Cognitive behavioural therapy to treat stress and insomnia: A randomized wait list-controlled trial of two online courses

Hürlimann, Philipp ; Bodenmann, Guy ; Riemann, Dieter ; Weitkamp, Katharina

DOI: https://doi.org/10.1111/jsr.13874

Received: 17 August 2022 | Revised: 22 February 2023 | Accepted: 24 February 2023

DOI: 10.1111/jsr.13874

RESEARCH ARTICLE

Cognitive behavioural therapy to treat stress and insomnia: A randomized wait list-controlled trial of two online courses

Philipp Hürlimann[1] | **Guy Bodenmann**[2] | **Dieter Riemann**[3,4] | **Katharina Weitkamp**[2]

[1]MeinStressCoach, digital coach GmbH, Zug, Switzerland

[2]Clinical Psychology for Children/Adolescents and Couples/Families, University of Zurich, Zurich, Switzerland

[3]Department of Psychiatry and Psychotherapy, Medical Center—University of Freiburg, Faculty of Medicine, Freiburg, Germany

[4]Center for Basics in NeuroModulation (NeuroModulBasics), Faculty of Medicine, University of Freiburg, Freiburg, Germany

Correspondence
Philipp Hürlimann, Digital coach GmbH, Rosenbergstrasse 6, CH-6300 Zug, Switzerland.
Email: info@meinstresscoach.ch

Summary

This randomized, wait list-controlled trial aimed to evaluate the efficacy of the cognitive behavioural therapy-based online e-learning course *stressfit* for better stress management and the cognitive behavioural therapy for insomnia-based online course *SweetDreams* for coping with insomniac problems. The course modules offer state of the art psychoeducation and cognitive behavioural strategies concerning different aspects of stress, sleep and insomnia. They provide practice-oriented exercises for self-reflection, as well as a variety of evidence-based methods and measures to increase self-efficacy when dealing with stress or insomnia. Study participants were randomly assigned to the three test conditions *stressfit*, *SweetDreams* or a wait list. Participants filled in questionnaires on a wide range of scales relevant to stress and insomnia at three points in time (before, 4 weeks after, and 3 months after the treatment). Of the 588 participants in total, data from 347 participants (59%) were finally included in the data analyses. Data analyses showed that both courses yielded significant positive effects compared with the wait list condition 4 weeks and to some degree 3 months after completion in relation to insomnia symptoms, physical and psychological wellbeing, life satisfaction and general health (General Health Questionnaire), as well as on satisfaction with and effectiveness of coping with stress and sleep disorders. In conclusion, *SweetDreams* and *stressfit* proved to be feasible and effective online cognitive behavioural therapy (for insomnia) tools to reduce insomnia and stress symptoms on a broad variety of scales at the 4-weeks measurement point as well as at the 3-months follow-up.

KEYWORDS
cognitive behavioural therapy for insomnia, cognitive behavioural therapy, e-learning, insomnia, online courses, stress prevention

1 | INTRODUCTION

Over the past 10 years, cognitive behavioural therapy for insomnia (CBT-I) has become the therapy of choice in the treatment of insomnia worldwide. This is supported by the German (Riemann, Baglioni, et al., 2017) and European guidelines for the treatment of insomnia (Riemann, Baum, et al., 2017), as well as by the American College of Physicians (Brasure et al., 2016; Qaseem et al., 2016; Wilt

et al., 2016). These guidelines provided a broad spectrum of evidence suggesting that CBT-I should be the preferred form of treatment for insomnia. Cognitive behavioural therapy (CBT) is also a most recommended and established treatment for stress conditions and related diseases (Heber et al., 2017).

Thanks to the new possibilities of digitalization, internet-based forms of treatment have increasingly come into focus of research in recent years (Berger, 2015). These internet-based CBT and CBT-I tools are being researched intensively, and there are already numerous studies that have been able to prove the effectiveness of internet-based CBT and CBT-I tools in relation to various dependent variables like stress and insomnia, but also depression and anxiety (Heber et al., 2017).

1.1 | Scientific background

In the context of this work, it is of particular interest that online CBT and CBT-I tools have been shown to be effective for the treatment of stress and insomnia. In a systematic review and meta-analysis of 23 randomized, wait list-controlled trial (RCT) studies with 4226 participants, which examined the benefits of stress-specific online CBTs, overall mean effect size for stress at post-test was Cohen $d = 0.43$ (95% confidence interval [CI] 0.31–0.54; Heber et al., 2017). Regarding internet-delivered CBT stress management courses, it was demonstrated that they are an effective, accessible and potentially time-effective approach to reduce stress and its negative health outcomes (Asplund et al., 2017). In addition, evidence exists that CBT-based online stress courses are an effective way to support participants in their self-directed coping with stress-related problems using evidence-based methods (Nobis et al., 2018).

A meta-analysis by Zachariae et al. (2016) examined the effects of online CBT-I tools on sleep disorders. It contained 11 RCTs with a total of 1460 participants. The interventions led to improvements on a broad variety of sleep-related factors: severity of insomnia, sleep efficiency, subjectively assessed sleep quality, nocturnal waking time, total sleep time, frequency of awakening, and many others. Cheng and Dizon (2012) and Seyffert et al. (2016) also conducted meta-analyses examining the effect of online CBT-I tools on insomnia. These two analyses included six RCT studies with 433 participants and 15 RCT studies with 2392 participants, respectively. Here, too, a wide range of parameters related to sleep and insomnia (sleep quality, sleep efficiency, the number of awakenings, total sleep time, sleep-onset latency, Insomnia Severity Index [ISI], severity of depression) were positively influenced by online CBT-I tools. The effects were stable over a period of 3–48 weeks after treatment.

Although the effectiveness of both online and offline CBT and CBT-I treatments for stress and insomnia is now widely accepted in the scientific community, the practical implementation of these findings is still lagging behind. For example, various authors criticised the lack of availability and the high costs of CBT in a face-to-face setting (Zachariae et al., 2016). In addition, Zachariae et al. (2016) stated that making CBT-I available and accessible via the internet could be an appropriate way to meet the needs of the population. The care deficit of patients with insomnia seems very relevant in terms of health economics. Insomnia is associated with very high indirect health costs, mainly due to reduced performance at work, which results in total annual costs of 40 billion euros in Germany alone (Spiegelhalder et al., 2020).

1.2 | Research question

Two online CBT(-I) tools were developed in German language (see Section 2.4, "Course content") to fill this treatment gap: *stressfit* (ST) for better stress management; and *SweetDreams* (SW) for insomnia. The aim of this RCT is to examine the efficacy of the online CBT (-I) courses *ST* and *SW* in relation to various constructs related to stress and insomnia after a treatment period of 4 weeks and again after 3 months. As primary outcomes, we examined the effects of *ST* on the stress scale and of SW on the insomnia scale (ISI; see Section 2). As secondary outcomes, we looked in an exploratory manner at the effects of the two courses on physical and psychological health, life satisfaction, productivity and general wellbeing scales, as well as any overlapping effects of ST on the insomnia scale and SW on the stress scale.

Because ST and SW are two new online CBT(-I) courses developed in Switzerland, a main aim of this study was to provide a proof of concept for these courses. Sawdon et al. (2021), Boullin et al. (2016) and Ellis et al. (2012) showed the need to prevent the frequent development of untreated subclinical insomnia into clinically relevant insomnia if they are not treated preventively at an early stage. In the context of this study, the preventive effectiveness of these two courses should therefore be examined in primarily sub-clinically affected subjects with stress and insomnia.

2 | METHODOLOGY

In this RCT, the participants were randomly assigned to one of three treatment conditions (ST, SW, wait list [WL]), and had to fill out questionnaires at three points in time.

2.1 | Procedure

For this trial, the Helsinki declaration for ethical treatment was respected. The participants were mainly recruited between January and August 2021 through articles on stress and insomnia in newspapers. At the beginning of the trial the participants registered using an online form and signed an informed consent form. The participants could withdraw from the study at any time.

Depending on the assigned condition, the participants had to work through the CBT course ST or the CBT-I course SW online, or were asked to wait for the next questionnaire without any intervention (WL). All participants filled in questionnaires at three

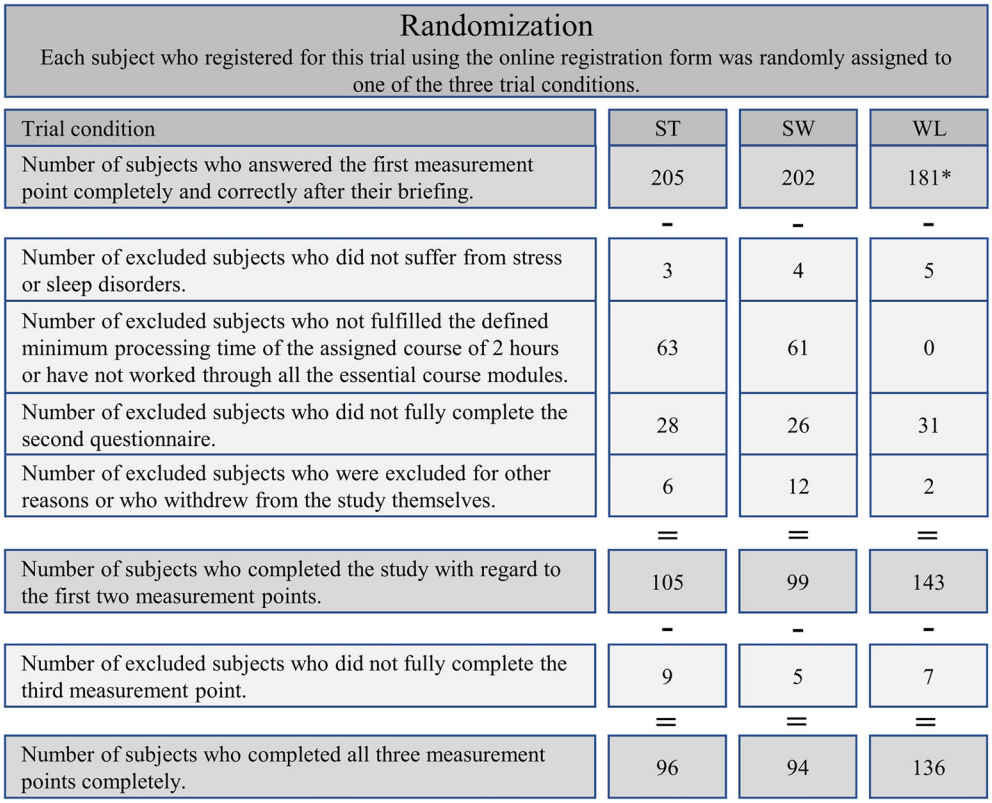

FIGURE 1 Recruitment flow. *The variance in the wait list (WL) condition compared with the *stressfit* (ST) and *SweetDreams* (SW) conditions can possibly be attributed to the assumption that more subjects stopped their trial participation when they found out from the briefing that the courses would only be activated for them in 3 months (after the trial)

measurement time points. The first time point was before the treatment (PRE); the second time point was 4 weeks later, after the treatment took place (4 W); and the third time point was 3 months after treatment (3 M).

Participants received e-mail invitations to complete the questionnaires and courses. Both the questionnaires and the CBT(-I) courses could be carried out online in all common browsers (Internet Explorer, Edge, Firefox, Chrome and Safari) and device types (PC, tablet, smartphone). The degree of completion of the questionnaires as well as the duration and degree of processing of the courses were automatically recorded digitally.

2.2 | Criteria for inclusion and exclusion

According to their own statements, the participants had to suffer from stress and/or insomnia. The participants had to answer at least the first two of the three questionnaires in full. The course adherence showed that the subjects spent time with their assigned courses (treatment) for very different lengths of time (from a few minutes to over 10 hr). This time spent with the course material could not be controlled because the subjects completed the courses online. Therefore, a minimum processing time had to be set in order to distinguish between "valid" and "invalid" subjects for data analyses. A compromise had to be found that on the one hand the measured effect sizes were not incorrectly affected by subjects with a very short processing time, and on the other hand the sample size was not unnecessarily reduced. Because it is possible to work through the essential modules (SW: "Treatment of insomnia" and ST: "Dealing with stress") thoroughly in 2 hr, we decided to set the cut-off here.

2.3 | Sample

Out of the original 588 participants, some participants had to be excluded for various reasons (Figure 1, Recruitment flow): they indicated that they did not suffer from stress or sleep disorders ($n = 12$); they did not complete at least the first two questionnaires in full ($n = 85$); they did not fulfil the defined minimum processing time of the assigned course of 2 hr or did not work through all the essential course modules ($n = 124$); or they were excluded for other reasons or opted out of the study themselves ($n = 20$). The treatment condition WL had a significantly lower dropout rate than ST and SW. This was due to the exclusion criterion "minimum processing time". Subjects of the WL condition could not be excluded based on this criterion because they did not have to process course material.

Finally, of the original 588 participants, the data from 326 participants (55%; 136 participants for WL, 96 for ST and 94 for SW) could be used for the evaluations between all three measurement times, and from 347 participants (59%; 143 WL, 105 ST and 99 SW) at least for the statistical analyses using data from the first two measurement times.

Of the 347 participants, $n = 270$ (78%) were female, mean age was $M = 47.84$ years ($SD = 11.98$); $n = 130$ (37%) participated solely because of problems with stress, $n = 40$ (12%) solely because of problems with sleep/insomnia and $n = 177$ (51%) stated that they

participated because of both problems. Of the participants, $n = 109$ (31%) were single, $n = 196$ (56%) married (including cohabitation and registered partnership), $n = 33$ (10%) were divorced, $n = 3$ (1%) were widowed, and $n = 6$ (2%) reported being separated.

2.4 | Course content

The course content of ST developed by Bodenmann (2000) is based on the Freiburg stress prevention training, which is effective in reducing both acute and chronic stress with internal as well as external causes (Bodenmann et al., 1999; Bodenmann et al., 2001; Cina et al., 2002).

The course content of SW developed by Riemann is based on the European guideline for the diagnosis and treatment of insomnia considering the procedure of CBT-I (Riemann, Baum, et al., 2017).

Both the stress management course ST and the insomnia course SW consist of various e-learning modules in German. The courses are available at https://www.meinstresscoach.ch. Course duration is 3–5 hr, depending on the individual reading speed and depth of processing. Both courses are approved as CE-certified Class I Medical Devices.

In addition to receiving the relevant psychoeducation in relation to stress and sleep, course participants learn a variety of evidence-based therapeutic methods of CBT(-I) and physical relaxation techniques in order to optimize their stress management and sleep quality. The CBT-I techniques and psychoeducation taught in SW include the following, among others: CBT-I techniques including specific techniques like stimulus control, sleep restriction, sleep-promoting thoughts, identification of cognitive vicious circles, perception differentiation, imagination techniques, progressive muscle relaxation, sleep diary. Additionally, there is psychoeducation on sleep hygiene, physical and mental tension, unfavourable sleeping habits, sleep-inhibiting substances, shift work, nightmares, phase delay/phase advance. These are conveyed in simple step-by-step instructions and often deepened at the end with so-called self-analysis exercises. The tools taught can be used for acute situations as well as for long-term and sustainable prevention. With the help of numerous self-analysis exercises, the course participants digitally record the aspects that are specifically relevant to their problem areas. If necessary, there is an option to share these aspects online with a medical doctor, sleep medicine specialist or (psycho)therapist so that he or she can coordinate the necessary treatment or discuss the issues in the next session. This trial, however, only examined the effectiveness of the e-learning courses themselves.

2.5 | Measures

The questionnaires contained the following scales and item groups: first, demographic information was requested (age, gender, income, relationship status, reason for participation). The extent of the participants' stress level was assessed by a stress scale, based on Kanner et al. (1981), consisting of 10, 11-point items from 0 to 100 asking about stress in general and in various areas. This study showed a Cronbach's Alpha for the stress scale of $\alpha = 0.81$. The severity of the participants' insomnia was assessed by the ISI, which consists of seven items ranging from 0 to 4 (English original version: Morin, 1993; German Version: Gerber et al., 2016). For the German version, good psychometric properties and satisfactory convergent and factorial validity were reported. This study showed a Cronbach's Alpha for the insomnia scale of $\alpha = 0.87$. The sum score ranges from 0 to 28; a score of 0–7 is regarded as no insomnia, 8–14 as subclinical insomnia, 15–21 as moderate clinical insomnia, and 22–28 as severe clinical insomnia.

The participants were asked at two measurement times two single 11-point items from 0 to 100 about their satisfaction (very satisfied—very dissatisfied), respectively, effectiveness (very good—very bad) with influencing their own stress management and sleep quality. The physical and psychological conditions were evaluated through three 5-point items each from 0 (never) to 5 (very often) (Merz, 2014). This scale was used successfully in previous studies and is based on the scale by Bodenmann-Kehl (1999). This study showed a Cronbach's Alpha for physical condition of $\alpha = 0.81$ and for psychological condition of $\alpha = 0.85$. Life satisfaction was assessed through four, 5-point items from 0 (not at all) to 5 (very much) (Janke & Glöckner-Rist, 2012). This study showed a Cronbach's Alpha for the life satisfaction scale of $\alpha = 0.82$. Productivity was measured through three, 6-point items from 0 (very unsatisfied) to 6 (very satisfied) by an own developed short scale that was used successfully in previous studies (Merz, 2014). This study showed a Cronbach's Alpha for the productivity scale of $\alpha = 0.87$. Finally, general health was assessed using the General Health Questionnaire (GHQ-12), which consists of 12, four-point items. The GHQ-12 (English original version: Gureje & Obikoya, 1990; German version: Schmitz et al., 1999) achieved a Cronbach's Alpha value of $\alpha = 0.88$ in this study.

2.6 | Statistical analyses

Analysis of covariance (ANCOVAs) were performed with the independent variable "Treatment", which had the three values ST, SW and WL. The scales stress, insomnia (ISI), physical and psychological condition, life satisfaction, productivity and general health were used as dependent variables.

The intention was to determine the extent to which the means of the dependent variables differed between groups and between the measurement times PRE-4 W and PRE-3 M. We included pre-values as covariates. Post hoc tests were conducted according to Tukey for determining to which of the three test conditions any significant variances could be attributed. In addition, the variance homogeneity of the dependent variables was examined according to Levene for each ANCOVA.

Because the average values of the various test conditions (e.g. on the "stress" scale: ST $M = 38.7$, SW $M = 35.71$, WL $M = 38.97$) varied noticeably between groups at the time of the PRE-measurement despite randomization, we calculated the differences in the values between the measurement times (4 W-PRE and 3 M-PRE) and used these scores as dependent variables for analyses.

As primary outcomes, we chose the stress scale and the insomnia scale (ISI) applying a relevant level of significance of $p < 0.05$. All other outcomes were considered secondary and the data analyses as exploratory.

3 | RESULTS

The analysis showed that the variance of the differences in the stress levels between the measurement times PRE-4 W ($p = 0.091$; $F = 2.416$, $\eta^2 = 0.014$) and PRE-3 M ($p = 0.101$; $F = 2.312$, $\eta^2 = 0.014$) was not significant. However, with regard to the covariate, there was a significant correlation between the initial values and the effect sizes of the treatments on these values at the later measurement times (Table 1).

The analyses revealed that the variance of the differences in the insomnia symptoms (ISI) was significant when comparing the measurement times PRE-4 W ($p < 0.001$; $F = 9.837$, $\eta^2 = 0.054$) and PRE-3 M ($p = 0.001$; $F = 6.986$, $\eta^2 = 0.042$). A post hoc test according to Tukey showed that at the measurement times PRE-4 W, both the SW course and the ST course led to these significant improvements ($p < 0.05$) in insomnia symptoms compared with the WL condition. Effect sizes were in the range of small effects. At the measurement times PRE-3 M, it was shown that the trial condition SW still led to significantly better scores for sleep quality even after 3 months compared with WL ($p < 0.05$). Table 2 shows that 25.6% of all subjects

TABLE 1 Mean values and standard deviations of the scale values as well as significant post hoc tests

	Time of measurement PRE			
Scale	ST M (SD)	SW M (SD)	WL M (SD)	
Stress (0–100)	38.70 (13.43)	35.71 (15.72)	38.97 (15.13)	
ISI (0–28)	12.22 (4.94)	11.28 (5.17)	10.84 (6.13)	
Physical condition (1–5)	3.48 (0.75)	3.62 (0.76)	3.70 (0.70)	
Psychological condition (1–5)	3.12 (0.76)	3.33 (0.79)	3.31 (0.74)	
Life satisfaction (1–5)	3.64 (0.63)	3.68 (0.70)	3.70 (0.67)	
Productivity (1–6)	4.00 (0.96)	4.31 (0.89)	4.19 (0.91)	
GHQ-12 (1–4)	2.36 (0.48)	2.24 (0.43)	2.33 (0.49)	
	Time of measurement 4 W			
Scale	ST M (SD)	SW M (SD)	WL M (SD)	Post hoc tests (Tukey)
Stress (0–100)	32.02 (14.74)	31.61 (14.97)	35.58 (14.72)	
ISI (0–28)	9.76 (4.52)	8.35 (4.35)	10.10 (5.32)	ST, SW > WL
Physical condition (1–5)	3.59 (0.74)	3.80 (0.70)	3.61 (0.75)	ST, SW > WL
Psychological condition (1–5)	3.28 (0.74)	3.46 (0.73)	3.26 (0.76)	ST, SW > WL
Life satisfaction (1–5)	3.73 (0.67)	3.85 (0.69)	3.70 (0.65)	SW > WL
Productivity (1–6)	4.19 (0.95)	4.44 (0.80)	4.19 (0.93)	
GHQ-12 (1–4)	1.95 (0.46)	1.98 (0.42)	2.18 (0.45)	ST > WL
	Time of measurement 3 M			
Scale	ST M (SD)	SW M (SD)	WL M (SD)	Post hoc tests (Tukey)
Stress (0–100)	26.55 (15.01)	25.26 (16.28)	30.48 (18.01)	
ISI (0–28)	9.90 (5.01)	7.40 (5.12)	9.45 (5.71)	SW > WL
Physical condition (1–5)	3.68 (0.74)	3.85 (0.74)	3.76 (0.71)	SW > WL
Psychological condition (1–5)	3.42 (0.70)	3.58 (0.79)	3.38 (0.75)	ST > WL
Life satisfaction (1–5)	3.82 (0.57)	3.96 (0.65)	3.67 (0.69)	ST, SW > WL
Productivity (1–6)	4.26 (0.78)	4.59 (0.80)	4.30 (0.88)	
GHQ-12 (1–4)	1.92 (0.37)	1.90 (0.47)	2.05 (0.49)	

Note: Definition of the sign ">" under "Post hoc tests (Tukey)": the difference in the mean values of this trial condition (measurement time 4 W or 3 M compared with measurement time PRE) is significantly larger ($p < 0.05$) than the difference in the mean values of the following trial condition; Trial conditions: ST = *stressfit*, SW = *SweetDreams*, WL = wait list; time of measurement: PRE = before the treatment, 4 W = 4 weeks after the treatment, 3 M = 3 months after the treatment; ISI = Insomnia Severity Index.
Abbreviation: GHQ-12, General Health Questionnaire.

TABLE 2 Distribution of the subjects by degree of severity of insomnia according to the ISI across the three measurement times and the three trial conditions

ISI degree of expression at time of measurement	ST *N* (%)	SW *N* (%)	WL *N* (%)	Total *N* (%)
PRE				
No clinically significant insomnia	17 (16.2%)	23 (23.2%)	49 (34.3%)	89 (25.6%)
Subthreshold insomnia	53 (50.5%)	49 (49.5%)	45 (31.5%)	147 (42.4%)
Clinical insomnia (moderate severity)	33 (31.4%)	24 (24.2%)	44 (30.8%)	101 (29.1%)
Clinical insomnia (severe)	2 (1.9%)	3 (3.0%)	5 (3.5%)	10 (2.9%)
4 W				
No clinically significant insomnia	32 (30.5%)	40 (40.4%)	54 (37.8%)	126 (36.3%)
Subthreshold insomnia	55 (52.4%)	53 (53.5%)	54 (37.8%)	162 (46.7%)
Clinical insomnia (moderate severity)	17 (16.2%)	6 (6.1%)	33 (23.1%)	56 (16.1%)
Clinical insomnia (severe)	1 (1.0%)	0 (0.0%)	2 (1.4%)	3 (0.9%)
3 M				
No clinically significant insomnia	33 (34.4%)	56 (59.6%)	53 (39%)	142 (43.6%)
Subthreshold insomnia	45 (46.9%)	31 (33.0%)	59 (43.4%)	135 (41.4%)
Clinical insomnia (moderate severity)	16 (16.7%)	6 (6.4%)	19 (14.0%)	41 (12.6%)
Clinical insomnia (severe)	2 (2.1%)	1 (1.1%)	5 (3.7%)	8 (2.5%)

Abbreviation: Trial conditions: ST = *stressfit*, SW = *SweetDreams*, WL = wait list; time of measurement: PRE = before the treatment, 4 W = 4 weeks after the treatment, 3 M = 3 months after the treatment; ISI categories of severity of insomnia: 0–7 = no clinically significant insomnia, 8–14 = subthreshold insomnia, 15–21 = clinical insomnia (moderate severity), 22–28 = clinical insomnia (severe).

had "no clinically significant insomnia" according to the ISI scale at the time of the PRE measurement, and a further 42.4% had "subthreshold insomnia". Thus, about two-thirds of the subjects had no clinically relevant insomnia at the start of the study. It is therefore largely a sub-clinical sample. On a descriptive level, it is also striking that the percentage of subjects with "no clinically significant insomnia" in the trial condition SW increased much more between the measurement times PRE (23.2%), 4 W (37.8%) and 3 M (59.6%) than in the trial condition WL with PRE (34.3%), 4 W (37.8%) and 3 M (39%; Table 2).

With regard to their physical condition (Table 3), the participants described a significant improvement ($p < 0.001$; $F = 8.599$, $\eta^2 = 0.048$) for the time 4 weeks after the treatment (small effect size). According to the post hoc test, the improved physical condition is detectable both after working through ST and SW ($p < 0.05$; Table 1). This effect was marginal at the 3-months follow-up ($p = 0.077$; $F = 2.584$, $\eta^2 = 0.016$), whereby the post hoc test showed a continued improvement in the SW condition.

Scores on the psychological condition scale assessed were significantly improved at both 4 weeks ($p = 0.007$; $F = 5.012$, $\eta^2 = 0.028$) and 3 months ($p = 0.046$; $F = 3.109$, $\eta^2 = 0.019$; small effect size). The post hoc test revealed that the psychological condition was improved after 4 weeks after both ST and SW treatments ($p < 0.05$). This effect on the psychological condition could still be demonstrated for *ST* even after 3 months ($p < 0.05$).

With regard to life satisfaction, there was an improvement after 4 weeks ($p = 0.009$; $F = 4.794$, $\eta^2 = 0.027$), with this effect even increasing after 3 months ($p < 0.001$; $F = 12.641$, $\eta^2 = 0.073$). Effect sizes were small after 4 weeks and medium after 3 months. According to Tukey's post hoc test, both 4 weeks and 3 months after treatment by SW ($p < 0.05$) showed an improvement compared with the WL condition. A treatment by ST showed an improvement in perceived life satisfaction after 3 months compared with the WL ($p < 0.05$).

An increase in the self-perceived productivity of the participants was not detected after the treatments, neither after 4 weeks nor after 3 months.

Analysis of the general health status (GHQ-12) revealed a significant improvement after 4 weeks ($p < 0.001$; $F = 13.161$, $\eta^2 = 0.071$) and a significant improvement after 3 months ($p = 0.021$; $F = 3.934$, $\eta^2 = 0.024$). Effect sizes were medium after 4 weeks and small after 3 months. In the post hoc analysis, significant changes were visible in the ST condition for the measurement time after 4 weeks ($p < 0.05$). After 3 months the effect was marginal ($p = 0.053$).

When asked how satisfied the participants were with their stress management in the last 2 weeks or how effective they were using the techniques (Table 4), after 4 weeks both satisfaction ($p = 0.005$; $F = 5.477$, $\eta^2 = 0.031$) and effectiveness ($p = 0.043$; $F = 3.165$, $\eta^2 = 0.018$) showed a significant increase (both small effect sizes) compared with the values PRE. Tukey post hoc test (Table 5) revealed that working through ST significantly increased satisfaction with regard to one's own stress management compared with the WL condition ($p < 0.05$). In addition, the post hoc test after Tukey showed that the completion of ST significantly increased the perceived effectiveness with regard to one's own stress management both compared with the WL and with SW ($p < 0.05$). These effects were no longer evident after 3 months.

In turn, when asked how satisfied the participants were with how they were able to improve their sleep quality in the last 2 weeks, or

TABLE 3 Analysis of variance with covariate of the differences of the scale of the respective items between the scale values before the treatment and 4 weeks or 3 months after the treatment

Scale	Difference PRE-4 W		
	F	*p*	η^2
Stress			
IV: Trial condition	2.416	0.091	0.014
Covariate	101.246	< 0.001***	0.228
ISI			
IV: Trial condition	9.837	< 0.001***	0.054
Covariate	137.610	< 0.001***	0.286
Physical condition			
IV: Trial condition	8.599	< 0.001***	0.048
Covariate	45.375	< 0.001***	0.117
Psychological condition			
IV: Trial condition	5.012	0.007**	0.028
Covariate	58.472	< 0.001***	0.146
Life satisfaction			
IV: Trial condition	4.794	0.009**	0.027
Covariate	42.930	< 0.001***	0.111
Productivity			
IV: Trial condition	2.143	0.119	0.012
Covariate	74.514	< 0.001***	0.178
GHQ-12			
IV: Trial condition	13.161	< 0.001***	0.071
Covariate	141.311	< 0.001***	0.292
Scale	**Difference PRE-3 M**		
	F	*P*	η^2
Stress			
IV: Trial condition	2.312	0.101	0.014
Covariate	110.854	< 0.001***	0.256
ISI			
IV: Trial condition	6.986	0.001**	0.042
Covariate	129.748	< 0.001***	0.287
Physical condition			
IV: Trial condition	2.584	0.077	0.016
Covariate	57.477	< 0.001***	0.151
Psychological condition			
IV: Trial condition	3.109	0.046*	0.019
Covariate	96.649	< 0.001***	0.231
Life satisfaction			
IV: Trial condition	12.641	< 0.001***	0.073
Covariate	77.277	< 0.001***	0.194
Productivity			
IV: Trial condition	2.946	0.054	0.018
Covariate	137.517	< 0.001***	0.299
GHQ-12			
IV: Trial condition	3.934	0.021*	0.024

(Continues)

TABLE 3 (Continued)

Scale	Difference PRE-3 M		
	F	*P*	η^2
Covariate	208.604	< 0.001***	0.393

Note: Covariates: the mean value of the scale of the respective items at the time of measurement PRE of the individual participants was taken as the covariate; time of measurement: PRE = before the treatment, 4 W = 4 weeks after the treatment, 3 M = 3 months after the treatment; GHQ-12, General Health Questionnaire; ISI, Insomnia Severity Index; IV, independent variable.
*$p < 0.05$.**$p < 0.01$.***$p < 0.001$.

how effective they were at improving their sleep quality, 4 weeks after the treatment both satisfaction ($p < 0.001$; $F = 19.697$, $\eta^2 = 0.103$) and effectiveness ($p < 0.001$; $F = 13.716$, $\eta^2 = 0.074$) showed a significant increase (both medium effect sizes). Based on the post hoc test, working through SW and ST significantly increased satisfaction with regard to one's own ability to improve sleep quality compared with the WL ($p < 0.05$). In addition, the post hoc test showed for SW a significantly increased perceived effectiveness with regard to improving one's own sleep quality compared with WL ($p < 0.05$). Even after 3 months, these effects of increased satisfaction ($p < 0.001$; $F = 11.641$, $\eta^2 = 0.067$) and effectiveness ($p < 0.001$; $F = 12.967$, $\eta^2 = 0.075$) with one's ability to improve one's sleep quality persisted as effects with medium size. According to the post hoc tests, this increased satisfaction ($p < 0.05$) and effectiveness ($p < 0.05$) were shown in SW compared with WL and ST.

4 | DISCUSSION

The aim of this study was to investigate the extent to which the CBT-based online course ST and the CBT-I-based online course SW have positive effects on stress and insomnia-related scales.

The study found evidence that working with SW produced significant effects on insomnia symptoms, physical condition, psychological condition and life satisfaction. In addition, satisfaction with and perceived effectiveness of one's ability to improve one's own sleep quality increased significantly after 4 weeks and also after 3 months.

Regarding ST, significant effects on the following scales were found: insomnia, physical condition, psychological condition, life satisfaction and general health. In addition, self-rated satisfaction and effectiveness with regard to one's own stress management had increased significantly after 4 weeks. Thus, ST was yielding similar effects to offline stress prevention trainings. In the meta-analysis by Kaluza (1997), including 36 studies, weak to moderate effects were found, ranging from $d = 0.20$ to $d = 0.50$ ($\eta^2 = 0.01$ to $\eta^2 = 0.06$) within 1 week to 1 month after participation in the programme. However, while offline programmes usually go along with an increase in benefits over time (Kaluza, 2002), this was less the case with ST where effects faded out until 3 months after application. The offline-programme ST had yielded stable improvement within 1 year (Bodenmann et al., 2001), indicating a generally weaker long-term

TABLE 4 Analysis of variance with covariate of the differences of the respective item between the values before the treatment and 4 weeks or 3 months after the treatment

	Difference PRE-4 W			Difference PRE-3 M		
Item	***F***	***p***	η^2	***F***	***p***	η^2
Effectiveness of coping with stress						
IV: Trial condition	3.165	0.043*	0.018	2.533	0.081	0.015
Covariate	177.601	< 0.001***	0.341	159.668	< 0.001***	0.331
Satisfaction with coping with stress						
IV: Trial condition	5.477	0.005**	0.031	0.276	0.759	0.002
Covariate	199.271	< 0.001***	0.367	141.194	< 0.001***	0.305
Effectiveness of sleep improvement						
IV: Trial condition	13.716	< 0.001***	0.074	12.967	< 0.001***	0.075
Covariate	215.205	< 0.001***	0.386	185.190	< 0.001***	0.365
Satisfaction with sleep improvement						
IV: Trial condition	19.697	< 0.001***	0.103	11.641	< 0.001***	0.067
Covariate	167.468	< 0.001***	0.328	176.712	< 0.001***	0.354

Note: Covariate: the value of the respective item at the time of measurement PRE of the individual test participants was taken as the covariate; time of measurement: PRE = before the treatment, 4 W = 4 weeks after the treatment, 3 M = 3 months after the treatment; IV, independent variable.
*p < 0.05.**p < 0.01.***p < 0.001.

effect of the e-learning approach. In summary, both treatments yielded significant improvements compared with the WL condition with regard to a wide range of stress and sleep-related variables, and were revealed to be efficacious in supporting individuals dealing with stress and/or sleep disorders. Findings are comparable to the meta-analysis by Bhui et al. (2012) or Kaluza (1997).

While most effect sizes were significant 4 weeks after the training, some effects faded out in some way at the 3 M follow-up in both courses. This finding suggests that the learnt techniques should be applied more regularly after the treatment and should be incorporated as an integral part of daily routine in order to be maintained. It can be assumed that individuals who use the techniques regularly and conscientiously (long-term) will achieve stronger and persistent positive effects in reducing their stress or insomnia symptoms as would booster-sessions strengthen positive durable effects (Schär & Bodenmann, 2007).

This does not necessarily mean that the courses ST and SW have to be worked through completely again. However, to achieve even stronger effects, a partial rework could be helpful, on the one hand to refresh the correct application of the techniques and on the other hand to use and try other techniques from the wide range of tools provided in the courses at a later point in time. Ideal would be if individuals would build their own programmes out of the proposed components and tailor the intervention to their specific needs.

In the study, there was an exclusion criterion of a minimum processing time of 2 hr in order to be included in the evaluation, with a regular processing time of 3–5 hr being recommended, depending on the reading speed and processing depth of the content. In this respect, it is encouraging that even such a short average processing time already led to so many significant effects, illustrating the power of the interventions (see Section 4.2, "Future Research").

It should be mentioned that the largely subclinical sample with regard to insomnia (Table 2) provides a plausible partial explanation for why the significant effects of the CBT-I treatment SW on the ISI scale found in this trial were smaller than in comparable CBT-I trials like Zachariae et al. (2016). This is because already low ISI scores at the measurement point PRE in a largely subclinical sample cannot improve to the same extent as in a sample with subjects with mainly clinically relevant insomnia (floor effect).

Finally, it should be noted that most of the data collected in this study were collected during the acute phase of the Covid-19 health crisis, between January and August 2021. We could not control for potential overlap with symptom aggravation or relief due to seasonal change or the lifting of lockdown regulations. Stress levels and symptoms also improved in the WL condition that could point to external influences. However, stronger improvements were observed in participants who completed either the ST or the SW course above and beyond these external circumstances.

4.1 | Limitations

One limitation of this study is that it is not a clinical study. No patients were examined but subjects with self-rated stress symptoms or insomnia problems from which they suffered. Because the subjects were recruited via a newspaper article, it must be considered that various subjects may have participated in the study out of personal interest and not primarily because of strong subjective suffering. In such cases, it is questionable whether the techniques taught have been applied with the same intensity as a subject with clinically relevant insomnia and high subjective suffering as a motive.

In addition, only a minimum processing time of 2 hr was required for inclusion into the study, even though the courses usually have a processing time of 3–5 hr. This might have impacted the results and analyses based on real processing time as a covariate could have been

TABLE 5 Satisfaction and effectiveness in coping with stress and improving sleep **m**ean values and standard deviations of the items as well as significant post hoc tests

Item	Time of measurement PRE ST M (SD)	 SW M (SD)	 WL M (SD)	
Efficiency of coping with stress	56.38 (19.72)	52.22 (22.61)	51.82 (21.28)	
Satisfaction with coping with stress	59.24 (19.74)	53.43 (22.55)	56.99 (21.06)	
Efficiency of sleep improvement	59.43 (21.70)	53.54 (22.56)	50.98 (26.23)	
Satisfaction with sleep improvement	59.33 (22.50)	52.22 (22.11)	50.63 (25.68)	
Item	**Time of measurement 4 W** **ST** **M (SD)**	 **SW** **M (SD)**	 **WL** **M (SD)**	**Post hoc tests (Tukey)**
Efficiency of coping with stress	39.62 (16.87)	43.43 (21.34)	43.29 (21.06)	ST > SW, WL
Satisfaction with coping with stress	40.67 (17.83)	40.40 (21.23)	47.69 (21.84)	ST > WL
Efficiency of sleep improvement	49.33 (21.45)	36.36 (20.13)	48.18 (21.65)	SW > WL
Satisfaction with sleep improvement	48.10 (21.58)	34.65 (20.91)	50.70 (24.08)	SW, ST > WL
Item	**Time of measurement 3 M** **ST** **M (SD)**	 **SW** **M (SD)**	 **WL** **M (SD)**	**Post hoc tests (Tukey)**
Efficiency of coping with stress	39.17 (18.16)	33.09 (23.19)	39.41 (22.70)	–
Satisfaction with coping with stress	38.85 (17.94)	36.60 (23.58)	39.56 (23.88)	–
Efficiency of sleep improvement	51.98 (20.55)	33.83 (23.06)	43.16 (24.40)	SW > ST, WL
Satisfaction with sleep improvement	51.77 (20.93)	34.47 (23.72)	43.68 (24.19)	SW > ST, WL

Note: Definition of the sign ">" under "Post hoc tests (Tukey)": the difference in the mean values of this trial condition (measurement time 4 W or 3 M compared with measurement time PRE) is significantly larger ($p < 0.05$) than the difference in the mean values of the following trial condition; Trial conditions: ST = *stressfit*, SW = *SweetDreams*, WL = wait list; time of measurement: PRE = before the treatment, 4 W = 4 weeks after the treatment, 3 M = 3 months after the treatment; the 11-point scale ranged from 0 (very good or very satisfied) to 100 (very bad or very dissatisfied).

performed to reduce this confounding variable. However, we chose to stay with our 2 hr cut-off of minimum processing time, because it can be assumed that 2 hr seem enough to indicate proper participation. However, due to the sample size and reflections on power, we waived these analyses. With regard to this question, a next trial should analyse processing time and outcomes in more detail. Furthermore, individual courses compared separately with a WL condition, where only specific techniques of the courses are investigated, could shed light on those elements that worked best and contributed most to significant effects. It is also possible that the low-threshold offer (no costs) influenced drop-out rate in that more people abandoned the courses without completion (Hänggi, 2006). When interpreting the data, it must be taken into account that COVID restrictions were lifted during the course of this trial, which may have led to fluctuations in the data quality for all three test conditions (especially at the third point of measurement). However, this confounding effect should have been controlled by including the WL condition.

4.2 | Future research

It should be noted that in this study, positive effects from those who were particularly conscientious in performing the techniques were probably diluted by the data from those who invested less time. It would therefore be interesting for a future study to specifically collect data on how often, regularly and consistently the participants used the techniques they had learned in order to get information on differential effects in more detail. It would also be interesting to record the exact processing time of the participants in order to correlate this with the effect sizes on the different scales. Because clinically relevant symptoms (such as other forms of sleep disorders) were not recorded in this trial, it would make sense to record such symptoms as control variables in future trials. Given the randomization scheme of our study, we assume that—if there were any other relevant sleep disorders—their presence may not have biased our results. Finally, it should be noted that other trials were able to demonstrate greater effects of CBT or CBT-I treatments on stress and insomnia, for example, Zachariae et al. (2016). Future research has yet to show whether these differences are due to their clinical sample, the different teaching of the techniques, or the different study design.

4.3 | Clinical applications

Several studies on other internet-delivered CBT- or CBT-I-based e-learning courses have already shown that this form of therapy is effective in reducing stress (Asplund et al., 2017; Heber et al., 2017;

Nobis et al., 2018) or insomnia (Cheng & Dizon, 2012; Seyffert et al., 2016; Zachariae et al., 2016). Regarding online CBT-I-based courses for insomnia, it was found that they can be an acceptable form of treatment in the stepped care model to treat insomnia (Cheng & Dizon, 2012), and that these can be a good compromise when face-to-face treatment is too expensive or unavailable (Ho et al., 2015). ST and SW are even more interesting in this respect, as they offer the additional possibility that the patient can capture and share their individual illness situation directly online with a suitable expert thanks to various self-analysis tasks they fill out during the course, which can further increase cost-effectiveness and availability. Another advantage of the methods of CBT(-I)-based courses such as ST and SW is that they do not only treat the symptoms of stress and insomnia, but also address their causes. In addition, they can teach practical techniques that can be used in the event of acute stress and insomnia, as well as techniques designed for long-term and sustainable prevention.

Online CBT-(I) courses such as ST and SW have a wide range of applications in clinical settings as well as in organizational contexts. They can be helpful in milder cases for self-users, but they can also be prescribed by appropriate specialists as preparation for a more extensive therapy, as a tool for bridging waiting times until the face-to-face therapy starts or as a tool for blended therapies (combining the courses with psychotherapy or coaching). Finally, it can also be useful to use the courses as a post-therapeutic intervention (like booster sessions) to prevent relapse after therapy.

5 | CONCLUSION

The courses SW and ST have been shown to be practicable and effective online CBT(-I) tools for participants to independently and sustainably reduce insomnia and stress symptoms on a broad variety of scales at the 4 W as well as partially at the 3 M follow-up. They can both be seen as an inexpensive, easily accessible and widely available alternative to face-to-face psychotherapy and to a drug-based treatment against insomnia or stress symptoms with their side-effects.

AUTHOR CONTRIBUTIONS

Philipp Hürlimann carried out the data collection and the statistical analyses, and drafted a first version of the paper. Katharina Weitkamp contributed to the statistical analyses and manuscript drafting. Guy Bodenmann and Dieter Riemann conceived of the study, supervised the statistical analyses, and edited the manuscript. All authors contributed to the revision of this manuscript and approved the submitted version.

CONFLICT OF INTEREST STATEMENT

The main author of this publication, Philipp Hürlimann, is also the operator of the "MeinStressCoach" platform on which the two CBT courses were distributed. In addition, the two course authors Prof. Dr Bodenmann (respectively, the University of Zurich) and Prof. Dr Riemann will receive royalties. Katharina Weitkamp has no conflict of interest to declare.

ACKNOWLEDGEMENT

Open access funding provided by Universitat Zurich.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

ORCID

Philipp Hürlimann https://orcid.org/0000-0003-3197-3844
Dieter Riemann https://orcid.org/0000-0002-1968-6220

REFERENCES

Asplund, R. P., Dagöö, J., Fjellström, I., Niemi, L., Hansson, K., Zeraati, F., Ziuzina, M., Geraedts, A., Ljótsson, B., Carlbring, P., & Andersson, G. (2017). Internet-based stress management for distressed managers: Results from a randomised controlled trial. *Occupational and Environmental Medicine*, *75*, 105–103.

Berger, T. (2015). *Internetbasierte Interventionen bei psychischen Störungen*. Hogrefe.

Bhui, K. S., Dinos, S., Stansfeld, S. A., & White, P. D. (2012). A synthesis of the evidence for managing stress at work: A review of the reviews reporting on anxiety, depression, and absenteeism. *Journal of Environmental and Public Health*, *2012*, 1–21. https://doi.org/10.1155/2012/515874

Bodenmann, G. (2000). *Stressfit. Unveröffentlichtes Kursmanual*. Universität Zürich.

Bodenmann, G., Perrez, M., Cina, A., & Widmer, K. (2001). Verbesserung der individuellen Stressbewältigung im Rahmen des Freiburger Stressbewältigungstrainings (FSPT): Ergebnisse einer 1-Jahres-Follow-up-Untersuchung. *Zeitschrift für Gesundheitspsychologie*, *9*, 2–12.

Bodenmann, G., Widmer, K., & Cina, A. (1999). Das Freiburger Stresspräventionstraining (FSPT): Selbstwahrgenommene Veränderungen innerhalb von 6 Monaten. *Verhaltenstherapie*, *9*, 87–94.

Bodenmann-Kehl, C. (1999). *Eine Analyse spezifischer Ansatzpunkte zur Förderung der familiären Kompetenz*. Universität Fribourg.

Boullin, P., Ellwood, C., & Ellis, J. G. (2016). Group vs. individual treatment for acute insomnia: A pilot study evaluating a "one-shot" treatment strategy. *Brain Sciences*, *7*(1), 1–10. https://doi.org/10.3390/brainsci7010001

Brasure, M., Fuchs, E., MacDonald, R., Nelson, V. A., Koffel, E., Olson, C. M., Khawaja, I. S., Diem, S., Carlyle, M., Wilt, T. J., Ouellette, J., Butler, M., & Kane, R. L. (2016). Psychological and behavioral interventions for managing insomnia disorder: An evidence report for a clinical practice guideline by the American College of Physicians. *Annals of Internal Medicine*, *2016*(165), 113–124.

Cheng, S. K., & Dizon, J. (2012). Computerised cognitive behavioural therapy for insomnia: A systematic review and meta-analysis. *Psychotherapy and Psychosomatics*, *2012*(81), 206–216. https://doi.org/10.1159/000335379

Cina, A., Widmer, K., & Bodenmann, G. (2002). Die Wirksamkeit des Freiburger Stresspräventionstrainings (FSPT): Ein Vergleich von zwei Trainingsvarianten. *Verhaltenstherapie*, *12*, 36–45.

Ellis, J. G., Gehrman, P., Espie, C. A., Riemann, D., & Perlis, M. L. (2012). Acute insomnia: Current conceptualizations and future directions. *Sleep Medicine Reviews*, *16*(1), 5–14. https://doi.org/10.1016/j.smrv.2011.02.002

Gerber, M., Lang, C., Lemola, S., Colledge, F., Kalak, N., Holsboer-Trachsler, E., Pühse, U., & Brand, S. (2016). Validation of the german version of the insomnia severity index in adolescents, young adults and adult workers: Results from three cross-sectional studies. *BMC Psychiatry*, *16*, 174. https://doi.org/10.1186/s12888-016-0876-8

Gureje, O., & Obikoya, B. (1990). The GHQ-12 as a screening tool in a primary care setting. *Social Psychiatry and Psychiatric Epidemiology*, *25*(5), 276–280.

Hänggi, Y. (2006). Kann web-basierte Stressprävention erfolgreich sein? *Zeitschrift für Klinische Psychologie Und Psychotherapie*, *35*(3), 169–177.

Heber, E., Ebert, D. D., Lehr, D., Cuijpers, P., Berking, M., Nobis, S., & Riper, H. (2017). The benefit of web- and computer-based interventions for stress: A systematic review and meta-analysis. *Journal of Medical Internet Research*, *19*(2), e32. https://doi.org/10.2196/jmir.5774

Ho, F. Y., Chung, K.-F., Yeung, W.-F., Ng, T. H., Kwan, K.-S., Yung, K.-P., & Cheng, S. K. (2015). Self-help cognitive behavioral therapy for insomnia: A meta-analysis of randomized controlled trials. *Sleep Medicine Reviews*, *19*, 17–28.

Janke, S., & Glöckner-Rist, A. (2012). Deutsche version der satisfaction with life scale (SWLS). In D. Danner & A. Glöckner-Rist (Eds.), *Zusammenstellung sozialwissenschaftlicher Items und Skalen*. GESIS.

Kaluza, G. (1997). Evaluation von Stressbewältigungstrainings in der primären Prävention–eine Meta-Analyse (quasi-) experimenteller Feldstudien. *Zeitschrift für Gesundheitspsychologie*, *5*(3), 149–169.

Kaluza, G. (2002). Förderung individueller Belastungsverarbeitung: Was leisten Stressbewältigungsprogramme? In B. Röhrle (Ed.). Prävention und Gesundheitsförderung, DGVT.

Kanner, A. D., Coyne, J. C., Schaefer, C., & Lazarus, R. S. (1981). Comparison of two modes of stress measurement: Daily hassles and uplifts versus major life events. *Journal of Behavioral Medicine*, *4*(1), 1–39.

Merz, C. (2014). The mutual enrichment of work and love (Published dissertation).

Morin, C. M. (1993). *Insomnia: Psychological assessment and management*. Guilford Press.

Nobis, S., Heber, E., & Lehr, D. (2018). E-Mental Health im betrieblichem Gesundheitsmanagement–das Potential von Online-Gesundheitstrainings am Beispiel von GET.ON Stress. In D. Matusiewicz & L. Kaiser (Eds.), *Digitales Betriebliches Gesundheitsmanagement* (pp. 475–490). Springer.

Qaseem, A., Kansagara, D., Forciea, M. A., Cooke, M., & Denberg, T. D. (2016). Management of chronic insomnia disorder in adults: A clinical practice guideline from the American College of Physicians. *Annals of Internal Medicine*, *2016*(165), 889–897.

Riemann, D., Baglioni, C., Bassetti, C., Bjorvatn, B., Dolenc Groselj, L., Ellis, J. G., Espie, C. A., Garcia-Borreguero, D., Gjerstad, M., Gonçalves, M., Hertenstein, E., Jansson-Fröjmark, M., Jennum, P. J., Leger, D., Nissen, C., Parrino, L., Paunio, T., Pevernagie, D., Verbraecken, J., … Spiegelhalder, K. (2017). European guideline for the diagnosis and treatment of insomnia. *Journal of Sleep Research*, *26*(6), 675–700. https://doi.org/10.1111/jsr.12594

Riemann, D., Baum, E., Cohrs, S., Croenlein, T., Hajak, G., Hertenstein, E., Klose, P., Langhorst, J., Mayer, G., Nissen, C., Pollmächer, T., Rabstein, S., Schlarb, A., Sitter, H., Weeß, H.-G., Wetter, T., & Spiegelhalder, K. (2017). S3-Leitlinie Nicht erholsamer Schlaf/Schlafstörungen: Kapitel "Insomnie bei Erwachsenen" (AWMF-Registernummer 063-003), Update 2016. *Somnologie*, *21*, 2–44. https://doi.org/10.1007/s11818-016-0097-x

Sawdon, O. L., Elder, G. J., Santhi, N., Alfonso-Miller, P., & Ellis, J. G. (2021). Testing an early online intervention for the treatment of disturbed sleep during the COVID-19 pandemic in self-reported good and poor sleepers (sleep COVID-19): Study protocol for a randomised controlled trial. *Trials*, *22*, 913. https://doi.org/10.1186/s13063-021-05888-0

Schär, M., & Bodenmann, G. (2007). Auffrischungskurse bei der Prävention von Beziehungsstörungen: Wer nimmt teil, wer profitiert? *Verhaltenstherapie*, *17*, 251–260.

Schmitz, N., Kruse, J., & Tress, W. (1999). Psychometric properties of the general health questionnaire (GHQ-12) in a German primary care sample. *Acta Psychiatrica Scandinavica*, *100*(6), 462–468.

Seyffert, M., Lagisetty, P., Landgraf, J., Chopra, V., Pfeiffer, P. N., Conte, M. L., & Rogers, M. A. (2016). Internet-delivered cognitive behavioral therapy to treat insomnia: A systematic review and meta-analysis. *PLoS One*, *11*(2), e0149139. https://doi.org/10.1371/journal.pone.0149139

Spiegelhalder, K., Acker, J., Baumeister, H., Buettner-Teleaga, A., Danker-Hopfe, H., Ebert, D. D., Fietze, I., Frase, L., Klein, S., Lehr, D., Maun, A., & Mertel, I. (2020). Digitale Behandlungsangebote für Insomnie—eine Übersichtsarbeit. *Somnologie*, *24*, 106–114. https://doi.org/10.1007/s11818-020-00238-9

Wilt, T. J., MacDonald, R., Brasure, M., Olson, C. M., Carlyle, M., Fuchs, E., Khawaja, I. S., Diem, S., Koffel, E., Ouellette, J., Butler, M., & Kane, R. L. (2016). Pharmacological treatment of insomnia disorder: An evidence report for a clinical practice guideline by the American College of Physicians. *Annals of Internal Medicine*, *165*, 103–112.

Zachariae, R., Lyby, M. S., Ritterband, L. M., & O'Toole, M. S. (2016). Efficacy of internet-delivered cognitive-behavioral therapy for insomnia—a systematic review and meta-analysis of randomized controlled trials. *Sleep Medicine Reviews*., *30*, 1–10. https://doi.org/10.1016/j.smrv.2015.10.004

How to cite this article: Hürlimann, P., Bodenmann, G., Riemann, D., & Weitkamp, K. (2023). Cognitive behavioural therapy to treat stress and insomnia: A randomized wait list-controlled trial of two online courses. *Journal of Sleep Research*, e13874. https://doi.org/10.1111/jsr.13874