

Review

Web-based interventions for the management of stress in the workplace: Focus, form, and efficacy

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Abstract: Objectives: This review sought to determine what is currently known about the focus, form, and efficacy of web-based interventions that aim to support the well-being of workers and enable them to manage their work-related stress. **Method:** A scoping review of the literature as this relates to web-based interventions for the management of work-related stress and supporting the psychological well-being of workers was conducted. **Results:** Forty-eight web-based interventions were identified and reviewed, the majority of which ($n = 37$) were “individual”-focused and utilized cognitive-behavioral techniques, relaxation exercises, mindfulness, or cognitive behavior therapy. Most interventions identified were provided via a website ($n = 34$) and were atheoretical in nature. **Conclusions:** There is some low-to-moderate quality evidence that “individual”-focused interventions are effective for supporting employee well-being and managing their work-related stress. There are few web-based interventions that target “organizational” or “individual/organization” interface factors, and there is limited support for their efficacy. A clear gap appears to exist between work-stress theory and its application in the design and development of web-based interventions for the management of work-related stress.

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Supporting employee well-being in the workplace is an increasingly important public health challenge¹. Recent organizational trends have pointed to the emergence of

progressively more challenging and dynamic working environments, attributable in part to economic globalization, the decline of traditional industries, and the growth of occupational sectors such as IT and service industries². Issues associated with this changing landscape include pressure to upskill, job insecurity, role conflict, reduced employees leave and rest time, fewer rewards, and insufficient work-life balance³.

Much of the current research with regard to worker stress interventions is marked by a distinct transition in focus from the traditional face-to-face format to web-based delivery modalities. Web-based behavioral health interventions are typically delivered through dedicated program websites, computer program, or smartphone application⁴. The benefits of web-based versus traditional face-to-face interventions include fewer constraints with regard to time and location, the potential to access a larger target group, and protection of participant anonymity, thereby reducing possible stigma with regard to seeking help for stress. An increasing number of studies have reported on the delivery and evaluation of web-based stress management interventions for workers. However, the literature has yet to be reviewed with regard to the focus and form of such interventions and their efficacy in the prevention and management of employee stress.

A considerable number of worker-directed stress management intervention studies have been published. A recent meta-review synthesized the findings of 23 systematic reviews, reporting 499 primary research studies on the efficacy of interventions for managing stress at work⁵. A seminal meta-analytic review⁶ indicated that occupational stress management interventions are moderately effective in reducing stress in the work place, but that cognitive-behavioral and multimodal interventions were most effective, with medium average effect sizes of $d = 0.68$ and $d = 0.51$, respectively. Relaxation-based interventions were found to have a small average effect size ($d = 0.35$). The effect of organizational-directed interventions, however, was nonsignificant.

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A later update of this review⁷⁾ applied more methodologically stringent inclusion criteria (e.g., only controlled experimental studies with random participant assignment were included for review). Average effective sizes for cognitive-behavioral ($d = 1.167$) and relaxation-based interventions were larger ($d = 0.497$) than the previous study although they were found to be smaller for multimodal interventions ($d = 0.239$). Bhui and colleagues, however, caution against drawing conclusive comparisons with regard to the benefits of single intervention techniques, highlighting considerable heterogeneity of intervention type, mode of delivery, outcome measure, and target population⁵⁾. These reviews do indicate, however, that workplace stress management interventions, particularly those incorporating cognitive-behavioral components, can be efficacious in improving employee well-being.

The Current Review

Scoping studies represent an increasingly prevalent method for the conduct of a broad search of the literature on a defined topic⁸⁾. The framework for this review derives from that proposed by Arksey and O'Malley⁹⁾ and aims to describe and summarize in detail the current findings and range of research in a particular area of study. As such, this review sought to determine what is currently known about the focus, form, and efficacy of web-based interventions for the prevention and management of stress in the workplace. "Focus" was taken to refer to the target strategy and content of the interventions, while "form" was taken to refer to structure and delivery modality. Within the context of this study, "efficacy" referred to the reported study results in relation to participant outcomes and the methodological quality of the evidence under review.

Methods

The published literature was identified by searching the following electronic databases from inception to 18 April 2016:

- Academic Search Complete
- CINAHL
- PsycINFO
- Medline
- Web of Science

Key terms such as "Stress," "Strain," "Mental Health," "Well-being," "Occupation," "Job," "Employee," and "Worker," combined with the terms "digital," "web-based," "mobile," and "online" were searched. The following inclusion and exclusion criteria were applied:

Inclusion Criteria

- Interventions that aimed to reducing worker stress or

improve mental well-being,

- Delivered via web-based modalities,
- Participants recruited from working populations, over 18 years of age, and
- Studies published in English.

Web-based interventions were defined as any intervention that was delivered via website, e-mail, or smartphone application. Interventions directed at full-time or part-time employed/self-employed working individuals only were included.

Exclusion Criteria

- Review papers, meta-analyses, or meta-synthesis,
- Non web-based interventions,
- Papers not published in English,
- Development, protocol, or cost-analysis papers,
- Participants not recruited from a working population, and
- Aimed at workers with a clinical psychiatric or mental health diagnosis.

Interventions delivered via stand-alone (i.e., non-web-based) computer programs were also excluded.

The initial search output returned 6,197 papers. Following title and abstract screening, 5,876 papers were removed due to duplication or not meeting inclusion criteria. The full texts of the remaining 321 papers were retrieved and screened, from which a further 271 papers were excluded after assessment. This left a total of 50 papers included in the final review, describing 48 studies (two papers reported 1-year follow-up data). One review author (CR) independently selected the studies to include in the review according to the inclusion and exclusion criteria. If there was any uncertainty concerning the inclusion of a study, this was discussed with the two other review authors (MB and JW), and a decision was agreed.

A search of the reference lists for additional references in all identified primary studies was also conducted. The reference lists of key reviews⁵⁻⁷⁾ were also searched. No additional papers that met inclusion criteria were identified through this process. The methodical quality of the reviewed evidence was evaluated utilizing principles of the GRADE approach¹⁰⁾ and the Cochrane collaboration "Risk of Bias" tool¹¹⁾. Data relating to study authors, sample characteristics, prevention level, intervention techniques, theoretical underpinning, research design, and delivery modality were extracted from each of these studies and charted (see Appendix).

Results

General Findings

Form The majority of interventions were primarily delivered via a website (34 of 48, 70.83%). Four interventions were delivered solely via a mobile device, while four utilized a combined website and mobile approach.

Moreover, four interventions were delivered via a “blended” format: three of which comprised cognitive behavior therapy (CBT) delivered via combined group and e-mailed/website sessions and one involved an eHealth module combined with occupational physician consultations. Two interventions delivered solely via e-mail were also identified. Support or guidance from program facilitators was delivered through various modalities including e-mail, text message, phone call, support groups, e-coach feedback, and online forum moderation. However, 17 studies did not indicate whether support or guidance from the program facilitators was provided. Excluding six programs that were delivered over 1-week period or less, mean intervention duration was 8.82 weeks, with a median of 7 weeks.

Focus To accurately characterize the included literature, the interventions described in these studies were categorized as “individual,” “organizational,” or “individual/organization interface” focused in terms of their target strategy, based on a categorization proposed by De Frank and Cooper¹². “Individual-focused” interventions support employees experiencing stress symptoms, providing them with the knowledge and skills needed to cope effectively with their personal levels of stress. “Organizational” interventions address aspects of the working environment that may be stress inducing. They generally aim to create a less-stressful environment for employees. Finally, “organizational/individual interface” interventions aim to resolve issues as these relate to interactions between employees and their organization, such as role conflict and person-environment fit¹³.

Forty-two interventions were classified as “individual” focused; three were classified as “organizational,” while three interventions were found to target the “individual/organizational” interface. Thirty-eight interventions (79.17%) were evaluated through a randomized control trial; eight studies (16.67%) employed a noncontrolled pre-post experimental design; one study employed a non-randomized control group; and one program was assessed qualitatively (see Appendix). The reported efficacy of these interventions in the context of their target strategy and primary content is now presented.

“Individual”-focused stress management interventions

The majority of interventions (42 of 48, 87.5%) utilized an “individual”-focused strategy. Of these, 1 comprised a web-based psycho-educational program, 27 were based on cognitive-behavioral and/or relaxation-based techniques, while 6 web-based CBT interventions were also identified. For the purposes of this review, interventions utilizing techniques based on the principles of the cognitive-behavioral method were considered separately from interventions that comprised CBT solely within a therapeutic approach. Moreover, four mindfulness-based interventions and four interventions in which multiple

health behaviors, including stress management, were targeted as part of a broader health promotion program were also identified. Twelve of these studies (14-26) were considered to be of moderate methodological quality, with the remainder classified as low or very low in quality arising from significant limitations in study design or implementation.

Didactic stress management: Shimazu, Kawakami, Irimajiri, Sakamoto, and Amano²⁷ assessed the impact of a web-based psycho-education program with a sample of 225 white collar workers in a machinery construction company through a randomized control trial. The intervention had limited impact on participants’ scores of self-efficacy, problem solving, stress, and job satisfaction. Stratified analysis of study data did reveal a significant positive impact of the intervention on the job satisfaction of male participants and on the self-efficacy of younger participants (i.e., aged <40 years) compared with waitlist controls.

Cognitive-behavioral and/or relaxation techniques:

Twenty-seven studies were identified in which cognitive-behavioral and/or relaxation techniques comprised the principal intervention. These studies include 21 randomized controlled trials (RCTs), 16 of which supported the efficacy of these techniques, while 5 reported that a web-based intervention had only limited^{26,28,29} or no impact^{30,31} on measures of worker well-being or psychological stress and strain. Six noncontrolled cohort studies were also identified, each of which reported positive outcomes on employee well-being. Most studies were at serious risk of bias, with just seven considered to be of at least moderate methodological quality.

Two web-based intervention programs, *GET.ON Stress* and *GET.ON Recovery*, were evaluated through several randomized control trials and associated with significant medium to large reductions in worker’s perceived stress. A combined mobile and computer-based *GET.ON Stress* program was trialed with a sample of 264 employees recruited via a health insurance company¹⁴. A significant large reduction in perceived stress was found for the intervention group postintervention ($d = 0.83$) and at 6-month follow-up ($d = 1.02$) compared with waitlist controls. This reduction was maintained at a 12-month follow-up ($d = 1.83$). Significant medium to large positive improvements were also made by the intervention group compared with controls ($d = 0.4-0.75$) on measures of mental health, work-related health, and stress-related skill postintervention and at 6-month follow-up (although there were no improvements on absenteeism or presentism).

GET.ON Stress was also evaluated in self-guided and adherence-focused guided formats in two other trials^{15,16}. With regard to the self-guided format, significant medium to large reductions in perceived stress postintervention ($d = 0.96$) and 6-month follow-up ($d = 0.65$) were reported

for participants in the intervention group versus waitlist controls. Significant small to medium improvements were also made the intervention group on measures related to mental health and work skills and competences ($d = 0.30-0.69$) at both assessment points compared with controls. No improvements were made on measures of absenteeism, work engagement, or physical health-related quality of life. Similar positive improvements were also found for the guided intervention program, with medium to large reductions in perceived stress postintervention ($d = 0.79$) and 6-month follow-up ($d = 0.85$) reported for participants in the intervention group versus waitlist controls. Significant improvements were also made the intervention group on measures related to mental health, work-related health, and skills and competences related to emotional regulation at both assessment points compared with controls.

Three trials were conducted with teachers with work-related stress/insomnia and depressive symptoms, respectively. *GET.ON Recovery* was evaluated with 128 teachers with work strain and sleep problems¹⁷. A significant large reduction in insomnia severity was reported for intervention group participants postintervention ($d = 1.45$) and at 6-month follow-up ($d = 1.43$) versus waitlist controls. Significant improvements were also made on measures of rumination, worrying, sleep efficiency, restorative sleep, recreational activities, and recovery versus controls. Effect sizes ranged from small to large ($d = 0.34-0.77$) postintervention and at 6-month follow-up ($d = 0.34-0.99$). There was no impact on recovery mastery or absenteeism.

These findings were further replicated in a trial of an unguided (i.e., fully automated) version of *GET.ON Recovery*, again with a sample of teachers³². A significant large reduction in insomnia severity was again reported for intervention group participants postintervention ($d = 1.37$) versus waitlist controls. Moderate-to-large improvements versus controls were also found for mental health, sleep, perseverance cognitions, and recovery experience outcomes. These improvements remained stable at 6-month follow-up.

The web-based *Everything under Control* program was also trialed with a sample of 150 teachers with elevated depressive symptoms³³. The intervention group reported significantly greater decreases in such symptoms postintervention compared waitlist controls, which was maintained at 3- and 6-month follow-up points. The magnitude of these differences were medium postintervention ($d = 0.59$) and small at 3-month ($d = 0.37$) and 6-month ($d = 0.38$) follow-up. Significant small to medium improvements were also made by the intervention group compared with controls on a range of secondary measures of stress, self-efficacy, quality of life, and worrying postintervention ($d = 0.36-0.63$), at 3-month ($d = 0.38-0.62$) and at 6-month ($d = 0.33-0.54$) follow-up. There were no sig-

nificant improvements on measures of absenteeism or burnout at any point.

A divergence of interventions components were identified within the cognitive-behavioral sphere. This includes a web-based positive psychology program delivered to 147 insurance company employees over a 7-week period, which produced significant medium to large improvements on a range of measures including job satisfaction and quality of life (both $d > 1$), happiness ($d = 0.93$), emotional stress ($d = 0.69$), and mindfulness ($d = 0.62$) compared with waitlist controls¹⁸. Another intervention focused on building the four key components of psychological capital (i.e., hope, efficacy, optimism, and resilience) and was trialed with 384 employees from a broad cross-section of industries³⁴. A small significant positive increase in psychological capital ($d = 0.191$) was found for the intervention group versus inactive control postinterventions (this was the only outcome measure).

Ly, Asplund, and Andersson³⁵ evaluated the efficacy of an “acceptance and commitment”-based smartphone application intervention with a sample of 73 midlevel sales managers and reported significant small to medium improvements were reported on scores of mood ($d = 0.41$) and perceived stress ($d = 0.50$) postintervention by those who accessed the application compared with waitlist controls.

A “blended” web-based intervention comprising an eHealth module and occupation physician support was evaluated with a sample 131 sick-listed employees³⁶. The eHealth module comprised psycho-education, cognitive-behavioral exercises, pain and fatigue management, problem solving, and relapse prevention, while the physicians also received e-mailed decision-based aids based on principles of stepped collaborative care. It was found that participants who received the intervention returned to the work significantly more quickly than controls, while a significantly larger proportion also achieved remission 9 months postbaseline compared with controls although lasting return to work and treatment response did not differ between these two groups.

Several papers detailed the published results of a trial of online workplace mental health promotion for nurses and allied health professionals. Ketelaar, Nieuwenhuijsen, Gartner, Bolier, Smeets, and Sluiter³⁷ reported on a cluster RCT in which intervention group participants completed and received feedback on a worker health surveillance module and then either offered a range of online interventions (which targeted psychological well-being, depressive and panic symptoms, work-related stress, and problem drinking). Both the intervention and control groups improved in work functioning although there was no significant difference between the two. There were also no differences between these two groups at follow-up on scores of mental distress, impaired work functioning or impaired mental health. A smaller uncontrolled

pre-post-trial was then conducted with 128 participants who had comprised the waitlist control for this study³⁸⁾. Significant small improvements were reported for stress ($d = 0.23$) and for work functioning and work-related fatigue postintervention.

These studies were also part of a larger trial that included a third arm comprising access to an occupational physician³⁹⁾. The online interventions were compared with an occupational physician consultation in a cluster RCT⁴⁰⁾ with both groups undertaking the work health surveillance module before assignment. Both groups improved in work functioning over time, with no significant differences between the two. Another study⁴¹⁾ also compared the work health surveillance module plus online interventions to a waitlist control. While there was no impact on worker's general well-being, depression, or anxiety scores, significant improvements in mental health and psychological well-being were reported versus control postintervention. With regard to mental health, effect sizes were medium ($d = 0.37$) at 3-month and small ($d = 0.28$) at 6-month follow-up, while they were medium in size at both follow-up points ($d = 0.43$ and $d = 0.50$, respectively) with regard to psychological well-being.

Four RCTs were identified in which the magnitude of study findings was not reported. These included two small trials of interventions delivered via mobile devices. A two-day mobile-phone intervention based on audiovisual relaxation experiences was found to significantly reduce anxiety and increased reported relaxation in Italian commuters⁴²⁾, while a short stress inoculation training (SIT) program delivered on mobile devices over 4 weeks to oncology nurses produced significant reductions in state and trait anxiety and significant improvements in active coping skills and "denial" (i.e., behaving as if a stressor does not exist) postintervention compared with the control group⁴³⁾.

A brief self-paced multimedia intervention trialed with a sample of 309 "tech" employees over 3 months resulted in significant "modest" improvements in knowledge and attitude to seeking help and a reduction of stress postintervention compared with controls⁴⁴⁾ (although there were only marginal changes in work productivity and no change in mood, anxiety, and depression compared with the control group). Furthermore, Hasson, Anderberg, Theorell, and Arnetz²⁰⁾ tested a web-based intervention tool with 303 IT and media workers in six Swedish companies. All study participants received access to an online health promotion tool, which provided real-time monitoring of perceived current health and stress status, a diary to record their stressors, and information about stress and health. However, the intervention group also received web-based cognitive exercises that included time management and relaxation techniques, cognitive reframing, and access to "chat" with other participants.

Significantly greater improvement was found for the

intervention group compared with controls on perceived ability to manage stress, sleep quality, mental energy, concentration, and social support postintervention. There were also significant positive changes in several biological markers including DHEA-S (a steroid with neuroprotective effects), neuropeptide Y, chromogranin A, and tumor necrosis factor α .

Six noncontrolled studies of web-based cognitive-behavioral and/or relaxation techniques were also identified. All six studies reported positive outcomes; none stated effect sizes apart from one³⁸⁾. *Stress GYM*, a web-enhanced behavioral self-management program for stress in military personnel, was delivered to 142 officers and enlisted sailors⁴⁵⁾. The program produced a significant reduction in stress intensity, with a positive association between the number of modules completed and decrease in reported stress reported ($r = 0.21$).

Rao and Kemper⁴⁶⁾ delivered an online guided imagery intervention to a sample of 273 health professionals. The intervention, which comprised three modules of autogenic training and guided imagery, produced significant improvements in participants' reported levels of perceived stress, anxiety, empathy, and self-efficacy postintervention.

Two studies^{47,48)} reported on the development and evaluation of a four-session program that aimed to enhance employees' psychological well-being. The first was delivered to 28 white collar workers. There were significant increases reported postintervention on well-being scores of environmental mastery, positive relationships with others, and self-acceptance. A significant improvement was also found for participants' anxiety although there was no improvement in depression, job satisfaction, or psycho-somatic symptoms. The intervention did not impact on three other subdomains of well-being, namely autonomy, personal growth, and purpose. A later study⁴⁸⁾ comprised a process evaluation of this same web-based stress management program with a larger sample of 239 workers. Participants' psychological well-being significantly improved following the intervention although there were no changes in depression scores.

Ahtinen, Mattila, Valkkynen et al.⁴⁹⁾ pilot tested *Oiva*, an "acceptance and commitment therapy" smartphone application with 15 university staff. Participants' scores of stress and life satisfaction were significantly improved postintervention although there was no effect on psychological flexibility.

Web-based CBT: Six studies of web-based CBT programs for workers were identified. Each of these was tested through a randomized control trial, with five studies supporting their efficacy to some extent. Effect sizes were reported in three studies; these ranged from small to medium in size, with one study²¹⁾ reporting large improvements in an uncontrolled long-term follow-up.

Three randomized control trials evaluated the delivery

of CBT to workers via a blended approach. Mori, Tajima, Kimura et al.²²⁾ delivered web-based CBT to employees (168 Japanese system engineers) experiencing distress. Participants received a 2.5-h group education CBT session in the workplace and 1 month of online CBT-based homework exercises. The program had no significant impact on psychological distress, problem solving scores, or in the recognition of dysfunctional thinking compared with controls. A small significant improvement versus controls was observed in the intervention group's ability to transform thoughts postintervention ($d = 0.26$) and their ability to cope with stress at 6-month follow-up ($d = 0.37$).

Further analyses were then conducted with data from 73 participants with clinically significant levels of emotional distress at baseline. Participants with distress in the intervention group reported significantly lower psychological distress scores postintervention compared with similar participants in the control group with medium effect size ($d = 0.61$). Improvement was maintained at 6-month-follow-up ($d = 0.60$). Improvement was maintained when participants were further divided into homework completers and noncompleters and even accentuated at 6-month follow-up ($d = 0.63$ postintervention and $d = 0.74$ at follow-up).

A blended approach was also with a sample of 261 white collar workers in the workplace²³⁾, in which a 3-h CBT training group was followed by three individualized e-mail sessions (comprising CBT homework exercises and feedback from occupational physicians and nurses). The intervention produced a significant decrease in depressive symptoms compared with controls, as well as enabling the intervention group to significantly improve on self-reported understanding of stress control skills. There was no impact on worker self-esteem.

Kimura, Mori, Tajima et al.⁵⁰⁾ evaluated the efficacy of a 120-min group CBT class combined with 1 month of web-based CBT homework exercises with a sample of 215 private sector workers. The program produced a small significant increase in subjective work performance 3 months postintervention versus controls ($d = 0.31$) although there is no significant change following adjustment for baseline scores on two secondary outcomes of cognitive flexibility.

Imamura, Kawakami, Furukawa et al.²⁴⁾ conducted a RCT of internet CBT with 381 workers. The intervention had a modest impact on worker well-being, with small significant decreases in depressive symptoms reported postintervention ($d = 0.14$) and at 6-month ($d = 0.16$) follow-up versus controls. Small significant improvements compared with controls were also made on scores of dysfunctional attitude, knowledge, and self-efficacy. There were no significant effects on psychological distress or problem solving. A 12-month follow-up⁵¹⁾ found that the effect of the intervention on scores of depression

or distress was no maintained to this time point. However, the intervention may have been effective in preventing the occurrence of major depressive episode as there was a significantly lower incidence of such episodes reported for those in the intervention group versus the control group.

A CBT intervention delivered purely via e-mail was also trialed with 177 employees from a variety of occupations²¹⁾. Significant medium to large improvements were made by the intervention group on scores of stress, depression, anxiety, and emotional exhaustion. However, these improvements were only small ($d = 0.1$) to medium ($d = 0.6$) in size compared with the control group, who also improved on all scores apart from depression. The odds of recovery from clinical stress were significantly higher for participants in the intervention group compared with those in the control, with similar recovery effects found for depression and emotional exhaustion but not anxiety.

Ninety-seven participants from the intervention group were traced at a 3-year follow-up. The gains made by this group from preintervention were more pronounced, ranging from $d = 1.3$ for anxiety to $d = 1.8$ for stress. Significant maintenance of improvement was also found on measures of depression, emotional exhaustion, stress, and anxiety. However, this 3-year follow-up was uncontrolled, and so it was not possible to determine the extent to which these improvements were solely attributable to the intervention.

One study of web-based CBT⁵²⁾ reported no significant improvement compared with controls on scores of health, quality of life, or subjective work-related performance.

Mindfulness in the Workplace: Four web-based mindfulness interventions delivered in the workplace were identified. Mindfulness refers to a therapeutic technique that one attempts to focus awareness on the present moment and accepting one's feelings, thoughts, and bodily sensations. Three of these interventions were evaluated through randomized control trials, with one intervention assessed utilizing a noncontrolled cohort design. Support for the efficacy of mindfulness techniques was provided by all four studies although just one¹⁹⁾ was considered to be of moderate methodological quality, with the remainder classified as low^{53,54)} or very low⁵⁵⁾ in quality. The magnitude of improvement following intervention compared with controls ranged from small to medium in two studies^{19,54)} and medium to large in one study⁵³⁾. Effect sizes were not reported in one study⁵⁵⁾.

The Mindfulness at Work online and face-to-face mindfulness interventions were evaluated via a multiple arm RCT with a sample of 239 insurance carrier employees. The programs were also compared with therapeutic yoga and inactive controls for stress reduction in the workplace¹⁹⁾. Both the online and face-to-face mindfulness groups reported significant medium-to-small decreases in

perceived stress ($\eta^2 = 0.13$) and sleep difficulty ($\eta^2 = 0.04$) and a significant increase in heart rhythm versus inactive controls. Similar changes were also found for the yoga group. The online and in-person mindfulness interventions appeared to be equally effective, with increased heart rate coherence the only postintervention difference between the two groups. None of the interventions, however, had any impact on mood, worker productivity, pain, or blood pressure.

Aikens, Astin, Pelletier et al.⁵⁴) trialed the *Dow Mindful Resilience Program* with 89 employees of a chemical company. The program comprised abbreviated mindfulness-based stress reduction tailored to an occupational setting. The intervention group reported significantly higher ratings of mindfulness and resiliency and significantly lower perceived stress compared with waitlist control postintervention, with a medium average effect size of $d = 0.67$. These improvements were maintained at a 6-month follow-up.

A web-based mindfulness intervention *Stress Free Now* was evaluated with staff in a corporate call center⁴⁴). The intervention was delivered over an 8-week period with participants randomized to one of the four groups. One group received the web-based intervention plus e-mail reminders (WSM), and another received the web-based intervention and participated in a 1-h weekly group meeting (WSM1). A third group received the web-based intervention and the same weekly meetings although three of these meetings were facilitated by a counselor or a social worker (WSM2). A fourth group comprised the waitlist control and received no interventions.

Significant improvement on all outcome measures of stress, burnout, and mindfulness were found postintervention for all intervention groups. There was no change in productivity or professional efficacy. Perceived stress was the only outcome to improve for the control group. Improvements ranged from medium to large in size ($d = 0.5$ - 0.8) compared with controls and were maintained 16-week follow-up, except for mindfulness in WSM2 group and professional efficacy and emotional role functioning in the WSM and WSM2 groups. Effect sizes were larger for participants who received group support than did not on all outcome measures except for productivity ($d = 0.8$ versus $d = 0.4$ at 8 weeks and $d = 0.7$ versus $d = 0.4$ at 16 weeks).

Kemper and Khirallah⁵⁵) delivered a mind-body skill training program comprising 12 one-hour “modules” to 513 health professionals and trainees from a variety of disciplines. The modules targeted key skills of relaxation, mindfulness, guided imagery, and positive affect-generating meditation. Participants registered for and completed individual modules as they saw fit. Assessment measures were taken pre- and postcompletion of each individual module, with data analyzed from five modules completed by at least 100 registered learners. Significant

improvements were found postmodule completion on scores of stress, mindfulness, empathy, and perspective taking. One module, “introduction to stress, resilience, and the relaxation response” was assessed for its impact on scores of stress, resilience, and relaxation. Significant improvements were found on participants’ scores of stress after undertaking this module although there were no changes on the two other outcome measures.

Multiple Health-Behavior Interventions: Four studies were identified in which multiple health behaviors, including stress management, were targeted as part of a broader health promotion program. All four studies were considered to contain serious risk of bias and of low methodological quality. Two randomized control trials were conducted and reported no impact of a web-based intervention on worker mental health compared with controls^{56,57}). Two web-based health promotion programs (*COACH* and *RealAge*) for older workers were also evaluated through a cluster RCT⁵⁸). While positive changes were found for fruit and vegetable consumption, physical activity, and waist circumference, no improvements were made on any stress outcomes. Another study reported on the conduct of small non-RCT⁵⁹) to assess the impact of an internet-based program, called *BEST*, with a sample of 48 male Korean workers with metabolic syndrome. A significant reduction in health-related stress but not job stress was found postintervention compared with the control group. The magnitude of this difference was not reported.

“Individual/Organizational” Interface Interventions

Three studies that targeted the “individual-organizational” interface were identified. These three studies comprised one RCT, one noncontrolled study, and one qualitative study, each of which was considered to be of low methodological quality. There was limited evidence for the efficacy of such approaches.

Assertion in the Workplace, a 70-min web-based program, was tested utilizing a noncontrolled cohort design with 25 nurses working shift work⁶⁰). While participants’ knowledge of assertion was found to have increased significantly postintervention and at a 1-month follow-up, it had no impact on reported work-stress.

Yamagishi, Kobayashi, and Nakamura⁶¹) assessed the efficacy of a 60-min web-based “career identity” training intervention for managing stress through a randomized control trial with 60 nurses. Although knowledge of career identity increased in the intervention group, there were no significant improvements on measures of job stress or mental health postintervention compared with controls. However, as measures such as mental workload, job control, vigor, and anxiety significantly worsened in the control group, the intervention may have served as a protective factor with regard to employee well-being.

Another study⁶²) reported on the efficacy of online me-

diated discussion forums as a stress management intervention for 75 teachers over a period of 7 days. Forum posts were qualitatively analyzed, and an online survey was completed to assess impact. The forum was found to be an easy to follow resource and stimulated new ideas for coping with work-related stress, enhancing participants' confidence in managing stress.

“Organizational”-Level Interventions

Three organization-focused interventions were identified, which comprised the delivery of e-learning programs for managers. All three programs were evaluated through randomized control trials, two of which^{63,64} reported no impact on worker stress and determined to be of low quality due to serious risk of bias. One moderate quality study²⁵ pilot tested the efficacy of an e-learning health promotion program for managers “Managing Employee Pressure at Work” in improving employee well-being. The study employed a cluster RCT design in which 60 managers (responsible for 424 employees) from NHS Mental Health service providers in the United Kingdom were randomized to either a control or an intervention group. A small significant positive effect on employee well-being was reported postintervention compared with controls although there was no change in psychological distress, supervisor relationships or support, or sickness absence.

Discussion

The majority of interventions reviewed here were “individual”-focused and -utilized cognitive-behavioral and/or relaxation-based techniques, mindfulness techniques, or web-based CBT. There was some low-to-moderate quality evidence to indicate that such interventions could contribute to positive psychological outcomes for employees, with large effect sizes following intervention compared with controls in some cases^{14,15,17,18,21,53}. There were few positive outcomes reported for studies that targeted multiple health behaviors or utilized didactic stress management alone. Minimal support for the efficacy of interventions targeting the “organizational” or “individual/organizational” interface was also observed; however, there is a notable lack of primary research studies that evaluate web-based interventions that encompass these target strategies. Interventions targeted at employees with a clinical mental health condition or psychiatric diagnoses were excluded from this review.

Only thirteen studies reviewed here were considered to be of moderate methodological quality, with much of included research of low or very low quality and at serious risk of bias due to limitations in design and implementation. For example, just four studies blinded participants to their study condition, while only nine described procedures for concealing participant allocation to the research-

ers themselves. All of the reviewed studies relied on self-report measures, with just three utilizing objective measures such as biological markers to some extent as well. A lack of long-term follow-up was also problematic. While three studies administered follow-up measures to participant at least 1 year postintervention, only 11 conducted 6-month postintervention follow-up.

High rates of participant attrition were an undermining factor in many studies. Moreover, low levels of user adherence (i.e., failure to complete an intervention as prescribed by the researchers) are a common issue with web-based interventions⁶⁵ and were observed in many of studies reviewed here^{25,28,37,52}. It may be that blended and guided programs encourage higher levels of user adherence than self-guided and automated programs. However, adherence data from the reviewed interventions were not always readily available. The sustained engagement of employees with web-based interventions is an issue that warrants further exploration. It is imperative that web-based intervention studies collect and report relevant psychosocial or intervention characteristics that may influence the adherence of users, and that efforts are directed toward determining which factors impact upon adherence to such interventions.

The fact that the body of evidence under review here was of generally low quality is perhaps unsurprising as web-based platforms are a relatively new modality for the delivery of worker-directed interventions. As such, many of the included studies were preliminary, of a small scale and uncontrolled, which may be expected as the feasibility and acceptability of web-based interventions are ascertained. More RCTs of higher methodological quality need to be conducted before firmer conclusions may be drawn with regard to the efficacy of web-based interventions for the management of work-related stress.

Only two studies compared web-based interventions directly to face-to-face stress management interventions with same content. Wolever et al.¹⁹ found online and in-person mindfulness interventions to be equally as effective in reducing employee stress and sleep difficulty although Eisen et al.²⁸ reported limited impact of computer-based or in-person relaxation and time management program postinterventions. More research is required to determine whether web-based interventions are as effective as traditional face-to-face programs.

Most interventions were atheoretical (32 of 48, 66.67%). Just 16 referenced a specific theory or model with regard to the formulation or delivery of intervention content. The transactional model of stress⁶⁶ was the only stress-specific model identified. This was utilized in the design of four interventions, including the *GET.ON Stress* and *GET.ON Recovery* intervention programs, which were based on the transactional model and targeted key processes of problem solving and emotional regulation. *Stress GYM*⁴⁵ was also drawn from the transactional

model. Furthermore, an organization-level intervention delivered by Stansfeld et al.²⁵⁾ that provided health service managers with an e-learning health promotion course was also based on the transactional model of stress. The intervention content was specifically focused on relationship and supervisory behaviors, with the aim of building management standards to improve employee well-being and reduce sickness absence.

Five interventions^{26,27,43,56,57)} that referenced social cognitive theory (SCT) were also identified, including one that delivered SIT on mobile devices to oncology nurses⁴³⁾. SIT derives from the work of Meichenbaum^{67,68)} and encompassed three phases. A conceptual phase educated participants on the transactional nature of stress, while a skill acquisition and rehearsal stage emphasized the development of emotional regulation, coping skills, and the management of maladaptive behaviors. Finally, the application phase sought to increase participant self-efficacy, in line with Bandura's SCT. One study³⁴⁾ drew upon the theoretical foundation of psychological capital, namely hope, optimism, efficacy, and resilience, while the internet-based *BEST* program, a multicomponent intervention that targeted cardiovascular fitness and stress was modeled on the transtheoretical (stages of change) model of behavior change⁵⁹⁾. The transtheoretical model was also referenced in the delivery of the *RealAge* and *COACH* interventions⁵⁸⁾.

Perhaps, it is notable that all seven studies that reported on an intervention drawn from the transactional model of stress were associated with significant improvements to some extent on a range of measures related to employee well-being, stress, or mental health (albeit the magnitude of such improvement versus controls was small in one study²⁵⁾ and not reported in another⁴⁵⁾). While it is beyond the remit of this review to conclude whether such theory-based interventions are more effective than atheoretical programs, the delivery of more interventions drawing upon stress-specific theory would be valuable to investigate this issue more comprehensively.

In any case, it is evident that web-based interventions for worker stress that draw upon a stress-specific theoretical model remain the exception rather than the norm. This is perhaps surprising considering the multitude of work-stress models that currently exist, many of which are well validated and have been employed in occupational stress research for several decades now⁶⁹⁾.

Conclusion

There is some low-to-moderate quality evidence that "individual"-focused web-based interventions utilizing cognitive-behavioral, relaxation, mindfulness techniques, or CBT are effective for supporting employee well-being and enabling them to manage their work-related stress. However, future high-quality studies utilizing these ap-

proaches are needed to draw firmer conclusions about their efficacy. There are few web-based interventions that target "organizational" or "individual/organization" interface factors and limited support for their efficacy.

Conflicts of Interest: The authors declare that there are no conflicts of interest.

References

- 1) Ridge M, Wells J, Denny M, Cunningham J, Chalder T. Developing a web-based stress management intervention for occupational support workers. *J Ment Heal* 2011; 20(2): 185-197.
- 2) Jones F, Burke RJ, Westman M. *Work-life balance: A psychological perspective*. New York: Psychology Press; 2013.
- 3) Bhagat RS, Segovis J, Nelson T. *Work stress and coping in the era of globalization*. New York: Routledge; 2016.
- 4) Wantland DJ, Portillo CJ, Holzemer WL, Slaughter R, McGhee EM. The effectiveness of Web-based vs. non-Web-based interventions: a meta-analysis of behavioral change outcomes. *Journal of medical Internet research* 2004; 6(4): e40.
- 5) Bhui KS, Dinon S, Stansfeld SA, White PD. 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; 2012.
- 6) Van der Klink J, Blonk R, Schene AH, Van Dijk F. The benefits of interventions for work-related stress. *American journal of public health* 2001; 91(2): 270.
- 7) Richardson KM, Rothstein HR. Effects of occupational stress management intervention programs: a meta-analysis. *Journal of occupational health psychology* 2008; 13(1): 69.
- 8) Levac D, Colquhoun H, O'Brien KK. Scoping studies: advancing the methodology. *Implementation Science* 2010; 5(1): 1.
- 9) Arksey H, O'Malley L. Scoping studies: towards a methodological framework. *International Journal of Social Research Methodology* 2005; 8(1): 19-32.
- 10) Oxman AD, Group GW. Grading quality of evidence and strength of recommendations. *Bmj* 2004; 328(19): 1490-1494.
- 11) Higgins JP, Altman DG, Gøtzsche PC, et al. The Cochrane Collaboration's tool for assessing risk of bias in randomised trials. *Bmj* 2011; 343: d5928.
- 12) DeFrank RS, Cooper CL. Worksite stress management interventions: Their effectiveness and conceptualisation. *Journal of Managerial Psychology* 1987; 2(1): 4-10.
- 13) Giga SI, Cooper CL, Faragher B. The development of a framework for a comprehensive approach to stress management interventions at work. *International Journal of Stress Management* 2003; 10(4): 280.
- 14) Heber E, Lehr D, Ebert DD, Berking M, Riper H. Web-Based and Mobile Stress Management Intervention for Employees: A Randomized Controlled Trial. *Journal of medical Internet research* 2016; 18(1).
- 15) Ebert DD, Heber E, Berking M, et al. Self-guided internet-based and mobile-based stress management for employees: re-

- sults of a randomised controlled trial. *Occupational and Environmental Medicine* 2016; 73(5): 315-323.
- 16) Ebert DD, Lehr D, Heber E, Riper H, Cuijpers P. Internet-and mobile-based stress management for employees with adherence-focused guidance: efficacy and mechanism of change. *Scand J Work Environ Health* 2016.
 - 17) Thiarth H, Lehr D, Ebert DD, Berking M, Riper H. Log in and breathe out: internet-based recovery training for sleepless employees with work-related strain—results of a randomized controlled trial. *Scand J Work Environ Health* 2015; 41(2): 164-174.
 - 18) Feicht T, Wittmann M, Jose G, Mock A, von Hirschhausen E, Esch T. Evaluation of a seven-week web-based happiness training to improve psychological well-being, reduce stress, and enhance mindfulness and flourishing: a randomized controlled occupational health study. *Evidence-based complementary and alternative medicine: eCAM* 2013; 2013: 676953.
 - 19) Wolever RQ, Bobinet KJ, McCabe K, et al. Effective and viable mind-body stress reduction in the workplace: A randomized controlled trial. *Journal of Occupational Health Psychology* 2012; 17(2): 246-258.
 - 20) Hasson D, Anderberg UM, Theorell T, Arnetz BB. Psychophysiological effects of a web-based stress management system: A prospective, randomized controlled intervention study of IT and media workers [ISRCTN54254861]. *BMC Public Health* 2005; 5: 78.
 - 21) Ruwaard J, Lange A, Bouwman M, Broeksteeg J, Schrieken B. E - Mailed standardized cognitive behavioural treatment of work - related stress: A randomized controlled trial. *Cognitive behaviour therapy* 2007; 36(3): 179-192.
 - 22) Mori M, Tajima M. A web-based training program using cognitive behavioral therapy to alleviate psychological distress among employees: randomized controlled pilot trial. *JMIR Res Protoc* 2014; 3(4): e70.
 - 23) Kojima R, Fujisawa D, Tajima M, et al. Efficacy of cognitive behavioral therapy training using brief e-mail sessions in the workplace: a controlled clinical trial. *Industrial health* 2010; 48(4): 495-502.
 - 24) Imamura K, Kawakami N, Furukawa TA, et al. Effects of an internet-based cognitive behavioral therapy (iCBT) program in Manga format on improving subthreshold depressive symptoms among healthy workers: a randomized controlled trial. *PloS one* 2014; 9(5): e97167.
 - 25) Stansfeld SA, Kerry S, Chandola T, et al. Pilot study of a cluster randomised trial of a guided e-learning health promotion intervention for managers based on management standards for the improvement of employee well-being and reduction of sickness absence: GEM Study. *BMJ open* 2015; 5(10): e007981-e.
 - 26) Umanodan R, Shimazu A, Minami M, Kawakami N. Effects of computer-based stress management training on psychological well-being and work performance in Japanese employees: a cluster randomized controlled trial. *Industrial health* 2014; 52(6): 480-491.
 - 27) Shimazu A, Kawakami N, Irimajiri H, Sakamoto M, Amano S. Effects of web-based psychoeducation on self-efficacy, problem solving behavior, stress responses and job satisfaction among workers: A controlled clinical trial. *Journal of occupational health* 2005; 47(5): 405-413.
 - 28) Eisen KP, Allen GJ, Bollash M, Pescatello LS. Stress management in the workplace: A comparison of a computer-based and an in-person stress-management intervention. *Computers in Human Behavior* 2008; 24(2): 486-496.
 - 29) Geraedts AS, Kleiboer AM, Twisk J, Wiezer NM, van Mechele W, Cuijpers P. Long-term results of a Web-based guided self-help intervention for employees with depressive symptoms: Randomized controlled trial. *Journal of medical Internet research* 2014; 16(7): 14-28.
 - 30) Abbott J-A, Klein B, Hamilton C, Rosenthal A. The Impact of Online Resilience Training for Sales Managers on Wellbeing and Work Performance. *E-Journal of Applied Psychology* 2009; 5(1): 89-95.
 - 31) Schell E, Theorell T, Hasson D, Arnetz B, Saraste H. Impact of a Web-Based Stress Management and Health Promotion Program on Neck-Shoulder-Back Pain in Knowledge Workers? 12 Month Prospective Controlled Follow-Up. *Journal of Occupational & Environmental Medicine* 2008; 50(6): 667-676.
 - 32) Ebert DD, Lehr D, Smit F, et al. Efficacy and cost-effectiveness of minimal guided and unguided internet-based mobile supported stress-management in employees with occupational stress: a three-armed randomised controlled trial. *BMC Public Health* 2014; 14: 11.
 - 33) Ebert DD, Lehr D, Boß L, et al. Efficacy of an internet-based problem-solving training for teachers: Results of a randomized controlled trial. *Scandinavian Journal of Work, Environment & Health* 2014; 40(6): 582-596.
 - 34) Luthans F, Avey JB, Patera JL. Experimental analysis of a web-based training intervention to develop positive psychological capital. *Academy of Management Learning & Education* 2008; 7(2): 209-221.
 - 35) Ly KH, Asplund K, Andersson G. Stress management for middle managers via an acceptance and commitment-based smartphone application: A randomized controlled trial. *Internet Interventions* 2014; 1(3): 95-101.
 - 36) Volker D, Zijlstra-Vlasveld MC, Anema JR, et al. Effectiveness of a Blended Web-Based Intervention on Return to Work for Sick-Listed Employees With Common Mental Disorders: Results of a Cluster Randomized Controlled Trial. *Journal of medical Internet research* 2015; 17(5): e116.
 - 37) Ketelaar SM, Nieuwenhuijsen K, Gärtner FR, Bolier L, Smeets O, Sluiter JK. Effect of an e-mental health approach to workers' health surveillance versus control group on work functioning of hospital employees: a cluster-RCT. *PLoS ONE* 2013; 8(9): 1-11.
 - 38) Ketelaar SM, Nieuwenhuijsen K, Bolier L, Smeets O, Sluiter JK. Improving Work Functioning and Mental Health of Health Care Employees Using an E-Mental Health Approach to Workers' Health Surveillance: Pretest-Posttest Study. *Safety and Health at Work* 2014; 5(4): 216-221.

- 39) Gärtner FR, Ketelaar SM, Smeets O, et al. The Mental Vitality @ Work study: design of a randomized controlled trial on the effect of a workers' health surveillance mental module for nurses and allied health professionals. *BMC Public Health* 2011; 11 (Suppl 4): 290-302.
- 40) Ketelaar SM, Nieuwenhuijsen K, Gärtner FR, Bolier L, Smeets O, Sluiter JK. Mental Vitality@ Work: The effectiveness of a mental module for workers' health surveillance for nurses and allied health professionals, comparing two approaches in a cluster-randomised controlled trial. *International archives of occupational and environmental health* 2014; 87 (5): 527-538.
- 41) Bolier L, Ketelaar SM, Nieuwenhuijsen K, Smeets O, Gärtner FR, Sluiter JK. Workplace mental health promotion online to enhance well-being of nurses and allied health professionals: A cluster-randomized controlled trial. *Internet Interventions* 2014; 1(4): 196-204.
- 42) Riva G, Preziosa A, Grassi A, Villani D. Stress management using UMTS cellular phones: a controlled trial. *Studies in Health Technology & Informatics* 2006; 119: 461-463.
- 43) Villani D, Grassi A, Cognetta C, Toniolo D, Cipresso P, Riva G. Self-help stress management training through mobile phones: An experience with oncology nurses. *Psychological Services* 2013; 10(3): 315.
- 44) Billings DW, Cook RF, Hendrickson A, Dove DC. A Web-based approach to managing stress and mood disorders in the workforce. *Journal of Occupational & Environmental Medicine* 2008; 50(8): 960-968.
- 45) Williams A, Hagerty BM, Brasington SJ, Clem JB, Williams DA. Stress Gym: Feasibility of Deploying a Web-Enhanced Behavioral Self-Management Program for Stress in a Military Setting. *Military Medicine* 2010; 175(7): 487-493.
- 46) Rao N, Kemper KJ. The Feasibility and Effectiveness of Online Guided Imagery Training for Health Professionals. *Journal of evidence-based complementary & alternative medicine* 2016; 22(1): 54-58.
- 47) Kawai K, Yamazaki Y, Nakayama K. Development and formative evaluation of a Web-based stress management program to promote psychological well-being. *Japanese Journal of Health and Human Ecology* 2007; 73(4): 137-152.
- 48) Kawai K, Yamazaki Y, Nakayama K. Process evaluation of a web-based stress management program to promote psychological well-being in a sample of white-collar workers in Japan. *Industrial health* 2010; 48(3): 265-274.
- 49) Ahtinen A, Mattila E, Välikkynen P, et al. Mobile Mental Wellness Training for Stress Management: Feasibility and Design Implications Based on a One-Month Field Study. *JMIR mHealth and uHealth* 2013; 1(2): e11.
- 50) Kimura R, Mori M, Tajima M, et al. Effect of a brief training program based on cognitive behavioral therapy in improving work performance: A randomized controlled trial. *Journal of occupational health* 2015; 57(2): 169-178.
- 51) Imamura K, Kawakami N, Furukawa T, et al. Does Internet-based cognitive behavioral therapy (iCBT) prevent major depressive episode for workers? A 12-month follow-up of a randomized controlled trial. *Psychological medicine* 2015; 45 (09): 1907-1917.
- 52) Phillips R, Schneider J, Molosankwe I, et al. Randomized controlled trial of computerized cognitive behavioural therapy for depressive symptoms: effectiveness and costs of a workplace intervention. *Psychological medicine* 2014; 44(4): 741-752.
- 53) Alexandre D, Bernstein AM, Walker E, Hunter J, Roizen MF, Morledge TJ. A Web-Based Mindfulness Stress Management Program in a Corporate Call Center: A Randomized Clinical Trial to Evaluate the Added Benefit of Onsite Group Support. *Journal of Occupational and Environmental Medicine* 2016; 58(3): 254.
- 54) Aikens KA, Astin J, Pelletier KR, et al. Mindfulness goes to work: Impact of an online workplace intervention. *Journal of Occupational and Environmental Medicine* 2014; 56(7): 721-731.
- 55) Kemper KJ, Khirallah M. Acute Effects of Online Mind-Body Skills Training on Resilience, Mindfulness, and Empathy. *Journal of evidence-based complementary & alternative medicine* 2015; 20(4): 247-253.
- 56) Cook RF, Billings DW, Hersch RK, Back AS, Hendrickson A. A field test of web-based workplace health promotion program to improve dietary practices, reduce stress, and increase physical activity: Randomized controlled trial. *Journal of medical Internet research* 2007; 9(2): 1-14.
- 57) Cook RF, Hersch RK, Schlossberg D, Leaf SL. A Web-based health promotion program for older workers: Randomized controlled trial. *Journal of medical Internet research* 2015; 17 (3).
- 58) Hughes SL, Seymour RB, Campbell RT, Shaw JW, Fabiyi C, Sokas R. Comparison of Two Health-Promotion Programs for Older Workers. *American Journal of Public Health* 2011; 101 (5): 883-890.
- 59) Kim C-J, Schlenk EA, Kang S-W, Park J-B. Effects of an internet-based lifestyle intervention on cardio-metabolic risks and stress in Korean workers with metabolic syndrome: A controlled trial. *Patient Education & Counseling* 2015; 98(1): 111-119.
- 60) Yamagishi M, Kobayashi T, Kobayashi T, Nagami M, Shimazu A, Kageyama T. Effect of web-based assertion training for stress management of Japanese nurses. *Journal of Nursing Management* 2007; 15(6): 603-607.
- 61) Yamagishi M, Kobayashi T, Nakamura Y. Effects of Web-based Career Identity Training for Stress Management among Japanese Nurses: A Randomized Control Trial. *Journal of occupational health* 2008; 50(2): 191-193.
- 62) Leung SS, Chiang VC, Chui Yy, Lee AC, Mak Yw. Feasibility and potentials of online support for stress management among secondary school teachers. *Stress and Health* 2011; 27 (3): e282-e286.
- 63) Kawakami N, Kobayashi Y, Takao S, Tsutsumi A. Effects of web-based supervisor training on supervisor support and psychological distress among workers: a randomized controlled trial. *Preventive Medicine* 2005; 41(2): 471-478.
- 64) Kawakami N, Takao S, Kobayashi Y, Tsutsumi A. Effects of

- web-based supervisor training on job stressors and psychological distress among workers: a workplace-based randomized controlled trial. *Journal of occupational health* 2006; 48(1): 28-34.
- 65) Eysenbach G. The law of attrition. *Journal of medical Internet research* 2005; 7(1): e11.
- 66) Lazarus RS, Folkman S. *Stress, appraisal, and coping*. New York: Springer publishing; 1984.
- 67) Meichenbaum D. Cognitive behaviour modification. *Cognitive Behaviour Therapy* 1977; 6(4): 185-192.
- 68) Meichenbaum D. *Stress inoculation training*. New York: Pergamon; 1985.
- 69) Mark GM, Smith AP. Stress models: A review and suggested new direction. *Occupational health psychology* 2008; 3: 111-144.

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Appendix 1. Individual focused Interventions assessed by RCT/non-randomised control

Author/s (year) and sample (size)	Intervention Programme	Research design and Control group	Intervention length; delivery modality and support/guidance provided	Theoretical Underpinning	Findings
Abbott et al. (2009); Sales Managers, $n=53$	' <i>Resilience Online</i> ', resilience skills training programme.	Randomised Control Trial, Wait-List Control	10-week programme delivered via website, plus individual/conference calls and e-mails	No theory or model indicated in study protocol	No significant difference versus control group post-intervention on scores of distress, quality of life, happiness or work performance.
Aikens et al. (2014); Chemical Company Employees, $n=89$	' <i>Dow Mindful Resilience Programme</i> ' Abbreviated Mindfulness based Stress Reduction	Randomised Control Trial, Wait-List Control	7 week programme delivered via website (virtual class and online training) plus weekly e-mailed feedback.	No theory or model indicated in study protocol	Significantly higher ratings of mindfulness and resiliency, and significantly lower perceived stress compared to wait-list controls post-intervention, with a medium average effect size of $d=.67$. Improvements were maintained at a 6 month follow-up.
Alexandre et al. (2016) Call-Centre Employees, $n=161$	' <i>Stress Free Now</i> ' Mindfulness programme	Randomised Control Trial with four arms: E-mailed support (WSM) versus group support (WSM1) versus group support plus counsellor (WSM2) versus control.	8-week programme delivered via website with differing levels of support/guidance.	No theory or model indicated in study protocol	Significant improvement on measures of stress, burnout and mindfulness (no change in productivity or professional efficacy) for all intervention groups. Perceived stress the only outcome to improve for the control group. Effect sizes medium to large ($d=.5$ to $d=.8$) maintained 16 weeks follow-up, except for mindfulness in WSM2 group and professional efficacy and emotional role functioning in the WSM and WSM2 groups. Effect sizes were larger for participants who received group support than without compared to controls on all outcomes measures except for productivity ($d=.8$ versus $d=.4$ at 8 weeks and $d=.7$ versus $d=.4$ at 16 weeks).
Bolier et al. (2014); Nurses and Allied Health Professionals, $n=1140$	Range of CBT-based interventions targeting mental fitness; work stress; depressive and panic symptoms and risky drinking behaviour offered following screening	Randomised Control Trial, Wait-List Control	3-month intervention period programmes delivered via website. Feedback provided following screening, access to contact forum provided.	No theory or model indicated in study protocol	Significant improvements in mental health and psychological well-being versus controls post-intervention. Effect sizes for mental health were medium ($d=.37$) at 3 months and small ($d=.28$) at 6 months follow-up, while they were medium in size at both follow-up points ($d=.43$ and $d=.50$ respectively) with regard to psychological well-being. No impact on worker's general well-being, depression or anxiety scores
Billings et al. (2008); Tech employees, $n=309$	' <i>Stress and Mood Management</i> ' Cognitive-behavioural techniques plus relaxation and time management	Randomised Control Trial, Wait-List Control	3-month programme delivered via website, no guidance or support indicated	No theory or model indicated in study protocol	Significant 'modest' improvements in knowledge and attitude to seeking help, and in the reduction of stress versus controls. Marginal changes work productivity and no change in mood, anxiety and depression compared to a control group.

Appendix 1. Individual focused Interventions assessed by RCT/non-randomised control (continued)

Author/s (year) and sample (size)	Intervention Programme	Research design and Control group	Intervention length; delivery modality and support/guidance provided	Theoretical Underpinning	Findings
Cook et al. (2007) Human Resource Employees, $n=419$	'Health Connection' Multiple Health Behaviours targeted	Randomised Control Trial, Control group received print materials	3-month intervention period delivered via website, no guidance/support indicated	Social Cognitive Theory and Transtheoretical (Stages of Change) Model	Intervention had no impact on participant's perceived stress, stage of change in attempting to reduce stress, symptoms of distress or coping skills versus controls.
Cook et al. (2015) IT workers aged over 50, $n=278$	'Health Past 50' Multiple Health Behaviours targeted	Randomised Control Trial, Wait-List Control	3-month intervention period delivered via website, e-mailed support	Social Cognitive Theory	No impact on two stress measures; namely coping with stress and symptoms of distress
Ebert et al. (2014); Teachers, $n=150$	'Everything Under Control' Problem-solving intervention	Randomised Control Trial, Wait-List Control	7-week programme, delivered via website with e-coach feedback following completion of exercises	No theory or model indicated in study protocol	The intervention group reported significantly greater decreases in depressive symptoms post-intervention and at 3 and 6 month follow-up points versus controls. The magnitude of these differences were medium post-intervention ($d=.59$) and small at 3 month ($d=.37$) and 6 month ($d=.38$) follow-up. Significant small to medium improvements made compared to controls on secondary measures of stress, self-efficacy, quality of life and worrying post-intervention ($d=.36$ to $d=.63$), at 3 month ($d=.38$ to $d=.62$) and at 6 month ($d=.33$ to $d=.54$) follow-up. No significant improvements on measures of absenteeism or burnout at any point.
Ebert et al. (2015); Teachers, $n=128$	'GET-ON Recovery' programme, cognitive-behavioural methods	Randomised Control Trial, Wait-List Control	6-week programme, delivered via website. Fully automated programme (only technical support provided)	Lazarus' Transactional Model of Stress	Significant large reduction in insomnia severity post-intervention ($d=1.37$) versus wait-list controls. Moderate to large improvements versus controls were also found for mental health, sleep, perseverance cognitions and recovery experiences outcomes. Improvements remained stable at six-month follow-up.
Ebert et al. (2016a); Employees recruited via insurance company, $n=264$	'GET-ON Stress' programme, problem-solving and emotional-regulation strategies	Randomised Control Trial, Wait-List Control	7-week programme; delivered via website and mobile device. Programme was self-guided; participants could chose to receive automatic motivational text messages and small exercises on mobile phones.	Lazarus' Transactional Model of Stress	Significant medium to large reductions in perceived stress post-intervention ($d=.96$) and 6-month follow-up ($d=.65$) were reported for participants in the intervention group versus wait-list controls. Significant small to medium improvements were also made the intervention group on measures related to mental-health and work skills and competences ($d=.30$ to $d=.69$) at both assessment points compared to controls. No improvements were made on measures of absenteeism, work engagement or physical health-related quality of life.

Appendix 1. Individual focused Interventions assessed by RCT/non-randomised control (continued)

Author/s (year) and sample (size)	Intervention Programme	Research design and Control group	Intervention length; delivery modality and support/guidance provided	Theoretical Underpinning	Findings
Ebert et al. (2016b); Employees recruited via insurance company, n=264	'GET.ON Stress' programme, problem-solving and emotional-regulation strategies	Randomised Control Trial, Wait-List Control	7-week programme; delivered via website and mobile device. Participants received adherence focused guidance comprising adherence monitoring with personalised reminders and 'feedback on demand'.	Lazarus' Transactional Model of Stress	Medium to large reductions in perceived stress post-intervention (d=.79) and 6-month follow-up (d=.85) reported for participants in the intervention group versus wait-list controls. Significant improvements were also made the intervention group on measures related to mental-health; work-related health and skills and competences related to emotional regulation at both assessment points compared to controls. Work engagement, quality of life (physical health), absenteeism and presenteeism did not differ between the intervention and control groups.
Eisen et al. (2010) Manufacturing Company, n=288	Secondary Prevention: Abbreviated progressive relaxation and Time Management	Randomised Control Trial with three arms; In-person versus Computer-based and Wait list control	2-week programme delivered via website; support/guidance indicated	No theory or model indicated in study protocol	Post-session analysis indicated significantly decreased subjectively reported stress post-session, with a significantly greater reduction observed for the 'in-person' group. Neither intervention group rated themselves as experiencing less stress or more control over stress in their lives following completion of the program or at a one month follow-up.
Feicht et al. (2013); Insurance company employees, n=147	Secondary Prevention: Principles of Positive Psychology	Randomised Control Trial, Wait-List Control	7-week programme, Virtual session delivered via e-mail	No theory or model indicated in study protocol	Medium to large improvements on measures of job-satisfaction and quality of life (both d>.1); happiness (d=.93); emotional stress (d=.69) and mindfulness (d=.62). No impact on two objective measures of saliva concentrations of cortisol and alpha-amylase, or the Attention Network Test performance
Geraedts et al. (2014); n=231	Secondary Prevention: 'Happy@Work' Problem-solving treatment, Cognitive therapy and Psycho-education	Randomised Control Trial, 'Care as Usual' Control (received self-help booklet and advised to contact their physician).	6-week programme delivered via website with weekly feedback and e-mails	No theory or model indicated in study protocol	Anxiety (d=.16) and emotional exhaustion (d=.17) only measures on which the intervention group improved significantly more than the control group. No difference compared to controls on depressive symptoms anxiety, burnout and work-performance post-intervention or at a one-year follow-up
Hasson et al. (2005); IT and media workers, n=303	Online Health Promotion Tool plus cognitive exercises, time management and relaxation techniques and 'chat'	Randomised Control Trial, Active Control who received health promotion tool only	6-month intervention period, delivered via website, no support/guidance indicated	No theory or model indicated in study protocol	Significant improvement by intervention group on perceived ability to manage stress, sleep quality, mental energy, concentration and social support. Also significant positive changes in several biological markers including DHEA-S (a steroid with neuroprotective effects); Neuropeptide Y (NPY); Chromogranin A (CgA) and Tumour necrosis factor α (TNF α)

Appendix 1. Individual focused interventions assessed by RCT/non-randomised control (continued)

Author/s (year) and sample (size)	Intervention Programme	Research design and Control group	Intervention length; delivery modality and support/guidance provided	Theoretical Underpinning	Findings
Heber et al. (2016); Employees recruited via Insurance Company, $n=264$	'GET.ON STRESS' programme, problem-solving and emotional-regulation strategies	Randomised Control Trial, Wait-List Control	7-week programme; delivered via website combined with e-coach feedback and automatic texts	Transactional Model of Stress	Significant large improvements in reported stress post-intervention ($d=.83$) and at 6-month follow-up ($d=1.02$) versus controls. Maintained at a 12-month follow-up ($d=1.83$). Significant medium to large positive effects ($d=.4$ to $d=.75$) of mental health, work-related health and stress-related skills post-intervention and at 6 month follow-up. No impact on absenteeism or presentism).
Hughes et al. (2011); Older workers, $n=423$	'RealAge' and 'COACH' Health Promotion programmes.	3-armed Randomised Control Trial, Wait-List Control.	12-month intervention period, both delivered via websites which provided risk assessments, risk appraisals and health behaviour change plan options. RealAge participants received email reminders and health tips, COACH participants received e-mail and phone contact plus in-person assessments at beginning.	Trans-theoretical model (SOC) for specific health behaviors used as a moderator in the outcome analyses. Participants classified to stage of change at baseline on the basis of this model.	Neither intervention programme had a significant impact on any stress measures.
Imamura et al. (2014), Private Company Workers, $n=762$. Also Imamura et al. (2015)-one year follow up.	Internet CBT- <i>Useful mental health solution series for business</i>	Randomised Control Trial; Control group received weekly e-mails with useful stress information.	6-week training programme (6 lessons in total, up to ten weeks to complete). Delivered via website with once a week e-mail reminders from researchers.	No theory or model indicated in study protocol	Small significant decreases in depressive symptoms reported post-intervention ($d=.14$) and at 6-month ($d=.16$) follow-up versus controls. Small significant improvements compared to controls were also made on scores of dysfunctional attitude, knowledge and self-efficacy. There were no significant effects on psychological distress or problem-solving.
					12-month follow-up (Imamura et al., 2015) reported no effect of the intervention on scores of depression or distress at this point. However significantly lower incidence of such episodes reported for those in the intervention group versus the control group.

Appendix 1. Individual focused Interventions assessed by RCT/non-randomised control (continued)

Author/s (year) and sample (size)	Intervention Programme	Research design and Control group	Intervention length; delivery modality and support/guidance provided	Theoretical Underpinning	Findings
Ketelaar et al. (2013); Nurses and Allied Health Professionals, n=1140	Range of CBT-based interventions targeting mental fitness; work stress; depressive and panic symptoms and risky drinking behaviour offered following screening	Randomised Control Trial, Wait-List Control	3-month intervention period programmes delivered via website. Feedback provided following screening, access to contact forum provided.	No theory or model indicated in study protocol	No significant improvement on scores of work functioning; distress; work-related fatigue; posttraumatic stress or work ability post-intervention or a 3 or 6 month follow-up versus controls
Kim et al. (2015); Male workers with metabolic syndrome, n=48	'BEST' programme; Stress and Cardiovascular fitness targeted	Controlled Pre-Post Design (non-randomised), Education group control.	16-week intervention delivered via website, plus counselling and text message support	Trans theoretical (Stages of Change) Model	Significant reduction in job stress and health-related stress was found post-intervention compared to an education control group
Kimura et al. (2015); Electric Company Employees, n=215	Web-based Cognitive Behaviour Therapy	Randomised Control Trial; Wait-List Control	120 min group session in the workplace followed by one month of web-based homework exercises. Once a week email reminders sent by researchers.	No theory or model indicated in study protocol	Small significant increase in subjective work performance three months post-intervention versus controls (d=.31). No significant change following adjustment for baseline scores on two secondary outcomes of cognitive flexibility; namely ability to recognise dysfunctional thinking and ability to view situation from multiple perspectives.
Kojima et al. (2010) White collar workers, n=261	Web-based Cognitive Behaviour Therapy	Randomised Control Trial, Wait-List Control	Three hour group training in the workplace followed by three personalised e-mail sessions (homework and feedback occupational health nurse and physician)	No theory or model indicated in study protocol	Significant decrease in depression scores and improvement in understanding of stress control skills versus controls post-intervention. No significant change in self-esteem scores.
Luthans, Avey & Patera (2008); Various Occupations, n=384	Psychological Capital Intervention	Randomised Control Trial, Control received decision-making exercises	Two 45-minute sessions delivered via website, no support/guidance indicated	No theory or model indicated in study protocol	Small significant increase in psychological capital versus controls post-intervention (d=.191)
Ly et al. (2014); Sales Managers, n=147	Cognitive-Behavioural exercises based on ACT	Randomised Control Trial, Wait-List Control	6-week programme delivered via smartphone app with text message from therapists	No theory or model indicated in study protocol	Significant small to moderate improvements were reported on scores of mood (d=-.41) and perceived stress (d=-.50). No impact on transformative leadership

Appendix 1. Individual focused Interventions assessed by RCT/non-randomised control (continued)

Author/s (year) and sample (size)	Intervention Programme	Research design and Control group	Intervention length; delivery modality and support/guidance provided	Theoretical Underpinning	Findings
Mori et al. (2014) System engineers, n=168	Computerised Cognitive Behaviour Therapy	Randomised Controlled Trial, Wait-List Control	4-week intervention period (group session plus online homework), in study protocol plus e-mail feedback from CBT expert plus access to occupational health nurse for queries	No theory or model indicated	Small significant improvement versus controls in the intervention group's ability to transform thoughts post-intervention ($d=.26$) and their ability to cope with stress at 6 month follow-up ($d=.37$). No impact on psychological distress, problem-solving scores or in the recognition of dysfunctional thinking. Participants with clinically significant emotional at baseline reported significantly lower psychological distress scores compared to similar participants in the control group, with medium effect size ($d=.61$). Improvement was maintained at 6 month-follow up ($d=.60$) This was maintained when participants were further divided into homework completers and non-completers and even accentuated at 6 month follow up ($d=.63$ post-intervention, $d=.74$ at follow-up).
Philips et al. (2014) Various occupations, n=637	'Mood GYM' Computerised Cognitive Behaviour Therapy	Randomised Controlled Trial, Attentional Control group (directed to general information website)	5-week programme delivered via website, plus e-mail prompts and weekly phone calls	No theory or model indicated	No significant improvement versus controls on scores of health, quality of life or subjective work-related performance
Riva et al. (2006); Commuters, n=33	Relaxation Exercises	Randomised Controlled Trial with 3 arms: Narratives and guided videos versus New age videos versus inactive control	2-day programme delivered via mobile phones, no support/guidance indicated	No theory or model indicated	Significantly reduced anxiety and increased relaxation for the mobile narrative intervention group only.
Ruwaard et al. (2007) Various occupations, n=177	E-mailed Cognitive Behaviour Therapy	Randomised Controlled Trial, Wait-List Control	7-week programme delivered via e-mail, plus therapist feedback and phone calls if needed.	No theory or model indicated	Significant small ($d=.1$) to medium ($d=.6$) improvements on scores of stress, depression, anxiety and emotional exhaustion versus controls. The odds of recovery from clinical stress were significantly higher for participants in the intervention group versus those in the control. Similar recovery effects for depression and emotional exhaustion but not anxiety. Improvements more pronounced at 3 year follow-up (uncontrolled), ranging from $d=1.3$ for anxiety to $d=1.8$ for stress. Significant maintenance of improvement was also found for measures of depression, emotional exhaustion, stress and anxiety.

Appendix 1. Individual focused Interventions assessed by RCT/non-randomised control (continued)

Author/s (year) and sample (size)	Intervention Programme	Research design and Control group	Intervention length; delivery modality and support/guidance provided	Theoretical Underpinning	Findings
Schell et al. (2008); Media Workers, n=226	Online Health Promotion Tool plus cognitive exercises, time management and relaxation techniques and 'chat'	Randomised Control Trial with three arms. One group received tool plus access to stress management exercises and 'chat', one group received health promotion tool only, while third group was inactive control.	6-month intervention period, delivered via website, no support/guidance indicated	No theory or model indicated in study protocol	Intervention had no impact on neck, shoulder or back pain or on pain relatedness stress.
Shimazu et al. (2005); White Collar Workers in Construction Company, n=225	Psycho-Education	Randomised Control Trial, Wait-List Control	4-week programme; delivered via website with e-mail reminders/prompts	Social Cognitive Theory	No significant differences compared to control group on measures of self-efficacy; problem solving; stress and job satisfaction.
Thiart et al. (2015); Teachers, n=128	'GET.ON Recovery' programme, cognitive-behavioural methods	Randomised Control Trial, Wait-List Control	6-week programme, delivered via website with weekly feedback from coach plus e-mail reminders	No theory or model indicated in study protocol	Significant large reduction in insomnia severity post-intervention (d=1.45) and at 6-month follow-up (d=1.43) versus wait-list controls. Significant improvements also on measures of rumination, worrying, sleep-efficiency, restorative sleep, recreational activities and recovery versus controls. Effect sizes ranged from d=.34 to d=.77 post-intervention and d=.34 to d=.99 at 6 month follow-up. There was no impact on recovery mastery or absenteeism
Umanodan et al. (2014); Research and Development staff in a manufacturing company, n=263	Behavioural, Communication and Cognitive techniques	Randomised Control Trial, Wait-List Control	7-week programme delivered via website with e-mails reminders/prompts	No theory or model indicated in study protocol, Self-efficacy theory referenced in delivery of programme.	Significant increase on scores of knowledge only. No effect on measures of work performance; job satisfaction; social support; problem-solving; avoidance or suppression. Further analysis excluding a 'dashed group' of participants (i.e. those that accessed the intervention material for only two days or less) indicated a significant positive impact on scores of problem-solving and knowledge about stress versus controls.
Villani et al. (2013); Oncology Nurses, n=30	Stress Inoculation Training	Randomised Control Trial, Wait-List Control	4-week programme delivered via mobile phones, no support/guidance indicated	Stress Inoculation Training, incorporating Social Cognitive Theory	Significant reductions in state and trait anxiety, significant improvements in active coping skills and denial.

Appendix 1. Individual focused Interventions assessed by RCT/non-randomised control (continued)

Author/s (year) and sample (size)	Intervention Programme	Research design and Control group	Intervention length; delivery modality and support/guidance provided	Theoretical Underpinning	Findings
Volker et al. (2015); Sick-listed employees with common mental disorders, n=220	'Return@Work' Psycho-education, CBT, problem-solving, pain/fatigue manage and relapse prevention.	Randomised Control Trial, control received standard sickness absence guidance as usual.	5 modules (up to 16 sessions tailored to individual) over three month period. Blended programme, web-based modules combined with occupation physician consultations; physician received emailed decision aid.	No theory or model indicated in study protocol. Self-efficacy theory referenced in delivery of programme	Intervention group returned to the work significantly more quickly than controls. A significantly larger proportion also achieved remission nine months post-baseline compared to controls, although lasting return to work and treatment response did not differ between these two groups.
Wolaver et al. (2012); Insurance Carrier Employees, n=239	'Mindfulness at Work' Mindfulness-based Intervention	Randomised Control Trial with four arms: In-person versus online mindfulness versus yoga group versus inactive control.	12-week mindfulness programme delivered via virtual classroom. No guidance/support indicated	No theory or model indicated in study protocol	Significant medium to small decreases in perceived stress ($\eta^2=.13$) and sleep difficulty ($\eta^2=.04$) and a significant increase in heart rhythm versus inactive controls for both mindfulness groups and for the yoga group. Heart rate coherence the only post-intervention difference between the two mindfulness groups. None of the interventions had any impact on mood, worker productivity, pain or blood pressure.

Appendix 2. Individual focused Interventions evaluated through non-controlled cohort design

Author/s (year) and sample (size)	Intervention	Research design and Control group	Intervention length; delivery modality and support/guidance provided	Theoretical Underpinning	Findings
Ahtinen et al. (2013); University Staff, n=15	'Ovia'; Cognitive-Behavioural exercises based on ACT	Cohort Study, No Control Group	4-week programme delivered via smartphone app, no support/guidance indicated	No theory or model indicated in study protocol	Significant improvement in stress and life satisfaction. No impact on psychological flexibility.
Kawai et al. (2007); White Collar Workers, n=28	Cognitive-Behavioural exercises	Cohort Study, No control group.	4 week programme delivered via website. No guidance/support provided.	No theory or model indicated in study protocol	Significant increases in well-being scores of environmental mastery; positive relationships with others and self-acceptance, plus anxiety. No improvements in depression; job satisfaction; psychosomatic symptoms, or three other sub-domains of well-being; namely autonomy; personal growth and purpose.
Kawai et al. (2010); White Collar Workers, n=168	Cognitive-Behavioural exercises	Cohort Study, No control group.	4 week programme delivered via website. No guidance/support indicated.	No theory or model indicated in study protocol	Psychological well-being significantly improved following the intervention. No changes in depression scores.
Ketelaar et al. (2014); Nurses and Allied Health Professionals, n=128	Range of CBT-based interventions targeting mental fitness; work stress; depressive and panic symptoms and risky drinking behaviour offered following screening	Cohort Study with participants who comprised Wait-List Control of larger trial (Gartner et al., 2013)	3-month intervention period with programmes delivered via website. Feedback provided following screening plus personalised advice and offer to use an intervention programme.	No theory or model indicated in study protocol	Significant improvements were found for work functioning ($p=0.01$) and work-related fatigue ($p<0.01$). Work functioning improved in 30% of participants. A small positive effect on stress was found (Cohen $d=.23$) in the participants who had logged onto an EMH intervention (20%, $n=26$).
Kemper & Khirallah (2015); Health Professional Trainees, n=513	Mind-Body Skills Training	Cohort Study, no control group.	7-month intervention period, delivered via website. No guidance/support indicated.	No theory or model indicated in study protocol	Significant improvements reported post-module completion on scores of stress; mindfulness; empathy and perspective taking. One module, 'Introduction to Stress, Resilience and the Relaxation response' was assessed for its impact on scores of stress, resilience and relaxation. Significant improvements were found on participants' scores of stress after undertaking this module, although there were no changes on the two other outcome measures.
Rao and Kemper (2016); Health Professional, n=273	Guided Imagery	Cohort Study, No control group	3 one-hour modules delivered via website. No support/guidance indicated.	No theory or model indicated in study protocol	Significant improvements in participants' reported levels of perceived stress, anxiety, empathy and self-efficacy.
Williams et al. (2010); Military Personnel, n=142	'Stress GYM' Cognitive-behavioural exercises	Cohort Study, No control group.	9 modules (no time-frame indicated) delivered via website, no support/guidance indicated.	Transactional Model of Stress	Significant reduction in stress intensity post-intervention.

Appendix 3. Individual/Organisational focused Interventions

Study: Author/s (year) and sample (size)	Prevention level and intervention techniques	Research design and Control group	Intervention length, delivery modality and support/guidance provided	Theoretical Underpinning	Findings
Leung et al. (2007) Secondary School Teachers, n=75	Moderated Discussion Forum	Evaluated through quali- tative analysis of forum posts plus online evalua- tion	7 day access to forum available via a website, moderated by facilitator	No theory or model indicated in study protocol	Programme assessed qualitatively through an analysis of forum posts and completion of an online evaluation. Reported to be easy to follow; stimulated ideas for coping with work-related stress could enhance confidence in managing stress.
Yamagishi et al. (2007) Shift Nurses, n=32	'Assertion in the Workplace' Assertion training programme	Cohort Study, No control group	70-minute programme delivered over 3 weeks via website, no guid- ance/support indicated	No theory or model indicated in study protocol	Significant increase in 'knowledge of assertion' post-intervention and at a one-month follow-up. No impact on reported work-stress.
Yamagishi et al. (2008) Nurses, n=60	'Career Identity Training'	Randomised Control Trial, Wait-List Control	60-minute programme delivered over 3 weeks via website, no guid- ance/support indicated	No theory or model indicated in study protocol	Knowledge of career identity increased in the intervention group. No impact on measures of job stress or mental health. Mental workload, job control, vigour, and anxiety all significantly worsened in the control group; intervention may have served as a protective factor with regard to employee well-being

Appendix 4. 'Organisation' focused Interventions

Study: Author/s (year) and sample (size)	Prevention level and intervention techniques	Research design and Control group	Intervention length, delivery modality and support/ guidance provided	Theoretical Underpinning	Findings
Kakawami et al. (2006) Managers of software company, n=16	Primary/Secondary Prevention: e-Learning Worksite Mental Health Training Programme	Randomised Control Trial, Control received 2-hour relaxation training	4 week programme, deliv- ered via website, plus e-mail encouragement	No theory or model indicated in study protocol	Supervisor knowledge and attitude signifi- cantly improved versus controls although this did not affect workers' reported experiences of psychological distress
Kakawami et al. (2007) Supervisors in a Sales and Services Company, n=46	Primary/Secondary Prevention: e-Learning Worksite Mental Health Training Programme	Randomised Control Trial, Control received 2-hour relaxation training	4 week programme, deliv- ered via website, plus e-mail encouragement	No theory or model indicated in study protocol	No effect on employee job stress; supervisor support; co-worker support or psychological distress.
Stansfeld et al. (2015) NHS Mental Health Service Managers, n=60	Primary/Secondary Prevention: 'GEM Study': e-Learning Health Promotion Programme	Randomised Control Trial, Inactive Control	3-month programme, delivered via website with introduction and follow-up group sessions, plus e-mail and phone support.	Transactional Model of Stress	Small significant positive effect on employee well-being compared to controls. No change in psychological distress, supervisor relation- ships or support, or sickness absence