Improving resilience among employees high in depression, anxiety, and workplace distress

Allison L. Williams
Happify

Acacia C. Parks
Happify

Grace Cormier
Harvard Business School

Julia Stafford
Happify

Ashley Whillans
Harvard Business School

Contact Author: Allison Williams, Happify, 501 Clara Avenue #802, St. Louis, MO, 63112.
Phone: (703) 673-6122, Email: allison@happify.com

Allison Williams and Acacia Parks are employees of Happify. Grace Cormier and Ashley Whillans have no financial relationship with Happify.

Funding for this research was provided in full by Happify.

Abstract

Depression and anxiety are costly for both employees and employers, in terms of direct medical costs as well as costs stemming from lost productive time and missed days at work. Resilience training has been shown to improve workplace functioning for employees, which suggests that it is a promising avenue for reducing some of these costs. However, existing resilience trainings are often conducted in-person, suffer from low levels of engagement, and are difficult to scale to large groups of employees. In the current study, we compared change in resilience over time among employees who were assigned to and used an online resilience intervention platform (Happify), employees who were assigned to and used a scaled-down psychoeducational version of the platform, and employees who did not use their assigned platform (i.e., a no-usage comparison group). We did this separately for users high in emotional distress (clinical levels of depression and/or anxiety) and users high in workplace distress (high levels of presenteeism and/or burnout). Across both samples, employees who used the Happify platform showed significantly greater increases in resilience over eight weeks than employees in the two other groups; the latter two comparison groups did not differ significantly from each other. These findings suggest that a technology-based resilience intervention, which employs a low-touch, cost-effective, easily scalable intervention format, can successfully improve resilience among vulnerable employee groups, which may have important benefits in workplace settings.

Keywords: resilience, depression, anxiety, presenteeism, burnout, employee mental health

Improving resilience among employees high in depression, anxiety, and workplace distress

As the costs associated with healthcare have increased, so too has the importance of understanding mental health and the factors that may help to improve it (see Goetzel et al., 2018). Recent estimates suggest that mental health issues are common; up to 6.6% of the adult U.S. population has experienced a major depressive episode in the past year (Kessler et al., 2003). Anxiety disorders are also extremely common in the U.S., affecting an estimated 15.7 million people annually, and 30 million people at sometime in their lives (Lepine, 2002).

These high prevalence rates for mental health issues can have important implications for organizations, as poor mental health functioning is costly for both employees and employers. Depression costs employers an estimated $210 billion per year (Greenberg et al., 2005), with over 20% of U.S. employees reporting depressive symptoms (Shim, Baltrus, & Rust, 2011). Employers lose approximately 32 days of productivity annually from an employee with a depressive disorder (Greenberg et al., 2015), and employees with depression are 4-5 times more likely to experience work-related problems than employees with chronic physical illnesses such as diabetes or heart disease (Lerner et al., 2004). Other recent estimates have quantified the amount of lost productive time from employees with depression to be $44 billion annually (Stewart, Ricci, Chee, Hahn, & Morganstein, 2003). Similarly, Dupont and colleagues (1996) estimated that costs associated with anxiety disorders totaled $46.6 billion, with approximately 75% of these costs stemming from lost or reduced productivity in the workplace.

In considering options for reducing the rates of depression and anxiety in the workplace, one promising avenue is resilience promotion. Resilience is characterized as the ability to maintain mental health despite exposure to psychological or physical adversity (Kalisch et al., 2015; Tugade, Fredrickson, & Barrett, 2004). Resilient individuals are better able to form and maintain positive social relationships, regulate their behavior, and maintain a positive view of the self and their outlook on life (Wright, Masten, & Narayan, 2013). Ultimately, resilience can lead to greater overall life satisfaction and reduced occurrence of depression (Cohn et al., 2009; Fredrickson et al., 2008; Mak, Ng, & Wong, 2011), even after experiencing a traumatic event (Wingo et al., 2010). Importantly, resilience can have important implications for organizations (Lyubomirsky, King, & Diener, 2005), as resilient workers are less likely to miss work due to ill-health (Kotze & Lamb, 2012). Resilience also relates negatively with adverse outcomes such as job turnover intentions and behaviors (Seligman et al., 1986; Van Katwyk, Fox, Spector, & Kelloway, 2000) and burnout (Dyrbye et al., 2010). Perhaps most relevant to the present study, there is evidence that resilience can combat depression (Steinhardt & Dolbier, 2008) and anxiety (Scali et al., 2012), and that resilience is negatively related to all dimensions of presenteeism, which is the tendency to work while sick (Thogersen-Ntoumani et al., 2017). Together, these findings suggest that resilience may be an important skill for employees to learn to better address mental health issues and accompanying costs associated with them, such as presenteeism and burnout.

Importantly, resilience training interventions have been shown to be directly effective in workplace settings and to improve workplace functioning for employees (Robertson, Cooper, Sarkar, & Curran, 2015). A meta-analysis by Vanhove, Herian, Perez, Harms, and Lester (2016) found a consistent, small effect of resilience interventions on workplace performance, well-being, and social functioning. For example, resilience trainings have been shown to increase well-being and positive affect and decrease depression, anxiety, and negative affect (Forbes & Fikretoglu, 2018; Robertson et al., 2015). Resilience trainings have also had positive impacts on physical health outcomes such as cortisol (a stress hormone), heart rate, blood pressure, and cholesterol (Forbes & Fikretoglu, 2018; Robertson et al., 2015). In terms of psychosocial functioning, individuals participating in resilience trainings have reported increases in optimism, social support, self-efficacy, and purpose in life, relative to those who did not receive such trainings (Robertson et al., 2015; Waite & Richardson, 2004). Finally, with respect to job performance, resilience trainings have been shown to increase work productivity (Robertson et al., 2015), organizational commitment (Youssef & Luthans, 2007), ratings of job performance from both the employee (Robertson et al., 2015) and his or her supervisor (Cropanzano & Wright, 1999; Luthans, Avolio, Walumbwa, & Li, 2005), and burnout (Magtibay, Chesak, Coughlin, & Sood, 2017). One study quantified the effects of resilience training, finding that over a 2-month period, cost savings were $1846 per person in terms of reduced presenteeism (Johnson, Emmons, Rivard, Griffin, & Dusek, 2015).

In summary, it is increasingly clear that employee well-being is directly tied to employee productivity, retention, engagement, and social harmony. These factors, in turn, are strongly tied to the success of a business as a whole. However, despite the acknowledged need and growing demand for resilience interventions in the workplace, existing interventions are often difficult to scale, requiring in-person facilitation and other logistical and financial resources (Cherniak & Lahiri, 2010). These programs also struggle with lack of participation for a myriad of reasons, including a lack of motivation due to competing demands and/or a lack of willingness to be seen as someone who needs help—especially in workplace contexts where employees could perceive and experience negative career implications (Brohan et al., 2012; Clement et al., 2015).

Internet interventions have the potential to surmount many barriers to employees accessing traditional resilience programs, such as high costs for interventions and user inconvenience (Griffiths, Lindenmeyer, Powell, Lowe, & Thorogood, 2006). In the current study, we sought to test whether participating in an 8-week online intervention designed to improve happiness and well-being would increase resilience among employees who might benefit the most, namely, part-time and full-time employees that are high in emotional distress (symptoms of depression and/or anxiety) and employees high in workplace distress (symptoms of presenteeism and/or burnout). Although past research has found evidence supporting the effectiveness of resilience interventions in the workplace (e.g., Forbes & Fikretoglu, 2018, Waite & Richardson, 2004), the majority of these studies have focused on healthy individuals, which may limit their generalizability. Furthermore, little work has tested the impact of technology-based resilience interventions. Thus, this research will provide new insight into how a low-cost online intervention could potentially help employees who need it most.

To do this, we compared change in resilience over time between participants who used an online resilience intervention platform as recommended (*Happify*) and participants who used a scaled-down version of this online intervention platform that contained polls about mental health and well-being topics and that provided psychoeducational information about the topics contained in the polls. Lastly, we included a non-random subgroup of users who did not use their assigned platform at the recommended level. This comparison group was intended as a proxy for the natural improvement that individuals would likely experience over time. We hypothesized that participants who used the online resilience intervention platform (Happify) would show greater increases in resilience from baseline to post-test than participants who were in the psychoeducational comparison condition or who did not use their assigned platform. We further hypothesized that these benefits would hold for participants with clinical depressive symptoms and/or anxiety symptoms, as well as for employees with high levels of presenteeism and/or burnout.

Method

In this study, we report analyses separately for two samples of participants. Sample 1 was drawn from a randomized trial examining the efficacy of the Happify platform; we specifically selected users who were employed full-time and reported elevated levels of depression and/or anxiety. Sample 2 was drawn from a second randomized trial that targeted users who were full-time employed; we selected users who reported high levels of presenteeism and/or burnout. Both studies were conducted under the supervision of the Hiram College Institutional Review Board. See Table 1 for the demographic information of retained and excluded participants in each of the two samples, and Table 2 for the demographic information of retained participants by condition.

Sample 1: Users with high levels of emotional distress

Participants in Sample 1 were new registrants of Happify who consented to participate in an 8-week research study and who completed the baseline and post-test questionnaire. Assessments were considered part of the “8-week follow-up” if they were taken up to three weeks after the 8-week follow-up assessment target date. Of the participants who met these criteria ($N = 444$), we retained individuals who indicated that they were employed full-time or self-employed, and who reported depressive symptoms at the upper end of the mild level or higher (i.e., PHQ-9 ≥ 8; Kroenke et al., 2001) and/or anxiety symptoms at the upper end of the mild level or higher (i.e., GAD-7 ≥ 8; Spitzer, Kroenke, Williams, & Löwe, 2006). Research suggests that these cutoff scores have acceptable properties for diagnosing depression (Manea, Gilbody, & McMillan, 2012) and generalized anxiety disorder (Plummer, Manea, Trepel, & McMillan, 2016), respectively. In this sample, 61 participants (19.0%) indicated clinical levels of depression but not anxiety, 27 (8.4%) indicated clinical levels of anxiety but not depression, and 233 (72.6%) indicated clinical levels of both depression and anxiety; these percentages are consistent with research finding a high level of comorbidity between depression and anxiety (Brown, Campbell, Lehman, Grisham, & Mancill, 2001). Although we report results for the combined group of employees who are depressed or anxious due to this high level of comorbidity, all results hold when examining users with depression and anxiety separately. Ultimately, a total of 321 participants met all criteria and were included in analysis, which represented 72.1% of the initial sample. In this sample, retained and excluded participants differed with respect to distributions of age ($X^2(5) = 32.58$, $p < .001$), but not gender ($X^2(3) = 3.03$, $p = .39$). In terms of age, excluded participants were less likely to be in the younger age categories and more likely to be in the older age categories. Participants in the three conditions did not differ significantly by gender ($X^2(6) = 6.87$, $p = .33$) or age ($X^2(8) = 1.02$, $p > .99$).

Sample 2: Users with high levels of workplace distress

Participants in Sample 2 were new registrants of Happify who consented to participate in an eight-week research study and completed both the baseline and post-test questionnaires. As with Sample 1, although we intended participants to complete the post-test questionnaire eight weeks after enrolling in the study and completing the baseline questionnaire, we included in analysis those who completed the post-test questionnaire up to three weeks after the target date, in order to increase statistical power. Of the participants who met these criteria (*N* = 482), we analyzed a subset who had high levels of workplace distress. This subset of employees were those with with either high levels of presenteeism (i.e., scores above the midpoint of the job-stress related presenteeism scale; Gilbreath & Frew, 2008) or high levels of burnout (i.e., scores above the midpoint of the Maslach Burnout Inventory—General Survey; Schaufeli, Leiter, Maslach, & Jackson, 1996) totaled 270 participants and represented 56.0% of the sample. In this sample, participants included and excluded did not differ significantly with respect to gender ($X^2(3) = 2.98$, $p = .39$) or age ($X^2(5) = 7.44$, $p = .19$). In addition, participants in the three conditions did not differ significantly by gender ($X^2(6) = 6.92$, $p = .33$) or age ($X^2(10) = 14.75$, $p = .14$).

Table 1. Summary of participant demographic information by sample

	Sample 1: High Emotional Distress		Sample 2: High Workplace Distress	
Demographic	Included (*N* = 321)	Excluded (*N* = 124)	Included (*N* = 270)	Excluded (*N* = 212)
Gender				
Male	38 (11.8%)	22 (17.7%)	46 (17.0%)	25 (11.8%)

Female	279 (86.9%)	101 (81.5%)	219 (81.1%)	184 (86.8%)
Other	3 (0.9%)	1 (0.8%)	4 (1.5%)	2 (0.9%)
Missing	1 (0.3%)	0 (0.0%)	1 (0.4%)	1 (0.4%)
Age				
18-24	55 (17.1%)	10 (8.1%)	30 11.1%)	34 (16.0%)
25-34	140 (43.6%)	40 (32.3%)	119 (44.1%)	87 (41.0%)
35-44	75 (23.4%)	28 (22.6%)	73 (27.0%)	53 (25.0%)
45-54	37 (11.5%)	28 (22.6%)	39 (14.4%)	26 (12.3%)
55-64	14 (4.4%)	14 (11.3%)	7 (2.6%)	12 (5.7%)
65+	0 (0.0%)	4 (3.2%)	2 (0.7%)	0 (0.0%)

Table 2. Summary of demographic information for included participants, by condition

	Sample 1: High Emotional Distress			Sample 2: High Workplace Distress		
Demographic	H ($N = 86$)	PE ($N = 176$)	NUC ($N = 59$)	H ($N = 56$)	PE ($N = 161$)	NUC ($N = 53$)
Gender						
Male	6 (7.0%)	23 (13.1%)	9 (15.3%)	5 (8.9%)	30 (18.6%)	11 (20.8%)
Female	79 (91.9%)	151 (85.8%)	49 (83.1%)	50 (89.3%)	129 (80.1%)	40 (75.5%)
Other	0 (0.0%)	2 (1.1%)	1 (1.7%)	1 (1.8%)	1 (0.6%)	2 (3.6%)
Missing	1 (1.2%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (0.6%)	0 (0.0%)
Age						
18-24	15 (17.4%)	31 (17.6%)	9 (15.3%)	3 (5.4%)	25 (15.5%)	2 (3.8%)
25-34	39 (45.4%)	77 (43.8%)	24 (40.7%)	29 (51.8%)	68 (42.2%)	22 (41.5%)
35-44	19 (22.1%)	41 (23.3%)	15 (25.4%)	15 (26.8%)	43 (26.7%)	15 (28.3%)

45-54	10 (11.6%)	19 (10.8%)	8 (13.6%)	6 (10.7%)	21 (13.0%)	12 (22.6%)
55-64	3 (3.5%)	8 (4.6%)	3 (5.1%)	3 (5.4%)	3 (1.9%)	1 (1.9%)
65+	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (0.6%)	1 (1.9%)

Note. H = Happify, PE = Psychoeducation, NUC = No-usage comparison.

Study Procedure

All study experiences took place via smartphone or web, with no human contact outside of assistance with technical problems via email. The only inclusion criterion for intake, besides the level of computer literacy needed in order to find Happify in the first place, was that the user be a new registrant, with no experience on the platform to date; new users were offered the opportunity to participate in the study at the end of the process of registering for the free version of the consumer site.

Data Security. As data security is a concern for any online data collection, we implemented various safety measures to protect user privacy. They are summarized in the consent form as follows:

> When you register for the study, you will be asked to give us your email address. In our secure database, your email address will be tied to your data by a randomly generated numerical code, which will allow us to connect each new questionnaire you take to the other questionnaires you have taken. Depending on whether or not your email address contains identifying information, this may or may not constitute a risk to privacy were someone to compromise the security of our database. However, because email addresses will be stored separately from questionnaire data, the researchers will never be able to connect your data with any identifying information. However, if you wish to be completely certain that your data will remain private under any circumstances, you may create an anonymous email address for the purposes of this study and have its messages forwarded to your main account.

Allocation and Clinical Symptom Screening. Participants who consented to participate in the study were prompted to complete the baseline assessment via email as well as push notification on their mobile device, if they had installed the Happify app.

Experimental Conditions

Happify (happify.com) can be accessed via the web, or via an app (Android and iOS), and all study activities took place through the Happify platform. There were two intervention conditions between which participants could be randomly assigned: the full Happify platform and a psychoeducational comparison intervention. Per the consent form, participants were aware that there were different programs being tested, and that they would be randomly assigned to one program, which they would be unable to change. However, participants were unaware of whether the program to which they were assigned was "experimental" or "comparison." Since the psychoeducation condition was designed to look like any other Happify program, it is unlikely that users unfamiliar with Happify would be able to determine whether they were in the comparison condition. In the first 30 days, all participants received emails twice per week reminding them to visit the site and to complete their assigned program. They did not receive emails after that, except to prompt for follow-up assessment.

Happify. The Happify condition received full access to an online platform that offers techniques grounded in positive psychological interventions (PPI; Parks & Schueller, 2014), cognitive-behavioral therapy (CBT; Beck, 2011), and/or mindfulness-based stress reduction (MBSR; Kabat-Zinn, 2013) (Carpenter et al., 2016). Each of the core activities on the platform was selected from one or more of these three theoretical traditions, but only if there existed randomized, controlled research demonstrating its efficacy for improving well-being. Those core activities are organized into 5 categories using the acronym STAGE: savor (savoring and mindfulness), thank (gratitude), aspire (goal-setting, reframing/optimism, meaning, and using strengths), give (prosocial behavior, kindness, and forgiveness), and empathize (perspective-taking and self-compassion).

Some of these activities would be considered "traditional" exemplars of the literature they came from. Gratitude journals, acts of kindness, and using strengths are examples of activities on Happify that are canonical PPIs. Users do body scan meditations, walking meditations, and sitting meditations very much in line with traditional MBSR. They practice thought-stopping and thought disputing, as well as goal-setting, all of which are staples of traditional CBT. However, because these three approaches overlap in many ways, we do not clearly label each activity as "belonging" to only one area; for example, savoring appears in both positive psychology and mindfulness-based approaches, and many positive psychology-based activities could also be housed under the "behavioral activation" side of CBT.

Happify users have free choice from a growing catalog of over sixty 4-week programs tailored to different goals, such as conquering negative thoughts, feeling more connected to one's family, or finding meaning in one's job. Together, these programs contain over 2,500 different activity variants. The design of each program is overseen by an author with expertise in the topic. The author selects a subset of the core activities that are appropriate to the goals of the program, and works with a writer to customize the selected activities for the specific nature of the program. For example, a track on living with chronic pain was overseen by Afton Hassett, a researcher at the University of Michigan who specializes in psychosocial interventions for pain. She sampled interventions from positive psychology (gratitude, kind acts, strengths-building, finding meaning), cognitive-behavioral therapy (goal-setting, thought stopping), and mindfulness-based stress reduction (savoring the present moment, sitting meditation). Each of these appears in the track in a customized form that mentions pain and helps the user see the activity's relevance to chronic pain.

Psychoeducation comparison. In order to account for regression to the mean and expectation effects, it is important to evaluate active interventions against one or more comparison groups (Mohr et al., 2009). About half of online well-being intervention studies use waitlist control conditions, where users do not receive any aspects of the intervention being tested (Bolier et al., 2013a; Bolier et al., 2013b; Schueller & Parks, 2012). Our psychoeducational condition was designed to provide a more robust and more meaningful comparison group than a simple waitlist control. The psychoeducational comparison intervention emulates many existing websites that provide information about well-being, where a person might end up if they are searching online.

Psychoeducational participants logged in regularly to an identical looking Happify website or app, which included an identical onboarding process, and were offered content that grew and changed over time. However, comparison group users did not experience some of the engagement elements from the main platform -- they had no access to social forums, could not post their activity results publicly for others to see and comment on, and could not choose freely between different programs. Like a waitlist group, users do not receive activities to try, but unlike a waitlist group, they do engage with content about well-being, and they also have the experience of using the Happify platform. Users in the psychoeducational comparison group completed a series of polls on the topic of well-being (Haeck, Parks, & Schueller, 2016). In these polls, they were asked survey questions on well-being topics, and then were given some social comparison data about where they stand in their opinions compared with other users as well as information about why the well-being topic is important, including references to relevant scientific studies.

No-usage comparison. Our restriction to users who used their assigned intervention as instructed (a minimum of twice per week, on average, over 8 weeks) left us with a substantial number of users who were randomly assigned to one of the two groups, but who completed fewer than 16 activities during the 8-week period. From these users, we selected those who completed 8 or fewer activities over 8 weeks, and therefore were not significantly exposed to their assigned intervention; these users comprised a non-randomized comparison group. By separating out users who were assigned to an intervention, but who did not fully complete it, we hoped to observe the natural change in well-being that can be expected over time. With an estimate of natural change over time, we could assess the extent to which the two intervention conditions improved above and beyond the improvement they would have experienced regardless.

Instead of randomly assigning participants to a no-intervention control group, we chose to examine low-usage users based on internal pilot data, which suggests that participants assigned to a no-intervention group will seek out treatment elsewhere. These pilot results are consistent with previous research, which finds that when people who value happiness are given an ineffective strategy for pursuing it, they experience dysphoric effects (Mauss, Tamir, Anderson, & Savino, 2011). The non-randomized comparison group, therefore, allows us to see the well-being changes that occur in users who receive no intervention without risking the negative consequences of a no intervention group assignment in this eager population.

Measures

Sorting and Control Variables

Depressive Symptoms. In Sample 1, depressive symptoms were measured using the 9-item Patient Health Questionnaire (PHQ-9; Kroenke, Spitzer, & Williams, 2001). Participants were asked to rate the frequency with which they experienced various depressive symptoms in the past two weeks, on a scale that included the following response options: not at all, several days, more than half the days, almost every day. Symptoms included "feeling down, depressed, or hopeless," and "feeling tired or having little energy." Participants' responses were summed to create a total score that ranged from 0 to 27, with higher values indicating depressive symptoms that were greater in number and/or more frequent. PHQ showed acceptable internal consistency in the larger sample from which our subsample was screened ($\alpha = .88$). Baseline PHQ scores did not differ significantly as a function of study condition [$F(2,318) = 0.99$, $p = .37$].

Anxiety Symptoms. In Sample 1, anxiety symptoms were measured using the 7-item Generalized Anxiety Disorder scale (GAD-7; Spitzer, Kroenke, Williams, & Löwe, 2006). Participants were asked to indicate how frequently in the past two weeks they had experienced various symptoms of anxiety, on a scale ranging from not at all, several days, more than half the days, and nearly every day. Symptoms included "feeling nervous, anxious, or on edge," and "worrying too much about different things." Participants' responses were summed to create a total score that ranged from 0-21, with higher scores indicating more frequent anxiety symptoms. Participant GAD showed acceptable internal consistency in the larger sample from which our subsample was screened ($\alpha = .89$). Participant baseline GAD scores did not differ significantly as a function of condition among those retained for analysis, [$F(2,318) = 0.61$, $p = .55$].

Presenteeism. In Sample 2, presenteeism was measured using the 6-item job-stress-related presenteeism scale (JSRP; Gilbreath & Frew, 2008). Participants were asked to indicate how often they had engaged in thought patterns or behaviors indicating presenteeism, such as that they were "unable to concentrate on [their] job because of stress" or that they "delay starting on new projects at work because of stress." Participants' responses were summed to create a total score that ranged from 0-12, with higher scores indicating higher levels of job-stress-related presenteeism. The JSRP showed acceptable internal consistency in the larger sample from which our subsample was screened (α = .80). At baseline, presenteeism scale scores did not differ significantly between the different study conditions, $F(2,267) = 0.23$, $p = .80$.

Burnout. In Sample 2, burnout was measured using the 5-item *Exhaustion* subscale of the Maslach Burnout Inventory-General Survey (MBI-GS; Schaufeli et al., 1996). Participants were asked to indicate their level of agreement with statements such as, "I feel burned out from work," with response options ranging from 0 (*Disagree Strongly*) to 4 (*Agree Strongly*). Participants' responses were summed to create a total score that ranged from 0-20, with higher scores indicating higher levels of burnout. The MBI-GS *Exhaustion* subscale showed acceptable internal consistency in the larger sample from which our subsample was screened (α = .85). Burnout scale scores did not differ significantly as a function of study condition, $F(2,267) = 0.12$, $p = .89$.

Demographics. In both Sample 1 and Sample 2, participants were asked to indicate their gender and age. For gender, participants were able to select from options including male, female, and "it's complicated", and for age, participants were able to select from options including 18-24 years, 25-34 years, 35-44 years, 45-54 years, 55-64 years, and 65 years or older. In Sample 2 only, participants were also asked to indicate their job category from the following options: executive, administrator, or senior manager; professional; technical support; sales; clerical and administrative support; service occupation; precision production and crafts worker; and operator or laborer. Participants in each of the three conditions did not differ significantly in terms of gender or age in either Sample 1 or Sample 2 (all *p*s > .26).

Study Outcome: Resilience

Resilience was measured using a composite scale that aggregated measures of optimism, perceived stress, and positive emotionality, all three of which are key components of resilience (Parks et al., in press; Tugade & Fredrickson, 2004). Optimism was measured using the LOT-R (Scheier & Carver, 1985). Perceived stress was measured using the Perceived Stress Scale (PSS; Cohen, Kamarck, & Mermelstein, 1983). Positive emotionality was measured using the emotion subscale of the Happify scale (Carpenter et al., 2016). To compute the resilience index, items within each of the three resilience components (optimism, perceived stress, and positive emotionality) were rescored to run from 0-1, and then averaged separately by component. Next, the three component averages were averaged together, so that each component was weighted equally in the final composite, regardless of the number of items in any given scale. Finally, composite scores were multiplied by 100 for ease of interpretation, such that the final resilience index ranged from 0-100.

Analytic Strategy

To test whether using the Happify platform increased resilience in our two samples relative to users in a control condition, analyses focused on users who engaged with the platform as suggested (see Carpenter et al., 2016). Users included in analysis completed, on average, at least two activities per week, or a minimum of 16 total activities over the course of the eight-week study; this optimal activity level was derived from internal data from our consumer platform. We also retained a subsample of users who did not use their assigned platform as suggested, and completed (at most) eight activities during the eight-week intervention period as a non-randomized comparison condition. All analyses were conducted using Stata SE 14.2.

Results

Baseline differences. Baseline levels of resilience did not differ significantly for emotionally distressed participants in Sample 1 [$F(2,318) = 0.39$, $p = .68$] or for participants experiencing workplace distress in Sample 2 [$F(2,267) = 1.19$, $p = .31$].

Analysis overview. We conducted a two-way mixed analysis of covariance (ANCOVA), with time (baseline, post-test) entered as a within-subject factor and condition (Happify, Psychoeducation, No-Usage) entered as a between-subjects factor, separately for each sample. We also controlled for relevant demographic variables in the models. For Sample 1, this included participant gender and age. For Sample 2, this included participant gender, age, and job category. Results are summarized in Table 3 below and presented graphically in Figure 1.

Changes in resilience among users with high emotional distress. When examining changes in resilience over time among full-time employed participants with clinical symptoms of depression and/or anxiety, the mixed ANOVA revealed a significant main effect of time, $F(1,317) = 75.62$, $p < .001$, $\eta_p^2 = .19$ and a non-significant main effect of condition $F(2,317) = 0.13$, $p = .88$, $\eta_p^2 = .001$. However, these effects were qualified by a significant time by condition interaction, $F(2,317) = 3.86$, $p = .022$, $\eta_p^2 = .02$. Follow-up simple effects analyses revealed significant effects of time in all three conditions, such that participants in the Happify [$t(317) = 7.21$, $p < .001$], Psychoeducation [$t(317) = 6.31$, $p < .01$], and the no-usage conditions [$t(317) = 2.73$, $p < .007$] all saw significant increases in resilience over time ($M_H = 9.38$, $SE_H = 1.30$; $M_{PE} = 5.71$, $SE_{PE} = 0.90$; $M_{NU} = 4.26$, $SE_{NU} = 1.56$). In terms of change from baseline to post-test, participants in the Happify condition showed significantly greater change in resilience from baseline to post-test than did participants in the Psychoeducation ($t(317) = 2.32$, $p < .021$) or no-usage comparison conditions ($t(317) = 2.52$, $p = .012$). These changes in resilience are equivalent to a 25.1% increase in baseline resilience for users in the Happify condition, a 14.8% increase for users in the psychoeducation condition, and a 11.0% increase for users in the no-usage condition. Results for each of the resilience composite components separately are shown in the Appendix.

Changes in resilience among users with high workplace distress. The mixed ANOVA analyses revealed a significant main effects of time, $F(1,266) = 43.11$, $p < .001$, $\eta_p^2 = .14$, which was further qualified by a significant time by condition interaction, $F(2,266) = 3.38$, $p = .035$, $\eta_p^2 = .025$. Follow-up simple effects analyses revealed significant effects of time in both the Happify [$t(266) = 5.39$, $p < .001$] and Psychoeducation conditions [$t(266) = 5.12$, $p < .001$], but not in the no-usage condition [$t(266) = 1.72$, $p = .086$], suggesting that participants in both of the active experimental conditions saw significant increases in resilience over time (M_H = 9.68, SE_H = 1.80; M_{PE} = 5.44, SE_{PE} = 1.06), but that those who did not actively use their assigned condition did not (M_{NU} = 3.18, SE_{NU} = 1.85). Moreover, this increase over time in resilience for participants in the Happify condition was significantly larger than the increase in resilience for participants in either the Psychoeducation condition ($t(266) = 2.03$, $p = .044$) or the participants in the no-usage condition ($t(266) = 2.52$, $p = .012$). These changes in resilience are equivalent to a 20.9% increase in resilience for users in the Happify condition, a 11.6% increase for users in the psychoeducation condition, and a 6.3% increase for users in the no-usage condition. Results for each of the resilience composite components separately are shown in the Appendix.

Table 3. Baseline, post-test, and change in resilience scores by condition and sample

		Resilience			
Condition	N	Baseline	Post-test	Change	95% CI of Change
Sample 1: High Distress					
Happify	86	37.33	46.71	9.38	6.82, 11.94
Psychoeducation	176	38.59	44.30	5.71	3.93, 7.49
No Usage	59	38.80	43.06	4.26	1.19, 7.33
Sample 2: High Workplace Distress					
Happify	56	46.34	56.01	9.67	6.14, 13.22
Psychoeducation	161	46.75	52.19	5.44	3.35, 7.54
No Usage	53	50.21	53.40	3.18	-.45, 6.82

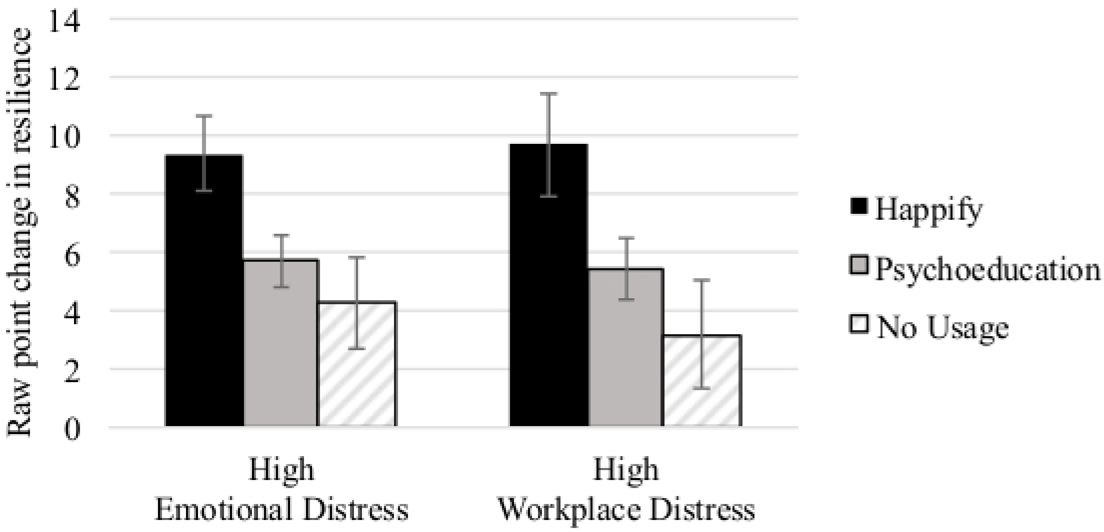

Figure 1. Raw point changes in resilience from baseline to an 8-week post-test for users in the Happify, psychoeducation, and no-usage conditions, for each of the study samples

Discussion

In two studies, we build on prior work demonstrating the effectiveness of the Happify platform (Carpenter et al., 2016; Parks et al., in press) to show that using an online- and smartphone-based resilience intervention increases resilience among employees who might need it most. Specifically, we demonstrated the effect for employees with elevated emotional distress (depression and/or anxiety), and replicated it for employees reporting high levels of workplace distress (presenteeism and/or burnout).

Automated technology-based interventions have numerous advantages over in-person or coaching-based interventions. First, they may circumvent the social stigma that might arise from singling out at-risk employees and encouraging them to participate in mental health programs at work. Second, they may also engage employees who might not have the schedule flexibility or motivation to seek in-person services; by accessing the intervention via computer or phone, they can participate as their schedule allows. Lastly, automated technology-based interventions are low-cost -- once created, the cost of disseminating to thousands or even tens of thousands of employees would be highly cost-effective (Griffiths et al., 2006; Muñoz et al., 2016). In short, the present study illustrates how a technology-based resilience intervention can improve resilience among vulnerable employee groups. This is particularly interesting given that these interventions can be substantially more accessible and engaging than in-person services.

Research has found decreased effectiveness when interventions are translated into an online format (e.g., Vanhove et al., 2016). This is, in part, due to low engagement rates; less usage means smaller effects (Eysenbach, 2005). It is therefore essential to design interventions in such a way that they are as engaging as possible -- and to document those engagement measures so that they can be studied and their impact better understood. Also important is the role of self-selection in internet intervention research. It is possible that the participants in the present study are different in key ways from average employees, as our samples are employees who specifically sought out Happify. Furthermore, while our focus on users who used the platform regularly allows us to get an accurate assessment of the platform's impact, it also introduces an additional layer of self-selection. Real-world enterprise data are a needed analogue to help determine whether the results of the current research generalize to realistic settings.

By the same token, when doing real-world research embedded in organizations, it is important to consider the impact of performing organizationally-embedded research on the user experience. It can be difficult to study mental health difficulties in employer settings because it is easy to set employees on edge when their employer wants to evaluate their mental health status. For example, compared to published prevalence rates, proportionately fewer participants reported high presenteeism and/or burnout in our sample, which could indicate a social desirability bias. Social desirability biases may be even more pronounced when the assessment is being administered by an employer, to whom people certainly do not want to admit presenteeism or burnout. It is possible, however, that employee reluctance to engage in mental health topics could be mitigated by top-down support of self-care initiatives. Unpublished data collected by authors Cormier and Whillans as well as others (e.g., Blake & Lloyd, 2008) lends support to the idea that leadership support and participation in wellness initiatives can enhance the effectiveness of workplace interventions; when testing a brief intervention to reduce burnout in the workplace, employees in this pilot study were more willing to engage with and benefit from the program when there was leadership support. It makes sense that interventions can only be successful insofar as the people receiving them are on board—genuine support from the employer is one possible way to facilitate this.

That said, real-world research in organizations can yield many interesting data points, such as objective outcomes that are directly tied to cost savings for the employer; reduction in mistakes made at work, improvements in productivity, better social cohesion among teams, and even reduction in presenteeism and/or burnout itself would all translate to better employer outcomes. Longer term research studies are needed in order to see change in habitual behaviors, as well as outcomes such as turnover.

Despite consistent findings across two very different samples, we acknowledge several limitations. First, because we were interested in participants who met specific criteria for inclusion (i.e., high emotional distress in Sample 1 and high workplace distress in Study 2), results may not generalize across all users of Happify. Indeed, we found significant differences in age between participants who were retained for and excluded from analysis in Sample 1, such that excluded participants in this sample were more likely to be older than those included in analysis. Further, Happify users may not be representative of the general population of employees—the type of user who seeks internet-based self-help may be systematically different.

Finally, although Happify has been localized in several different languages (including Spanish, French, Portuguese, German, Chinese, Japanese, and French-Canadian), the current study only examined changes in resilience among employees in the United States. Future work should examine the extent to which Happify, as a resilience intervention tool, functions similarly in various cultural groups, as many major employers are international, with offices all over the world.

In order to implement interventions in the workplace in ways that are affordable and scalable, work must be done along the entire spectrum of research design -- from rigorous, randomized controlled trials in highly controlled settings, to less structured, real-world studies with non-randomized comparison groups. Our hope in the present paper was to present two studies that are somewhere in between these two extremes. We offered both randomized, active comparison groups and a non-randomized no intervention control. We examined those groups of employees who are most likely to be of interest to employers due to their high cost to businesses: those suffering from high emotional distress, and those exhibiting presenteeism or burnout behaviors. Unlike a standard RCT, which takes an "intent-to-treat" approach—including everyone regardless of their engagement level—we instead wanted to obtain a baseline for how effective our intervention was for these high risk groups *when they actually receive it*. In workplace-based internet interventions, engagement is very fluid, depending on the level of resources the employer chooses to invest. Employers can offer incentives to employees, special features such as interactive webinars and daily content can be provided, and specialized content can be offered depending on the interest of the employees. All of these factors can impact engagement level, and engagement level varies from context to context depending on how much effort is spent to promote engagement. It is worthwhile in this setting, therefore, to separate effectiveness when used-as-directed from efficacy when users and non-users are averaged together. We hope that this study provides a first step towards understanding how high-risk employees can be helped with a low-touch, cost-effective, easily scalable intervention.

References

Afifi, T. O., & MacMillian, H. L. (2011). Resilience following child maltreatment: A review of protective factors. *The Canadian Journal of Psychology, 56*, 266-272. https://doi.org/10.1177/070674371105600505

Arnow, B. A. (2004). Relationships between childhood maltreatment, adult health and psychiatric outcomes, and medical utilization. *Journal of Clinical Psychiatry, 65*, 10-15.

Arnow, B. A., Blasey, C. M., Lee, J., Fireman, B., Hunkeler, E. M., Dea, R., Robinson, R., & Hayward, C. (2009). Relationships among depression, chronic pain, chronic disabling pain, and medical costs. *Psychiatric Services, 60*, 344-350. https://doi.org/10.1176/ps.2009.60.3.344

Beck, J. S. (2011). *Cognitive behavior therapy: Basics and beyond.* Guilford Press.

Bierla, I., Huver, B., & Richard, S. (2013). New evidence on absenteeism and presenteeism. *The International Journal of Human Resource Management, 24(7),* 1536-1550. https://doi.org/10.1080/09585192.2012.722120

Biron, C., Brun, J., Ivers, H., & Cooper, C. L. (2006). At work but ill: Psychosocial work environment and well-being determinants of presenteeism propensity. *Journal of Public Mental Health, 5(*4*),* 26-37. https://doi.org/10.1108/17465729200600029

Blake, H., & Lloyd, S. (2008). Influencing organisational change in the NHS: Lessons learned from workplace wellness initiatives in practice. *Quality in Primary Care*, *16*, 449-455.

Bolier, L., Haverman, M., Kramer, J., Westerhof, G. J., Riper, H., Walburg, J. A., ... & Bohlmeijer, E. (2013a). An Internet-based intervention to promote mental fitness for mildly depressed adults: Randomized controlled trial. *Journal of Medical Internet Research, 15*(9). https://doi.org/10.2196/jmir.2603

Bolier, L., Haverman, M., Westerhof, G. J., Riper, H., Smit, F., & Bohlmeijer, E. (2013b). Positive psychology interventions: A meta-analysis of randomized controlled studies. *BMC Public Health, 13*(1), 119. https://doi.org/10.1186/1471-2458-13-119

Brohan, E., Henderson, C., Wheat, K., Malcolm, E., Clement, S., Barley, E. A., ... & Thornicroft, G. (2012). Systematic review of beliefs, behaviours and influencing factors associated with disclosure of a mental health problem in the workplace. *BMC Psychiatry, 12*(11), 1-14. https://doi.org/10.1186/1471-244X-12-11

Brown, T. A., Campbell, L. A., Lehman, C. L., Grisham, J. R., & Mancill, R. B. (2001). Current and lifetime comorbidity of the *DSM-IV* anxiety and mood disorders in a large clinical sample. *Journal of Abnormal Psychology*, *110*, 585-599. https://doi.org/10.1037//0021-843X.110.4.585

Carpenter, J., Crutchley, P., Zilca, R. D., Schwartz, H. A., Smith, L. K., Cobb, A. M., & Parks, A. C. (2016). Seeing the "big" picture: Big data methods for exploring relationships between usage, language, and outcome in internet intervention data. *Journal of Medical Internet Research*, *18*(8). 1-41. https://doi.org/10.2196/jmir.5725

Cherniak, M., & Lahiri, S. (2010). Barrier to implementation of workplace health interventions:

An economic perspective. *Journal of Occupational and Environmental Medicine*, *52*, 934-942. https://doi.org/10.1097/JOM.0b013e3181f26e59

Clement, S., Schauman, O., Graham, T., Maggioni, F., Evans-Lacko, S., Bezborodovs, N., ... & Thornicroft, G. (2015). What is the impact of mental health-related stigma on help-seeking? A systematic review of quantitative and qualitative studies. *Psychological Medicine, 45*(1), 11-27. https://doi.org/10.1017/S0033291714000129

Cohen, S., Kamarck, T., & Mermelstein, R. (1983). A global measure of perceived stress. *Journal of Health and Social Behavior*, *24*(4), 385-396. http://dx.doi.org/10.2307/2136404

Cohn, M. A., Fredrickson, B. L., Brown, S. L., Mikels, J. A., & Conway, A. M. (2009). Happiness unpacked: Positive emotions increase life satisfaction by building resilience. *Emotion*, *9*(3), 361-368. http://doi.org/10.1037/a0015952

Collins, J. J., Baase, C. M., Sharda, C. E., Ozminkowski, R. J., Nicholson, S., Billotti, G. M., … & Berger, M. L. (2005). The assessment of chronic health conditions on work performance, absence, and total economic impact for employers. Journal of Occupational and Environmental Medicine, 47, 547-557. http://doi.org/10.1097/01.jom.0000166864.58664.29

Cropanzano, R., & Wright, T. A. (1999). A 5-year study of change in the relationship between well-being and job performance. *Consulting Psychology Journal: Practice and Research*, *51*(4), 252. http://psycnet.apa.org/doi/10.1037/1061-4087.51.4.252

DuPont, R. L., Rice, D. P., Miller, L. S., Shiraki, S. S., Rowland, C. R., & Harwood, H. J. (1996). Economic costs of anxiety disorders. *Anxiety*, *2*(4), 167-172. https://doi.org/10.1002/(SICI)1522-7154(1996)2:4%3C167::AID-ANXI2%3E3.0.CO;2-L

Druss, B. G, Rosenheck, R. A, & Sledge, W. H. (2000). Health & disability costs of depressive illness in a major U.S. corporation. *American Journal of Psychiatry, 157(*8), 1274-1278. https://doi.org/10.1176/appi.ajp.157.8.1274

Dyrbye, L. N., Power, D. V., Massie, F. S., Eacker, A., Harper, W., Thomas, M. R., ... & Shanafelt, T. D. (2010). Factors associated with resilience to and recovery from burnout: a prospective, multi‐institutional study of US medical students. *Medical Education, 44*(10), 1016-1026. https://doi.org/10.1111/j.1365-2923.2010.03754.x

Eysenbach, G. (2005). The law of attrition. *Journal of Medical Internet Research, 7*(1), 1-14. http://doi.org/10.2196/jmir.7.1.e11

Fredrickson, B., Cohn, M., Coffey, K., Pek, J., Finkel, S., & Judd, C. M. (2008). Open hearts build lives: Positive emotions, induced through loving-kindness meditation, build consequential personal resources. *Journal of Personality and Social Psychology, 95(5),* 1045-1062. http://dx.doi.org/10.1037/a0013262

Forbes, S., & Fikretoglu, D. (2018). Building resilience: The conceptual basis and research evidence for resilience training programs. *Review of General Psychology.* Advance online publication. http://psycnet.apa.org/doi/10.1037/gpr0000152

Gilbreath, B., & Frew, E. J. (2008). The stress-related presenteeism scale [measurement instrument]. *Pueblo, CO: Hasan School of Business, Colorado State University*.

Goetzel, R. Z., Roemer, E. C., Holingue, C., Fallin, M. D., McCleary, K., Eaton, W., ... & Braga, M. (2018). Mental health in the workplace: A call to action proceedings from the mental health in the workplace: Public health summit. *Journal of Occupational and Environmental Medicine*, *60*(4), 322-330. http://doi.org/10.1097/JOM.0000000000001271

Greenberg, P. E., Fournier, A. A., Sisitsky, T., Pike, C. T., & Kessler, R. C. (2015). The economic burden of adults with major depressive disorder in the United States (2005 and 2010). *The Journal of Clinical Psychiatry*, *76*(2), 155-162. https://doi.org/10.4088/JCP.14m09298

Griffiths, F., Lindenmeyer, A., Powell, J., Lowe, P., & Thorogood, M. (2006). Why are health care interventions delivered over the internet? A systematic review of the published literature. *Journal of Medical Internet Research*, *8*(2), 1-16. http://doi.org/10.2196/jmir.8.2.e10

Haeck, C., Parks, A. C., & Schueller, S. M. (2016). Impact of psychoeducational content delivered online to a positive psychology aware community. *The Journal of Positive Psychology*, *11*(3), 270-275. https://doi.org/10.1080/17439760.2015.1048819

Johns, S. A., Brown, L. F., Beck-Coon, K., Talib, T. L., Monahan, P. O., Giesler, R. B., ... & Wagner, C. D. (2016). Randomized controlled pilot trial of mindfulness-based stress reduction compared to psychoeducational support for persistently fatigued breast and colorectal cancer survivors. *Supportive Care in Cancer, 24*(10), 4085-4096. https://doi.org/10.1007/s00520-016-3220-4

Johnson, J. R., Emmons, H. C., Rivard, R. L., Griffin, K. H., & Dusek, J. A. (2015). Resilience training: A pilot study of a mindfulness-based program with depressed healthcare professional. *Explore*, *11*, 433-444. https://doi.org/10.1016/j.explore.2015.08.002

Kabat-Zinn, J. (2013). *Full catastrophe living, revised edition: How to cope with stress, pain and illness using mindfulness meditation.* Hachette UK.

Kalisch, R., Müller, M. B., & Tüscher, O. (2015). A conceptual framework for the neurobiological study of resilience. *Behavioral and Brain Sciences*, *38,* 1-79. https://doi.org/10.1017/S0140525X1400082X

Kessler, R. C., Berglund, P., Demler, O., Jin, R., Koretz, D., Merikangas, K. R., ... & Wang, P. S. (2003). The epidemiology of major depressive disorder: Results from the national comorbidity survey replication (NCS-R). *JAMA*, *289*(23), 3095-3105. http://psycnet.apa.org/doi/10.1001/jama.289.23.3095

Kotze, M., & Lamb, S. (2012). The influence of personality traits and resilience on burnout among customer service representatives in a call centre. *Journal of Social Sciences*, *32*(3), 295-309. https://doi.org/10.1080/09718923.2012.11893074

Kroenke, K., Spitzer, R. L., & Williams, J. B. (2001). The PHQ-9: Validity of a brief depression severity measure. *Journal of General Internal Medicine*, *16*(9), 606-613. http://doi.org/10.1046/j.1525-1497.2001.016009606.x

Lépine, J. P. (2002). The epidemiology of anxiety disorders: Prevalence and societal costs. *The Journal of Clinical Psychiatry, 63*(14), 4-8. Retrieved from: https://www.psychiatrist.com/jcp/pages/home.aspx

Lerner, D., Adler, D. A., Chang, H., Lapitsky, L., Hood, M. Y., Perissinotto, C., ... & Rogers, W. H. (2004). Unemployment, job retention, and productivity loss among employees with depression. *Psychiatric Services*, *55*(12), 1371-1378. https://doi.org/10.1176/appi.ps.55.12.1371

Luthans, F., Avolio, B., Walumbwa, F., & Li, W. (2005). The psychological capital of Chinese workers: Exploring the relationship with performance. *Management and Organization Review, 1*(2)*,* 249-271. https://doi.org/10.1111/j.1740-8784.2005.00011.x

Lyubomirsky, S., King, L., & Diener, E. (2005). The benefits of frequent positive affect: Does happiness lead to success? *Psychological Bulletin, 131*(6), 803-55. http://psycnet.apa.org/doi/10.1037/0033-2909.131.6.803

Magtibay, D. L., Chesak, S. S., Coughlin, K., & Sood, A. (2017). Decreasing stress and burnout in nurses: Efficacy of blended learning with stress management and resilience training program. *The Journal of Nursing Administration*, *47*, 391-395. https://doi.org/10.1097/NNA.0000000000000501

Mak, W. W. S., Ng, I. S. W., & Wong, C. C. Y. (2011). Resilience: Enhancing well-being through the positive cognitive triad. *Journal of Counseling Psychology*, *58*, 610-617. https://doi.org/10.1037/a0025195

Mauss, I. B., Tamir, M., Anderson, C. L., & Savino, N. S. (2011). Can seeking happiness make people unhappy? Paradoxical effects of valuing happiness. *Emotion*, *11*(4), 807. http://psycnet.apa.org/doi/10.1037/a0022010

Mohr D. C., Spring, B., Freedland, K. E., Beckner, V., Arean, P., Hollon, S. D., …, & Kaplan, R. (2009). The selection and design of control conditions for randomized controlled trials of psychological interventions. *Psychotherapy and Psychosomatics*, *78*, 275-284. https://doi.org/10.1159/000228248

Muñoz, R. F., Bunge, E. L., Chen, K., Schneller, S. M., Bravin, J. I., Shaughnessy, E. A., & Perez-Stable, E. J. (2016). Massive open online interventions: A novel model for delivering behavioral health services worldwide. *Clinical Psychological Science*, *4*, 194-205. https://doi.org/10.1177/2167702615583840

Parks, A. C., Williams, A. L., Tugade, M. M., Hokes, K. E., Honomichl, R. D., Zilca, R. D. (in press). *International Journal of Wellbeing*.

Parks, A. C. (2014). *The Wiley Blackwell handbook of positive psychological interventions.* Chichester: Wiley Blackwell.

Plummer, F., Manea, L., Trepel, D., & McMillan, D. (2016). Screening for anxiety disorders with the GAD-7 and GAD-2: A systematic review and diagnostic metaanalysis. *General Hospital Psychiatry*, *39*, 24-31. http://dx.doi.org/10.1016/j.genhosppsych.2015.11.005

Robertson, I., Cooper, C., Sarkar, M., & Curran, T. (2015). Resilience training in the workplace from 2003 to 2014: A systematic review. *Journal of Occupational and Organizational Psychology, 88(*3*),* 533-562. https://doi.org/10.1111/joop.12120

Scali, J., Gandubert, C., Ritchie, K., Soulier, M., Ancelin, M. L., & Chaudieu, I. (2012). Measuring resilience in adult women using the 10-items Connor-Davidson Resilience Scale (CD-RISC). Role of trauma exposure and anxiety disorders. *PLoS ONE*, *7*(6), 1-7. http://doi.org/10.1371/journal.pone.0039879

Schaufeli, W. B., Leiter, M. P., Maslach, C., & Jackson, S. E. (1996). Maslach Burnout Inventory–General Survey. In C. Maslach, S. E. Jackson, & M. P. Leiter (Eds.), The Maslach Burnout Inventory: Test manual (3rd ed., pp. 22–26). Palo Alto, CA: Consulting Psychologists Press.

Scheier, M. F., & Carver, C. S. (1985). Optimism, coping, and health: assessment and implications of generalized outcome expectancies. *Health Psychology*, *4*(3), 219-247. http://psycnet.apa.org/doi/10.1037/0278-6133.4.3.219

Schueller, S. M., & Parks, A. C. (2012). Disseminating self-help: Positive psychology exercises in an online trial. *Journal of Medical Internet Research, 14*(3), 1-10. https://doi.org/10.2196/jmir.1850

Seligman, M., Schulman, P., & Sarason, I. G. (1986). Explanatory style as a predictor of productivity and quitting among life insurance sales agents. *Journal of Personality and Social Psychology, 50(*4*),* 832-838. http://dx.doi.org/10.1037/0022-3514.50.4.832

Shim, R. S., Baltrus, P., Ye, J., & Rust, G. (2011). Prevalence, treatment, and control of depressive symptoms in the United States: results from the national health and nutrition examination survey (NHANES), 2005–2008. *The Journal of the American Board of Family Medicine, 24*(1), 33-38. https://doi.org/10.3122/jabfm.2011.01.100121

Simon, G. E., & Katzelnick, D. J. (1997). Depression, use of medical services and cost-offset effects. *Journal of Psychosomatic Research*, *42*(4), 333-344. http://psycnet.apa.org/doi/10.1016/S0022-3999(96)00367-4

Spitzer, R. L., Kroenke, K., Williams, J. B., & Löwe, B. (2006). A brief measure for assessing generalized anxiety disorder: The GAD-7. *Archives of Internal Medicine, 166*(10), 1092-1097. http://dx.doi.org/10.1001/archinte.166.10.1092

Steinhardt, M., & Dolbier, C. (2008). Evaluation of a resilience intervention to enhance coping strategies and protective factors and decrease symptomatology. *Journal of American College Health*, *56*, 445-453. https://doi.org/10.3200/JACH.56.44.445-454

Stewart, W. F., Ricci, J. A., Chee, E., Hahn, S. R., & Morganstein, D. (2003). Cost of lost productive work time among US workers with depression. *JAMA*, *289*, 3135-3144. https://dx.doi.org/10.1001/jama.289.23.3135

Thogersen-Ntoumani, C., Black, J., Lindwall, M., Whittaker, A., & Balanos, G. (2017). Presenteeism, stress resilience, and physical activity in older manual workers: A person-centred analysis. *European Journal of Ageing, 14(*4*),* 385-396. http://dx.doi.org/10.1007/s10433-017-0418-3

Tugade, M. M., & Fredrickson, B. L. (2004). Resilient individuals use positive emotions to bounce back from negative emotional experiences. *Journal of Personality and Social Psychology*, *86*, 320-333. https://dx.doi.org/10.1037%2F0022-3514.86.2.320

Tugade, M. M., Fredrickson, B. L., & Barrett, L. F. (2004). Psychological resilience and positive emotional granularity: Examining the benefits of positive emotions on coping and health. *Journal of Personality, 72*(6), 1161-1190. http://dx.doi.org/10.1111/j.1467-6494.2004.00294.x

Vanhove, A., Herian, M., Perez, A., Harms, P., & Lester, P. (2016). Can resilience be developed at work? A meta-analytic review of resilience-building programme effectiveness. *Journal of Occupational and Organizational Psychology, 89(*2*),* 278-307. https://doi.org/10.1111/joop.12123

Van Katwyk, P. T., Fox, S., Spector, P. E., & Kelloway, E. K. (2000). Using the Job-Related Affective Well-being Scale (JAWS) to investigate affective responses to work stressors. *Journal of Occupational Health Psychology*, *52*, 219 –230. http://dx.doi.org/10.1037/1076-8998.5.2.219

Van Steenbergen, E., Van Dongen, J., Wendel-Vos, G., Hildebrandt, V., & Strijk, J. (2016). Insights into the concept of vitality: Associations with participation and societal costs. *The European Journal of Public Health*, *26*(2), 354-359. https://doi.org/10.1093/eurpub/ckv194

Waite, P. J., & Richardson, G. E. (2004). Determining the efficacy of resiliency training in the work site. *Journal of Allied Health, 33*(3)*,* 178-183. Retrieved from: http://www.asahp.org/journal-of-allied-health/

Wingo, A. P., Wrenn, G., Pelletier, T., Gutman, A. R., Bradley, B., & Ressler, K. J. (2010). Moderating effects of resilience on depression in individuals with a history of childhood abuse or trauma exposure. *Journal of Affective Disorders*, *126*(3), 411-414. https://doi.org/10.1016/j.jad.2010.04.009

Wright, M. O. D., Masten, A. S., & Narayan, A. J. (2013). Resilience processes in development: Four waves of research on positive adaptation in the context of adversity. *In Handbook of Resilience in Children* (pp. 15-37). Springer, Boston, MA.

Youssef, C., & Luthans, F. (2007). Positive organizational behavior in the workplace: The impact of hope, optimism, and resilience. *Journal of Management, 33*(5)*,* 774-800. http://psycnet.apa.org/doi/10.1177/0149206307305562

Appendix

Table A1. Baseline, post-test, and change in optimism scores by condition and sample

		Optimism			
Condition	N	Baseline	Post-test	Change	95% CI of Change
Sample 1: High Emotional Distress					
Happify	86	10.83	12.33	1.49	.77, 2.22
Psychoeducation	176	10.93	12.03	1.10	.60, 1.60
No Usage	59	10.65	11.31	.44	-.20, 1.53
Sample 2: High Workplace Distress					
Happify	56	14.36	16.13	1.75	.71, 2.79
Psychoeducation	161	13.15	14.40	1.26	.64, 1.87
No Usage	53	13.28	14.25	.96	-.11, 2.03

Table A2. Baseline, post-test, and change in perceived stress scores by condition and sample

		Perceived Stress			
Condition	N	Baseline	Post-test	Change	95% CI of Change
Sample 1: High Emotional Distress					
Happify	86	14.93	18.22	3.29	2.10, 4.48
Psychoeducation	176	15.58	17.38	1.80	.97, 2.63
No Usage	59	15.67	17.52	1.85	.42, 3.28
Sample 2: High Workplace Distress					
Happify	56	17.57	21.35	3.79	2.19, 5.38
Psychoeducation	161	18.68	20.68	2.00	1.05, 2.95
No Usage	53	20.50	21.35	.85	-.79, 2.49

Table A3. Baseline, post-test, and change in Happify scale scores by condition and sample

		Happify Scale			
Condition	N	Baseline	Post-test	Change	95% CI of Change
Sample 1: High Emotional Distress					
Happify	86	29.53	43.21	13.68	9.82, 17.54
Psychoeducation	176	31.30	39.32	8.03	5.34, 10.71
No Usage	59	32.84	38.24	5.40	.77, 10.04
Sample 2: High Workplace Distress					
Happify	56	35.15	47.43	12.28	7.41, 17.15
Psychoeducation	161	38.77	44.86	6.09	3.21, 8.97
No Usage	53	44.04	47.46	3.42	-1.59, 8.43