$, $SE_M = .20$, $F(1,41) < 1.0$, NS.). However, participants that attended the sleep coaching reported a higher amount of self-care behavior after ($M = 4.28$, $SE_M = .20$) as compared to before ($M = 3.64$, $SE_M = .25$) the sleep coaching, $F(1,41) = 9.93$, $p < .05$, $\eta^2 = .20$.

Irritation For irritation, there was no interaction of time of measurement and the experimental group, $F(1,41) < 1.0$, NS.

Discussion

Main finding of this study

Pre-post comparisons using full scales for participants of the sleep coaching program showed beneficial effects of this intervention on well-being, self-care awareness, self-care behavior and level of irritation. However, the ANCOVA investigating effects of the experimental group and point of measurement using the reduced item scales, found significant effects for the sleep coaching for self-care behavior and self-care awareness, but not irritation. Most important, no improvement on the dependent variables from pre to post was observed for the control group consisting of members of the German Armed Forces attending other courses of the WHP program.

What is already known on this topic

There is ample evidence on the positive link between restorative sleep and individuals' physical and mental health including psychological problems and well-being and especially military service has been found to be associated with sleep problems (Balkin et al. 2008; Heinrich et al. 2015; Van Dongen et al. 2003). One effective mean to reach a large number of working adults and to teach better health behavior are WHP programs that have been found to have beneficial effects on employees' health (e.g., Hutchinson and Wilson 2011).

What this study adds

While research shows that WHP programs have beneficial effects and that sleep is crucial for well-being and functioning, research on sleep coaching embedded in a WHP program is still sparse. The present study aimed at filling this research gap by investigating the benefits of a sleep coaching embedded in the WHP program of the German Armed Forces for employees'

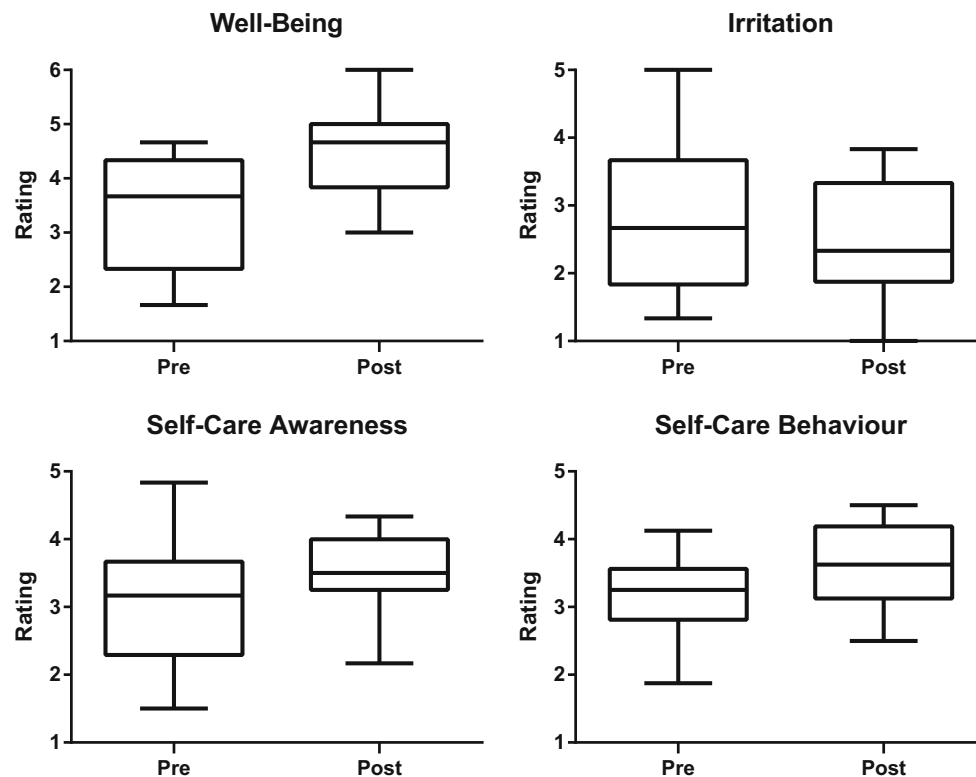


Fig. 1 Boxplots of well-being, irritation, self-care awareness and self-care behavior of sleep coaching participants before and after the intervention. *Horizontal bars* indicate the median of the distribution. *Boxes* cover

the central 50% of the data range and *vertical lines* cover observed values of up to 1.5 times the central data range. All pre–post differences are significant ($p < .05$)

well-being, self-care and irritation. Moreover, given that a pre–post experimental design was used, changes in the dependent variables within participants could be investigated. Besides, participants in the experimental and control groups were matched in accordance to demographic characteristics, which reduced the influence of self-selecting biases caused by different needs or interests for WHP interventions due to age or gender. In addition, relevant demographic characteristics were entered as covariates in the analyses. As such, the results of this study indicate that the sleep coaching had positive effects on subjective well-being and was more effective in increasing participants' self-care awareness and self-care behavior compared to other WHP courses such as physical activity.

Limitations of this study

Investigations on the effectiveness of sleep coaching was impeded by several circumstances. First, the sample size was rather small and due to organizational constraints it was not possible to use full scales for the assessment of the dependent variables in the control group. This might also have caused the non-significant interaction effects for irritation in the comparison of the experimental groups over time based on the reduced item set. Nevertheless, the pre–post comparison of the dependent variables using full-scale analyses in the experimental group also showed benefits of sleep coaching regarding irritation.

Second, none of the sleep coaching courses were given by the authors of the course themselves, but rather by the local military psychologists on the basis of the manual and the standardized course material. Thus, differences between the implementations of the sleep coaching courses cannot be ruled out. Similarly, participants in the control group also attended different WHP courses given by different trainers. The small sample size made it impossible to control for trainer effects in multi-level or hierarchical linear models, but further research should take into account the influence of location or course within which the employees were grouped. Third, two-thirds of the sample were female, which is a rather high rate of women for the German Armed Forces. One of the reasons for the higher rate of female participants might be that females (compared to males) tend to report more sleep problems and have a higher risk for insomnia (Zhang and Wing 2006) and, hence, might have been more motivated or interested in taking the sleep coaching course compared to other courses. However, for the comparison of the control and experimental groups, the distribution of females and males was not problematic as gender was used as one relevant criterion for matching and also controlled as a covariate in the analyses. Fourth, the dependent variables assessed in this study were based on self-reported measures and were not specifically directed at sleep behavior or sleep problems. This procedure enabled us to compare whether or not general health aspects such as well-being or self-care can be effectively

enhanced by the sleep coaching and whether or not such an expected increase in the general health occurs to a greater extent in the sleep coaching program compared to other WHP courses. An evaluation of the effectiveness of the sleep coaching program on objective (polysomnography) and subjective sleep quality will be performed in a follow-up study.

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Compliance with ethical standards

Conflict of interest The authors declare there is no conflict of interest.

Ethical approval All procedures performed were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki declaration and its later amendments.

Informed consent Informed consent was obtained from all individual participants included in the study.

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