

The Effectiveness of Online Stress Management Training Interventions: A Systematic Literature Review

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Abstract

The central aim of this systematic literature review study was to investigate the effectiveness of online stress management training interventions that aimed to improve employees' well-being. The study focused both on the effectiveness of online stress management training interventions and the sustainability of the intervention effects over time. Within this literature review 18 intervention studies, conducted worldwide among 3085 participants between 2002 and 2017, were evaluated. Methodological quality was examined using the Mixed Methods Appraisal Tool (MATT). In general, the main outcomes showed that most of the interventions turned out to be effective in decreasing employees' levels of stress. In addition, some of these studies also revealed sustainability of intervention effects over time. This suggests that online stress management interventions are a promising tool for organizations to foster employee well-being.

Keywords: Systematic literature review, online training interventions, stress management, employee well-being, sustainability of intervention effects

1. Introduction

Work related stress has a big impact on contemporary organizations in Western Society. The costs of work related stress are found to be over hundreds of billions annually in Europe,

America and the UK (EU-OSHA, 2010; Riedell, Lynch, Baase, Hymel, & Peterson, 2010). These costs are related to decreased productivity as a result of health problems caused by work related stress, missed work days and health care costs. Therefore, organizations are willing to invest time and money in training interventions that aim to reduce work related stress and enhance employee well-being (Aldana, 2001). Over the last fifteen years, online training interventions aimed at enhancing well-being and reducing work related stress were offered to employees in organizations around the world. An important research question is whether these online interventions are indeed effective in enhancing employee well-being and to what extent these potential intervention effects are sustainable over time. This paper explores these questions by reviewing the literature on online stress management interventions among organizations in different sectors all over the world. An overview of online stress management interventions, including training frequency, training hours, effectiveness and sustainability are provided. As such, this study adds to the learning and development literature by providing a state-of-the-art overview of the impact of online stress management training interventions on employee well-being. Subsequently, the results of the literature review and implications are discussed.

2. Theory

2.1 The Impact of Work Related Stress on Employee' Well-Being

Work related stress is a global issue and according to several studies the number one occupational disease in Western society. The Health and Safety Executive (Aldana, 2001). showed that work related stress in the UK costs about 3.7 billion pound every year. In addition, the report revealed that five million employees feel “very” or “extremely” stressed by their work, and half a million employees experience work-related stress at a level that they believe it is making them ill. In line with these findings, a study by Randolfi (1997), revealed that work related stress caused health problems that led to decreased productivity in organizations. Companies in America spend about 300 billion dollar annually for health care and missed work days as a result of workplace-related stress (Eastern Kentucky University, 2016). In addition, around, 40% of American workers say that their jobs are very or extremely stressful and at the same time, 26% of employees say they are very often burned out, or stressed at the workplace. In a similar vein, the European Survey of Enterprises on New and Emerging Risk (2010). revealed that work related stress is a risk for our society, both in terms of costs and in terms of employee' well-being. Moreover, the ESENER report revealed that 79 % of European managers are concerned about stress in their workplaces and recognize interventions are needed to solve this complex issue. In line with this sense of urgency by managers, organizations are willing to invest time and money in organizational interventions aimed at improving employee well-being (Aldana, 2001). Over te last decades, organizational interventions aimed at improving employee well-being were implemented in practice and turned out to have potential to reduce work related stress and increase employee' well-being (Giga, Noblet, Faragher & Cooper, 2003; Meyers, Van Woerkom, & Bakker, 2013; Van Wingerden, Bakker, & Derks, 2017). Since technological advantages have made the internet an essential part of today's business, contemporary employers are offering their employees online interventions to enhance their well-being (Cook, Billings, Hersch, Back, & Hendrickson, 2007;

Shimazu, Kawakami, Irimajiri, Sakamoto, & Amano, 2005).

2.2 Online Training Interventions for Employee Well-Being

The Internet plays an important role in employees' learning and development processes, and the prevalence of online learning in the workplace is still growing (Schlager, Fusco, & Schank, 2002). Online interventions in the workplace offer several advantages for both employees and organizations. In comparison to face-to-face interventions, online interventions do have advantages in relation to efficiency, scalability and flexibility (Stralen, de Vries, Mudde, Bolman, & Lechner, 2011). These types of interventions are cost-effective, have the ability to reach large numbers of individuals and can be easily tailored to individual needs (Napolitano et al., 2003). Because of these advantages, there is not only a growing interest in using online interventions for learning and development in the workplace, but also to enhance well-being at work (Cook et al., 2007, Shimazu et al., 2005). As underlined earlier by Mitchell, Vella-Brodrick and Klein (2010), there is still a small body of research on online interventions for well-being. In a review paper by Mitchell et al. (2010), five different online interventions were analyzed. The overview of characteristics reported in this study revealed that three out of the five intervention studies showed an increase of participants' well-being. However, only one intervention study contained a sample of employees, the other intervention studies in the review consisted of samples of adults with mild depression. The intervention study that aimed to enhance employee's resilience did not reveal any significant effects. In contrast, a literature review of fifteen articles on different positive psychology interventions in organizations by Meyers, Woerkom and Bakker (2013), contained fourteen classroom interventions and one online intervention. The online intervention study revealed a significant effect on participants' well-being. However, this study did not use a follow up measurement after the post-test, so we do not know whether the initial positive effects on employee well-being were sustainable over time. In line with this observation, more research on online training interventions for employee well-being is needed to get a better understanding of the full potential of these types of interventions. Over the last decade, multiple well-being interventions that already proofed their benefits and potential in a clinical or therapeutically setting, found their way to the workplace (Giga et al., 2003; Avey, Wernsing, & Luthans, 2008; Le Fevre, Kolt, & Matheny, 2006; Thiar, Lehr, Ebert, Berking, & Riper, 2015). One type of these interventions that aim to enhance employee well-being, are online stress management training interventions. This literature review will focus on the effectiveness of these online stress management training interventions for employee well-being and the sustainability of the initially found intervention effects.

3. Method: Search Strategy, Quality Assessment and Analysis Strategy

3.1 Search Strategy

A systematic literature search was conducted using three databases: Scopus, Web of Science and PsychINFO. The literature was searched using the search terms deduced from the research question, which are summarized in Table 1. In order to limit the amount of results and increase the relative amount of relevant results, rows 1 and 2 were limited to searching by title only. In addition, in order to maintain the actuality of this review, we only included articles that were published in English between 2002 and 2017. The initial search yielded a total of 64 findings,

after removal of duplicates, 29 findings remained for further quality assessment (see Figure 1).

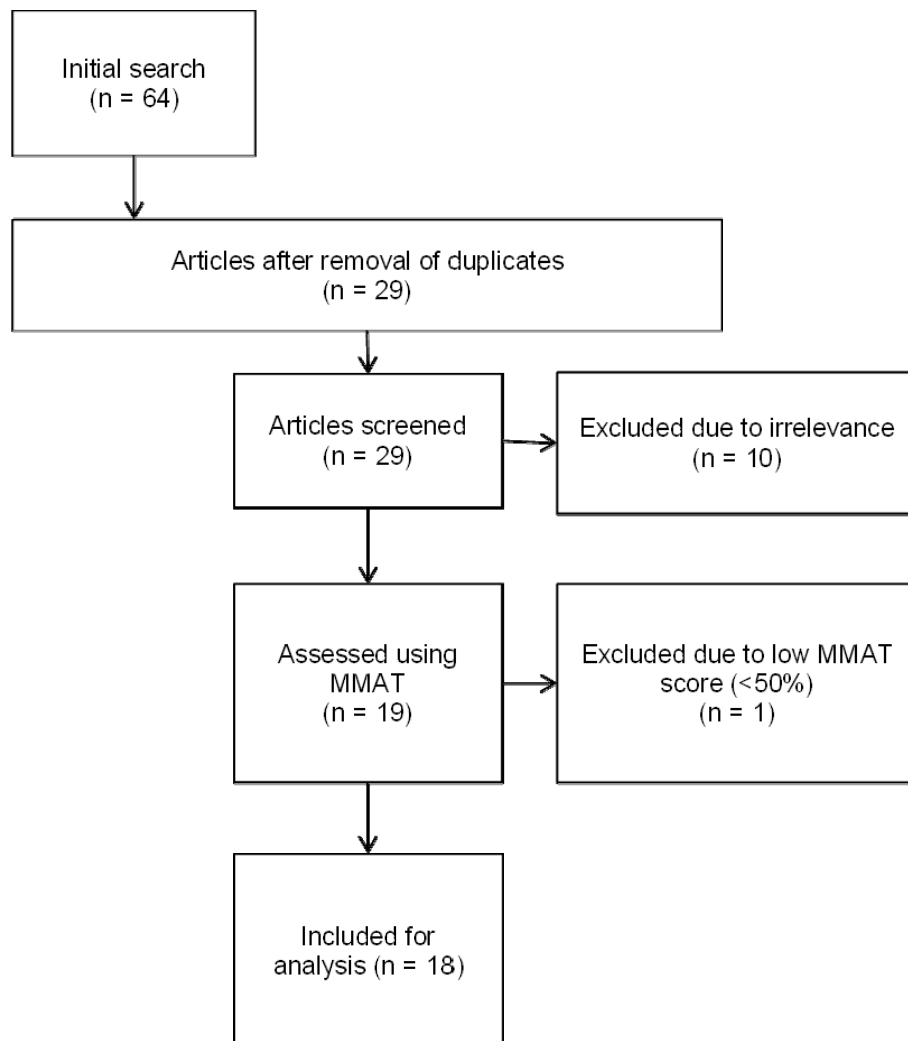


Figure 1. Flowchart Summarizing the Various Stages of Literature Search and Selection

Table 1. Summary of the Search Terms Used in Scopus, Web of Science and PsychINFO to Provide the Initial Literature Search

Row	Search terms	Search restrictions ¹
1	AND Stress AND (manag* OR reduc* OR lower* OR decreas* OR diminish* OR lessen OR weaken OR coping OR cope OR regulate OR handl* OR deal*)	Title
2	AND (web OR online OR internet OR digital) AND (Intervention OR treatment OR therapy OR program OR training OR trial OR RCT)	Title
3	AND organisation OR organization OR business OR company OR work OR workplace OR "work floor" OR employee OR worker OR job	Title/Abstract/Keyword (Scopus); Keyword (PsychINFO); Topic (Web of Science)

Note. ¹All searches were limited to findings published between 2002 and 2017

3.2 Quality Assessment.

To determine if the methodological quality of the remaining studies was sufficient, we applied the principles of the Mixed Methods Appraisal Tool (MMAT) (Pluye et al., 2011). Through means of a checklist, the MMAT is used to determine the quality of quantitative, qualitative and mixed methods studies (Pluye, & Hong, 2014). The ability to appraise mixed methods studies makes MMAT stand out among other tools, and it is known to be a reliable tool to efficiently determine which studies are suited for systematic literature search (Pace et al., 2012). Thus, we used the principles defined by MMAT to assess the quality of our initial findings.

To begin quality assessment of the remaining 29 studies, we first determined the relevance of the studies' research questions and the degree to which the questions were answered by looking at the titles and abstracts. Irrelevant studies or studies that did not have retraceable full versions were excluded from further analysis. As such, 10 studies were excluded after the first screening, leaving 19 studies for further quality assessment. By answering the MMAT questions for methodological quality assessment, we were able to determine the quality of the remaining 19 studies (Pluye et al., 2011). Studies that had a low MMAT score (< 50%) were subsequently excluded, removing another study from further analysis. Thus, a total of 18 studies remained for the final analysis (see Figure 1).

3.3 Analysis Strategy

In order to compare findings, and thus answer our research questions, we created an overview consisting of sample characteristics, intervention types, control conditions, assessment, measures, outcomes and other notable characteristics for the 18 remaining studies (see Table 2). Using this overview, we identified the main themes within the remaining literature by looking for similar findings and clustering them accordingly.

4. Results

The search resulted in 18 articles with a total number of 3085 participants (sample sizes

ranging from $N = 30$ to $N = 309$), living in the United States, Canada, Australia, Japan, China, the United Kingdom and different countries in Europe. Research has been conducted in a variety of organizations, operating in the field of healthcare, education, industry, construction, finance and assurance, IT, manufacturing, and government. An overview of the 18 studies and the characteristics of the online stress management interventions studies can be found in Table 2.

4.1 Effectiveness of Online Stress Management Training Interventions

The eighteen online stress management interventions presented in Table 2, could be divided in five different categories. Namely; Cognitive- behavioral based stress management interventions, Psycho-education based stress management interventions, Assertion training to manage stress levels, Career identity stress management training and Self-help based stress management interventions. The eight cognitive-behavioral based stress management interventions, focused on problem solving, emotion regulation and communication (Ruwaard, Lange, Bouwman, Broeksteeg, & Schrieken, 2007; Umanodan, Shimazu, Minami, & Kawakami, 2014; Ebert et al., 2016a; Ebert et al., 2016b; Heber, Lehr, Ebert, Berking, & Riper, 2016; Eisen, Allen, Bollash, & Pescatello, 2008; Hasson, Anderberg, Tehorell, & Arnetz, 2005; Billings, Cook, Hendrickson, & Dove, 2008). These eight studies all measured the effect of the intervention on (perceived) stress. All interventions had a significant negative effect on (perceived) stress, except the intervention study of Umanodan et al. (2014), which did not reveal a significant decrease of (perceived) stress, nor a significant effect on other study variables. The effects of two psycho-education based stress management interventions were tested by Ly, Asplund and Andersson (2014) and Shimazu, Anderberg, Theorell and Arnetz (2005). The interventions in these two studies, focused on problem solving, communication and self-efficacy of employees. The studies both measured the effect on (perceived) stress, where the intervention study by Ly et al. (2014) revealed a significant decrease of stress, the intervention study by Shimazu et al. (2005) did not reveal a significant effect, nor on (perceived) stress or on the other study variables.

Yamagishi, Kobayashi, Makiko, Nagami, Shimazu and Kageyama (2007) used an assertion training to manage the stress levels, behaviors and attitudes of employees, while Yamagishi, Kobayashi and Nakamura (2008) focused on career identity stress management training. Yamagishi et al. (2007) showed that the assertion knowledge and behavior increased significantly and that (perceived) stress decreased significantly. Within the study of Yamagishi et al. (2008), career identity knowledge increased significantly. However, there were no significant changes in mental health and (perceived) stress. Further, there are three self-help based stress management interventions, conducted by: Van Straten, Cuijpers and Smits (2008), Villani, Cognetta, Toniolo, Grassi, Cipresso and Riva (2013) and Zetterqvist, Maanmies, Strom, & Andersson (2003). The self-help stress management interventions mainly focused on relaxation, problem solving and time management skills to manage the stress levels of employees. The studies by Villani et al., (2013) and Zetterqvist et al., (2003) showed that coping skills increased significantly and (perceived) stress decreased significantly. The study by Van Straten et.al. (2008), revealed a significant decrease of depression and anxiety, but no effect on work related stress. Finally Jung et al., (2016) and Wolever et al., (2012) examined a

Mind-body stress management intervention. The intervention by Jung et al. (2016) turned out to be effective in decreasing (perceived) stress and negative affect and in increasing coping techniques, resilience and emotional intelligence. The intervention by Wolever et al., (2012) turned out to be effective in decreasing stress and increasing mindfulness. Sixteen of the eighteen online stress management intervention studies, showed significant effects on the majority of the intervention variables, in contrast, two studies (Shimazu et al., 2005; Umanodan et al., 2014) showed no significant effects. Nine of the eighteen studies reported significant estimates of effect sizes, eight of these nine studies reported Cohen's *d*. Further, four of the eighteen studies distinguished between 'within group' and 'between group' effect sizes, where the effect sizes for the experimental groups varied widely (-0.02; 1.83). The online stress management interventions differed in training time and training frequency. Training time ranged from 2 to 20 hours, training frequency ranged from 3 to 12 sessions. See Table 2 for all measures and outcomes of the 18 intervention studies, see Table 3 for details on stress measurement instruments, the means of pre and post measurements for these instruments and effect sizes. See table 4 for training time and frequency of the 18 intervention studies.

4.2 Sustainability of Online Stress Management Training Interventions Effects

In total, 10 of the 18 online stress management interventions used follow-up measurements to assess the sustainability of intervention effects. Heber et al. (2016) evaluated the intervention effects at three measurement points; 7 weeks, 6 months and 12 months after the intervention. The intervention turned out to be very effective in reducing stress levels and in improving different wellbeing outcomes such as work engagement and mental health. Other studies evaluated the intervention effects at two measurement points. Within the studies of Jung et al. (2016), Cieslack et al. (2016) and Ruwaard et al. (2007) all outcomes with significant effects remained significant at the follow-up measurement, respectively 8 weeks, 2 months and 3 years after the intervention. The studies of Ebert et al. (2016a; 2016b) were very effective, since almost all results remained significant at the follow-up measurement, 6 months after the intervention. The study of Eisen et al. (2008) revealed non-significant effects at the follow-up measurement, 1 month after the intervention.

Finally, the study of Yamagishi et al. (2008) was effective in relation to significantly improving career identity knowledge and impact on organizations 9 weeks after the intervention. However, the study by Yamagishi et.al, (2008) did not reveal positive effects on enhancing well-being or reducing job stress. In sum, of the 10 online stress management intervention studies that used follow-up measurements to assess the sustainability of intervention effects, 6 turn out to be effective to enhance employee well-being over a longer period of time. The time investment for the 6 online stress management interventions with sustainable intervention effects ranged between 3 and 17.5 hours. The most sustainable effects were found for the web- and mobile-based stress management training by Heber et al. (2016), the time investment for their online stress management training was 8.5 hour. See Table 5 for an overview of the study variables, the measurement points and frequencies of the 10 intervention studies that used follow-up measurements to assess the sustainability of intervention effects.

Table 2. Characteristics of the Online Stress Management Interventions

Study	Sample	Country	Intervention	Control conditions	Assessment	Measures	Outcomes	N-E group	N-C group
1) Yamagishi et al. (2007)	Nurses	Japan	Assertion training for stress management	None	Pre, post	Assertion knowledge	(+)	26	0
						Assertive behavior	(+)		
						Mental workload (job stress)	(-)		
2) Ruwaard et al. (2007)	Employees	Netherlands	Emailed cognitive behavioural treatment of work-related stress	Wait-list condition	Pre, post	Work-related stress	(-)	177	62
						Depression	(-)		
						Anxiety	(-)		
						Emotional exhaustion	(-)		
3) Umanodan et al. (2014)	Employees from 12 work units	Japan	computer-based stress management training (SMT) program	Wait-list control group	Pre, post	Knowledge stress management	ns.	142	121
						Job satisfaction	ns.		
						Work engagement	ns.		
						Problem-solving	ns.		
						Seeking social support	ns.		
						Changing mood	ns.		
						Emotional expression involving others	ns.		
						Avoidance and suppression	ns.		
						Changing point of view	ns.		
						Supervisor support	ns.		
						Coworker support	ns.		
						Knowledge stress management	ns.		
						Psychological distress	ns.		
Work performance	ns.								
Job satisfaction	ns.								

4) Zetterqvist et al. (2003)	Employees	Sweden	Internet-based self-help stress management program	Wait-list control group	Pre, post	Perceived stress	(-)	63	23
						Hospital anxiety & depression	(-)		
5) Ebert et al. (2016)	Employees	Germany	Self-guided internet-based and mobile-based stress management intervention	Wait-list control group	Pre, post	Perceived stress	(-)	131	132
						Depression	(-)		
						Anxiety	(-)		
						Presenteeism	(+)		
						Emotional exhaustion	(-)		
						Sleeping problems	(-)		
						Worrying	(-)		
						Quality of life	(+)		
						Psychological detachment	(+)		
						Emotion regulation skill	(+)		
						Absenteeism	ns.		
						Work engagement	ns.		
6) Ebert et al. (2016)	Employees large health insurance company	Germany	Internet- and mobile-based stress management (cognitive behavioural therapy)	Wait-list control group	Pre, post	Perceived stress	(-)	132	131
						Depression	(-)		
						Anxiety	(-)		
						Emotional exhaustion	(-)		
						Sleeping problems	(-)		
						Worrying	(-)		
						Quality of life	(+)		
						Psychological detachment	(+)		
						Emotion regulation skill	(+)		
						Presenteeism	ns.		
						Absenteeism	ns.		
						Work engagement	ns.		

7) Heber et al. (2016)	Employees	Germany	Guided web- and mobile-based stress management training	Wait-list control group	Pre, post	Perceived stress	(-)	132	132
						Mental health	(+)		
						Work-related health	(+)		
						Stress related skills	(+)		
						Work engagement	(+)		
						Quality of life	(+)		
						Absenteeism	(+)		
8) Ly et al. (2014)	Middle managers	Sweden	ATC-based stress management smartphone treatment	Wait-list control group	Pre, post	Perceived stress	(-)	36	37
						General health	(+)		
						Transformational leadership	ns.		
9) Yamagishi et al. (2008)	Shift-work nurses (two hospitals)	Japan	Web-based identity training for stress management	Control group	Pre, post	Knowledge of career identity	(+)	T0:26 T1:20 T2:16	T0:25 T1:16 T2:10
						Impact on organization	(+)		
						Mental health	ns.		
						Job stress	ns.		
10) Eisen et al. (2008)	Employees	USA	Stress-management intervention (instructor led vs computer presented)	Control group	Pre, post	Perceived stress	(-)	134	31
11) Jung et al. (2016)	Employees (in hospitals; health professionals)	South Korea	Online mind-body training program	Control group	Pre, post	Stress	(-)	42	45
						Coping strategies	(+)		
						Anger	(-)		
						Emotional intelligence	(+)		
						Negative affect	(-)		
						Resilience	(+)		

12) Hasson et al. (2005)	Employees (technology ,multimedia companies)	Sweden	Web-based stress management intervention	Reference group	Pre, post	Managing stress Concentration ability Sleep quality Mental energy Social support	(+) (+) (+) (+) (+)	121	156
13) Cieslak et al. (2016)	Health and human services professionals	Poland	Internet-based self-efficacy intervention (on secondary traumatic stress and secondary posttraumatic growth)	Education control group	Pre, post	Secondary traumatic stress Secondary posttraumatic growth Self-efficacy	(-) (+) (+)	87	81
14) Shimazu et al. (2005)	White collar workers in construction company	Japan	Web-based psychoeducation	Wait-list control group	Pre, post	Self-efficacy Stress Problem solving Job satisfaction	ns. ns. ns. ns.	T0:105 T1:100 T2: 95	T0:107 T1:104 T2:98
15) Villani et al (2011)	Oncology nurses	Italy	Innovative self-help stress management training (mobile tools)	Control group	Pre, post	Coping skills Anxiety state Anxiety trait reduction	(+) (-) (-)	15	15
16) Billings et al. (2008)	Working adults	USA	Web-based multimedia health promotion program	Wait-list control condition	Pre, post	Stress Knowledge of depression and anxiety Positive attitude treatment Approach alcohol consumption	(-) (+) (+) (+)	155	154

17) van Straten et al. (2008)	Employees	Netherlands	Web-based self-help intervention (mental health)	Wait-list control group	Pre, post	Depression Anxiety Quality of life Work related stress	(-) (-) ns. ns.	107	106
18) Wolever et al. (2012)	Employees (US)	USA	Virtual online classroom intervention	Control group	Pre, post	Depression Stress Mindfulness	ns. (-) (+)	52	44

All reported results significant to $p < .05$ (or lower). (+) significant increase; (-) significant decrease; ns. No significant effects; N - E group = N of experimental group; N - C group = N of experimental group

Table 3. Stress measurement instruments, means of pre and post measurements and effect sizes.

Study	Instruments	Pre (T0)	Post (T1)	Post (T2)	Outcomes	Effect sizes
1) Yamagishi et al. (2007)	Unknown sub-scale of job stress	m = 2.21	m = 2.11	N/A	ns.	ns.
2) Ruwaard et al. (2007)	Stress-subscale of Depression Anxiety Stress Scales (DASS-42)	E: m = 19.4 C: m = 19.7	E: m = 12.0 C: m = 17.6	N/A	(-)	Within: E: d = 0.6 Within: C: d = 0.2 Between: d = 0.6
3) Umanodan et al. (2014)	Unknown 'coping with stress' questions	E: m = 2.8 C: m = 3.0	E: m = 3.2 C: m = 3.0	E: m = 3.0 C: m = 2.8	(+) / (-)	T1: d = 0.19 T2: d = 0.19
	Brief Job Stress Questionnaire	E: m = 2.0 C: m = 2.1	E: m = 1.9 C: m = 2.0	E: m = 2.0 C: m = 2.0	ns.	ns.
4) Zetterqvist et al. (2003)	Perceived Stress Scale	E: m = 32.91 C: m = 33.17	E: m = 24.48 C: m = 28.88	N/A	(-)	N/A
5) Ebert et al. (2016)	Perceived Stress Scale-10	E: m = 25.7 C: m = 26.1	E: m = 18.1 C: m = 23.4	E: m = 17.5 C: m = 21.8	(-)	T1: d = 0.96 T2: d = 0.65

6) Ebert et al. (2016)	Perceived Stress Scale-10	E: m = 25.21 C: m = 25.31	E: m = 18.79 C: m = 23.33	E: m = 17.05 C: m = 22.24	(-)	T1: d = 0.79 T2: d = 0.85
7) Heber et al. (2016)	Perceived Stress Scale-10	E: m = 25.89 C: m = 25.15	E: m = 17.88 C: m = 22.96	E: m = 16.08 C: m = 22.10	(-)	Between: T1: d = 0.83 Within: T0-T1: E: d = 1.54 Within: T0-T2: E: d = 1.83 Within: T0-T1: C: d = 0.41 Within: T0-T2: C: d = 0.60
8) Ly et al. (2014)	Perceived Stress Scale-14 Perceived Stress Scale-10	E: m = 24.33 C: m = 24.49	E: m = 19.52 C: m = 23.29	N/A	(-)	Between: d = 0.50 Within: E: d = 0.62 Within: C: d = 0.17
	Brief Job Stress Questionnaire	E: m = (2.41 ; 2.97) C: m = (2.33 ; 2.90)	E: m = (2.18 ; 2.83) C: m = (2.40 ; 2.79)	E: m = (2.17 ; 2.94) C: m = (2.23 ; 2.93)	ns.	ns.
10) Eisen et al. (2008)	Stress Pulse Record	Session 1: E: m = 42.9 C: m = 45.8 Session 2: E: m = 46.7 C: m = 53.3	Session 1: E: m = 21.7 C: m = 38.3 Session 2: E: m = 21.1 C: m = 33.3	N/A	(-)	N/A
11) Jung et al. (2016)	Stress Response Inventory	E: m = 28.79 C: m = 26.80	E: m = 25.79 C: m = 34.09	E: m = 24.62 C: m = 37.31	(+)	N/A
12) Hasson et al. (2005)	Managing stress	E: m = 60 C: m = 60	E: m = 63 C: m = 58	N/A	(+)	N/A

13) Cieslak et al. (2016)	Secondary Traumatic Stress Scale	E: m = 2.26 C: m = 2.42	E: m = 2.10 C: m = 2.37	E: m = 2.27 C: m = 2.32	(+) / (-)	Between: T1: d = 0.49 Between: T2: d = 0.08 Within: T0-T1: E: d = 0.29 Within: T1-T2: E: d = -0.02 Within: T0-T1: C: d = 0.08 Within: T1-T2: C: d = 0.15
14) Shimazu et al. (2005)	Brief Job Stress Questionnaire	N/A	N/A	E: $\Delta m = -1.07$ C: $\Delta m = -0.72$	ns.	ns.
	Brief Job Stress Questionnaire	N/A	N/A	E: $\Delta m = -0.77$ C: $\Delta m = -0.27$	ns.	ns.
15) Villani et al (2011)	State Trait Anxiety Inventory	E: m = 9.429 C: m = 3.077	E: m = 5.067 C: m = 0.214	N/A	(-)	N/A
16) Billings et al. (2008)	Symptoms of Distress Scale	E: m = 17.52 C: m = 16.81	E: m = 16.03 C: m = 16.50	N/A	(-)	N/A
17) van Straten et al. (2008)	Maslach Burnout Inventory	E: m = 2.9 C: m = 2.8	E: m = 2.5 C: m = 2.8	N/A	ns.	N/A
	Maslach Burnout Inventory	E: m = 3.2 C: m = 3.4	E: m = 3.5 C: m = 3.2	N/A	ns.	N/A
	Maslach Burnout Inventory	E: m = 2.4 C: m = 2.4	E: m = 2.3 C: m = 2.6	N/A	ns.	N/A
18) Wolever et al. (2012)	Perceived Stress Scale-10	E: m = 24.52 C: m = 24.85	E: m = 14.91 C: m = 16.94	N/A	(-)	$\eta^2 = 0.02$

All reported results significant to $p < .05$ (or lower). (+) significant increase; (-) significant decrease; ns. non-significant ; N - E group = N of experimental group; N/A = not available;

E = experimental group; C = control group

Table 4. Online Stress Management Intervention training time and frequency

Study	Training frequency	Training hours	Related outcomes
1) Yamagishi et al. (2007)	70mn/week/3weeks	3,3	Assertion knowledge (+)
			Assertive behavior (+)
			Assertive mind ns.
			Job stress ns.
			Depression ns.
2) Ruwaard et al. (2007)	30mn/day/7weeks	17,5	Work-related stress (-)
			Depression (-)
			Anxiety (-)
			Emotional exhaustion (-)
3) Umanodan et al. (2014)	30mn/week/7weeks	3,5	Knowledge stress management ns.
			Supervisor support ns.
			Coworker support ns.
			Knowledge stress management ns.
			Psychological distress ns.
			Work performance ns.
			Job satisfaction ns.
			Work engagement ns.
			Problem-solving ns.
Seeking social support ns.			

			Changing mood	ns.
			Emotional expression involving others	ns.
			Avoidance and suppression	ns.
			Changing point of view	ns.
4) Zetterqvist et al. (2003)	40mn/6modelules	4	Perceived stress	(-)
			Hospital anxiety and depression	(-)
			Perceived family support	ns.
			Perceived friends support	ns.
5) Ebert et al. (2016)	60mn/session/4weeks	8	Perceived stress	(-)
			Depression	(-)
			Anxiety	(-)
			Presenteeism	(+)
			Emotional exhaustion	(-)
			Sleeping problems	(-)
			Worrying	(-)
			Quality of life	(-)
			Psychological detachment	(+)
			Emotion regulation skill	(+)
			Absenteeism	ns.
			Work engagement	ns.
6) Ebert et al. (2016)	60mn/8sessions	8	Perceived stress	(-)
			Depression	(-)

			Anxiety	(-)
			Emotional exhaustion	(-)
			Sleeping problems	(-)
			Worrying	(-)
			Quality of life	ns.
			Psychological detachment	(+)
			Emotion regulation skill	(+)
			Presenteeism	ns.
			Absenteeism	ns.
			Work engagement	ns.
7) Heber et al. (2016)	7 session/ 1 hr/ 1.5 hr coaching	8.5	Perceived stress	(-)
			Mental health	(+)
			Work-related health	(+)
			Stress related skills	(+)
			Work engagement	(+)
			Quality of life	(+)
			Absenteeism	(+)
8) Ly et al. (2014)	15mn/day/6weeks	7,5	Perceived stress	(-)
			General health	(+)
			Transformational leadership	ns.
9) Yamagishi et al. (2008)	60mn/week/3weeks	3	Knowledge of career identity	(+)
			Impact on organization	(+)

			Mental health	ns.
			Job stress	ns.
10) Eisen et al. (2008)	55mn/week/2weeks & 10mn/session/2 sessions	4	Perceived stress	(-)
			Subjective distress	ns.
			Control over stress	ns.
11) Jung et al. (2016)	10mn/day/8weeks	7	Stress	(-)
			Coping strategies	(+)
			Anger	(-)
			Emotional intelligence	(+)
			Negative affect	(-)
			Resilience	(+)
12) Hasson et al. (2005)		20	Managing stress	(+)
			Concentration ability	(+)
			Sleep quality	(+)
			Mental energy	(+)
			Social support	(+)
13) Cieslak et al. (2016)	4 sessions/ 4 weeks		Secondary traumatic stress	(-)
			Secondary posttraumatic growth	(+)
			Self-efficacy	(+)
14) Shimazu et al. (2005)	5 modules		Self-efficacy	ns.
			Stress	ns.
			Problem solving	ns.

			Job satisfaction	ns.
15) Villani et al. (2011)	15mn/session/8session	2	Coping skills	(+)
			Anxiety state	(-)
			Anxiety trait reduction	(-)
16) Billings et al. (2008)			Stress	(-)
			Knowledge of depression and anxiety	(+)
			Positive attitude treatment	(+)
			Approach alcohol consumption	(+)
17) van Straten et al. (2008)	45mn/week/4weeks	3	Depression	(-)
			Anxiety	(-)
			Quality of life	ns.
			Work related stress	ns.
18) Wolever et al. (2012)	14hr/12weeks	14	Depression	(ns.)
			Stress	(-)
			Mindfulness	(+)

All reported results significant to $p < .05$ (or lower). (+) significant increase; (-) significant decrease; ns. non-significant

Table 5. Sustainability of the Online Stress Management Intervention Effects

Study	Training frequency	Training hours	Related outcomes	
1) Yamagishi et al. (2007)	70mn/week/3weeks	3,3	Assertion knowledge	(+)
			Assertive behavior	(+)
			Assertive mind	ns.
			Job stress	ns.
			Depression	ns.
2) Ruwaard et al. (2007)	30mn/day/7weeks	17,5	Work-related stress	(-)
			Depression	(-)
			Anxiety	(-)
			Emotional exhaustion	(-)
3) Umanodan et al. (2014)	30mn/week/7weeks	3,5	Knowledge stress management	ns.
			Supervisor support	ns.
			Coworker support	ns.
			Knowledge stress management	ns.
			Psychological distress	ns.
			Work performance	ns.
			Job satisfaction	ns.
			Work engagement	ns.
			Problem-solving	ns.
			Seeking social support	ns.
			Changing mood	ns.
			Emotional expression involving others	ns.
			Avoidance and suppression	ns.
Changing point of view	ns.			
4) Zetterqvist et al. (2003)	40mn/6modelules	4	Perceived stress	(-)
			Hospital anxiety and depression	(-)

5) Ebert et al. (2016)	60mn/session/4weeks	8	Perceived family support	ns.			
			Perceived friends support	ns.			
			Perceived stress	(-)			
			Depression	(-)			
			Anxiety	(-)			
			Presenteeism	(+)			
			Emotional exhaustion	(-)			
			Sleeping problems	(-)			
			Worrying	(-)			
			Quality of life	(-)			
			Psychological detachment	(+)			
			Emotion regulation skill	(+)			
			Absenteeism	ns.			
			Work engagement	ns.			
6) Ebert et al. (2016)	60mn/8sessions	8	Perceived stress	(-)			
			Depression	(-)			
			Anxiety	(-)			
			Emotional exhaustion	(-)			
			Sleeping problems	(-)			
			Worrying	(-)			
			Quality of life	ns.			
			Psychological detachment	(+)			
			Emotion regulation skill	(+)			
			Presenteeism	ns.			
			Absenteeism	ns.			
			Work engagement	ns.			
			7) Heber et al. (2016)	7 session/ 1 hr/ 1.5 hr coaching	8.5	Perceived stress	(-)
						Mental health	(+)

			Work-related health	(+)
			Stress related skills	(+)
			Work engagement	(+)
			Quality of life	(+)
			Absenteeism	(+)
8) Ly et al. (2014)	15mn/day/6weeks	7,5	Perceived stress	(-)
			General health	(+)
			Transformational leadership	ns.
9) Yamagishi et al. (2008)	60mn/week/3weeks	3	Knowledge of career identity	(+)
			Impact on organization	(+)
			Mental health	ns.
			Job stress	ns.
10) Eisen et al. (2008)	55mn/week/2weeks & 10mn/session/2 sessions	4	Perceived stress	(-)
			Subjective distress	ns.
			Control over stress	ns.
11) Jung et al. (2016)	10mn/day/8weeks	7	Stress	(-)
			Coping strategies	(+)
			Anger	(-)
			Emotional intelligence	(+)
			Negative affect	(-)
			Resilience	(+)
12) Hasson et al. (2005)		20	Managing stress	(+)
			Concentration ability	(+)
			Sleep quality	(+)
			Mental energy	(+)
			Social support	(+)
13) Cieslak et al. (2016)	4 sessions/ 4 weeks		Secondary traumatic stress	(-)
			Secondary posttraumatic growth	(+)

14) Shimazu et al. (2005)	5 modules		Self-efficacy	(+)
			Self-efficacy	ns.
			Stress	ns.
			Problem solving	ns.
15) Villani et al. (2011)	15mn/session/8session	2	Job satisfaction	ns.
			Coping skills	(+)
			Anxiety state	(-)
16) Billings et al. (2008)			Anxiety trait reduction	(-)
			Stress	(-)
			Knowledge of depression and anxiety	(+)
			Positive attitude treatment	(+)
17) van Straten et al. (2008)	45mn/week/4weeks	3	Approach alcohol consumption	(+)
			Depression	(-)
			Anxiety	(-)
			Quality of life	ns.
18) Wolever et al. (2012)	14hr/12weeks	14	Work related stress	ns.
			Depression	(ns.)
			Stress	(-)
			Mindfulness	(+)

All reported results significant to $p < .05$ (or lower). (+) significant increase; (-) significant decrease; ns. non-significant

5. Discussion

This study aimed to contribute to the literature on online training interventions by conducting a literature review study on the impact of online stress management interventions aimed at fostering employee well-being. We examined both the effectiveness of 18 online stress management interventions and the sustainability of the intervention effects. Based on the results of this review, online stress management interventions turn out to be a promising tool to enhance employee well-being. In addition, more than half of the studies who measured intervention effects two or three times, revealed that intervention effects were sustainable over time. To our knowledge this is the first literature review study examining the effectiveness and sustainability of this type of organizational interventions on employee well-being. In the next section, we discuss the most important contributions of our study.

5.1 Theoretical Contributions

A first theoretical contribution of this article is that it adds to the existing intervention literature by being the first to offer a concise overview of the effectiveness of online stress management interventions in enhancing employees' well-being. Although earlier empirical reviews showed the potential of online interventions, (Mitchell et al., 2010; Wolever et al., 2012) until now no study had examined the effectiveness of online organizational stress management interventions in enhancing employees' well-being. Our review offers an overview of the different types of intervention studies conducted over the last fifteen years, including the intervention characteristics, intervention outcomes and the sustainability of the outcomes. Therefore, this study may help researchers to gain a better understanding of intervention design, quality and effectiveness. Second, the large total number of 3085 participants who work in different sectors in all parts of the world makes the literature review sample representative and relevant. In addition, by limiting the scope of the review to the years 2002-2017, it also gives a state-of-the-art overview that can be used as a base for future online intervention research.

5.2 Limitations and Research Issues

Besides the theoretical contributions, some limitations of our study need to be acknowledged. There are some factors that should still be kept in mind when interpreting the conclusions presented in this article. First, we limited our scope to online stress management interventions, rather than having a broader search strategy. Although this scope helped to gain a deep understanding of outcomes, effectiveness and sustainability, we cannot compare them with other types of online interventions aimed at enhancing employee well-being. Future studies might consider including other types of online organizational interventions like online mindfulness interventions, online mental well-being interventions and/or online work engagement interventions as well. Second, in most of the studies examined in this review, the outcomes were based on participants' self-reports, rather than more 'objective' measures. Although this is not something that was caused by our methodology specifically, it does mean that the results presented in this article should be interpreted with potential self-report bias in mind. However, employees' evaluations of their well-being may be subjective, and self-reports may be the best method to capture these perceptions and feelings (Sousa-Poza, & Sousa-Poza, 2000). In addition to measuring well-being and stress via questionnaires, future studies may

consider including measures of participants' levels of cortisol. Third, because of the rigor of our methodology, only a relatively small number of articles ended up being discussed in this study. However, since the final selection has been extensively screened beforehand in terms of methodological quality and relevance, we feel that the lack of quantity is mitigated by having a high-quality sample instead.

Beyond the limitations, there are also some research issues that need to be acknowledged. First, it is remarkable that in at least half of the studies, the control group showed a significant decrease in stress as well, albeit not as strong as the experimental group. In most studies, there were no significant differences between the control group and the experimental group(s) in terms of baseline statistics, with the exception of the study by Villani et al. (2013), where the experimental group scored higher on anxiety than the control group at T1. Further, the inconsistencies in the measurement of stress among the 18 studies challenges the comparability and interpretation of the outcomes. Therefore, we recommend that instead of only making general conclusions about all the studies together, to also take a closer look at the individual differences between studies and value the unique characteristics of each study separately. In addition, only 9 of the 18 studies reported significant estimates of effect sizes. With the exception of 1 study, they all reported Cohen's *d*. Only 4 studies distinguished between 'within group' and 'between group' effect sizes, where the effect sizes for the experimental groups varied widely (-0.02 ; 1.83). All in all, although there is evidence that online stress interventions reduce (perceived) stress, we have to take some caution into account in interpreting and generalizing the results.

5.3 Practical Implications

Besides theoretical contributions, the findings of this study also have practical implications for organizations, managers and employees. We suggest that organizations that aim to enhance employee well-being may find an efficient and effective solution in online stress management interventions. As online interventions turn out to be (cost) effective and can easily be tailored to individual needs (Stralen et al., 2011; Napolitano et al., 2003), these interventions show potential for all types of organizations. For organizations with small learning and development and/or mental health policy budgets, these type of interventions offer an affordable opportunity to foster employee well-being. The findings of this study may also have implications for HR(D) departments in relation to their learning and development and/or health policies and the programs they facilitate in the organization. Managers can stimulate employees to participate in online stress management interventions by sharing the positive contributions they may have on their well-being. Based on the review, the online cognitive-behavioral stress management interventions turn out to be the most effective in decreasing employees' stress and in improving employees' mental health, work-related health, work engagement and quality of life. In addition, these effects turn out to be sustainable up to 1 year after completing the intervention. Thus, from a management perspective, it would be recommendable to (proactively) offer employees online cognitive-behavioral stress management interventions to enhance their well-being. However, it needs to be mentioned that employees own preferences, interest and learning motivations are aspects in learning and development that may play an important role in the actual effectiveness of interventions. As the results of the literature review revealed, all

five sub types of online stress management interventions (Cognitive- behavioral based stress management interventions, Psycho-education based stress management interventions, Assertion training to manage stress levels, Career identity stress management training and Self-help based stress management interventions) have their own approach, focus, strengths and limitations. To help employees to select the type of intervention that has the most optimal fit with their needs and preferences, it is important to gain insights in their needs. Participants' input is not only essential to select the most effective intervention, this input also gives the opportunity to create a tailor made and personalized experience (for example Aikens et al. (2014)). For employees, this study underlines that online positive organizational interventions can support them to stay healthy and engaged in their job.

5.4 Future Research and Conclusion

Considering our limitations and implications, various suggestions for future research can be made. This literature review study not only gives a clear overview of the effectiveness of online stress management training interventions and sustainability of the intervention effects, but also reveals the need for future research. Because our search was limited to only including online stress management training interventions, it makes sense to broaden this scope in future research by including other types of online training interventions aimed at enhancing employee well-being as well. Most studies in this literature review present a description of the intervention design including the (estimated) time needed for participants to complete the intervention. However, we do need to mention that there is a lack of information on the time participants actually spend from start till finish. The newest technology and learning management systems can provide detailed information on participation time, for example on total time participants spend using the online intervention, which assignments of the interventions are completed, and how often participants logged into the different intervention chapters/elements. Insights in this information may help to gain a better understanding of differences in online intervention effectiveness.

Online stress management training interventions offer organizations an opportunity to actively enhance employees' well-being. As the outcomes of this study revealed, investing in this type of training interventions can be beneficial for both employees and organizations, on short and long term. Organizations who see online training interventions as a window of opportunities to invest in conditions for a healthy work environment, can proactively facilitate these interventions. By doing so, organizations take charge to create optimal conditions for a sustainable healthy workforce.

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