Promoting and prolonging the beneficial effects of a vacation with the help of a smartphone-based intervention

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Het doel van dit onderzoek was om te onderzoeken of het positieve effect van vakanties op het herstel, het welbevinden en de werkprestaties van werknemers te versterken en te verlengen zijn met behulp van een smartphone-gebaseerde interventie. In een 4-weekse longitudinale studie onder 79 Finse leraren hebben wij het beloop van herstel, welbevinden, en werkprestatie vóór, tijdens, en na een vakantie onderzocht. Deelnemers werd gevraagd om een herstel-app, genaamd Holidaily, bij voorkeur dagelijks te gebruiken en vijf digitale vragenlijsten in te vullen. De groep kon verdeeld worden in niet-gebruikers, passieve gebruikers, en actieve gebruikers. Uitkomsten van de studie zijn dat de meeste herstel- en welbevinden indicatoren voor alle deelnemers verbeterden tijdens de vakantie. Werkprestatie en concentratievermogen veranderden niet na de vakantie vergeleken met ervoor. Creativiteit daalde direct na de vakantie, maar steeg anderhalve week na de vakantie tot een hoger niveau dan voor de vakantie. Actief gebruik van de app had een positief effect op enkele uitkomstmaten. Zo steeg bij actieve gebruikers hun creativiteit direct na de vakantie, terwijl dit daalde onder passieve gebruikers. Het weggeven van positieve vakantie-effecten lijkt trager onder actieve gebruikers. Maar weinig deelnemers gebruikten de app actief. Desalniettemin duiden onze resultaten erop dat een smartphone-gebaseerde herstel-interventie positieve vakantie-effecten kan verlengen.

1 Introduction

Recovery from work is a decisive factor in buffering the relation between work stress and ill-health (Sonnentag, Venz, & Casper, 2017, for reviews). It refers to the process of lowering or eliminating strain symptoms caused by job demands and restoring employees' energetic and mental resources (Zijlstra & Sonnentag, 2006). Vacations constitute an exceptionally powerful recovery opportunity compared to evenings after work or regular weekends, offering a relatively long absence of job demands and an opportunity to spend time on preferred non-work activities (De Bloom et al., 2009; De Bloom, 2012). Existing studies indicate that vacations promote employees' recovery, well-being, and job performance (Chen

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& Petrick, 2013; De Bloom et al., 2009; De Bloom, Ritter, Kühnel, Reinders, & Geurts, 2014; Hartig, Catalano, Ong, & Syme, 2013; Kühnel & Sonnentag, 2011). Vacationing is, for example, associated with higher life satisfaction and subjective well-being, fewer health complaints, better self-rated health, and lower levels of exhaustion after the vacation (see Chen & Petrick, 2013, for a review). However, these beneficial effects usually fade soon after work is resumed (e.g., De Bloom et al., 2009; Reizer & Mey-Raz, 2018). The purpose of this study was to investigate whether it is possible to strengthen and prolong the beneficial effects of recovery occurring during a vacation with the help of a smartphone-based intervention.

Our target group consisted of teachers, who are an especially stressed occupational group among knowledge workers (e.g., Kyriacou, 2001; Skaalvik & Skaalvik, 2015, 2017). Teachers typically face job demands such as heavy workloads, students' behavioral problems, lack of autonomy, conflicts with colleagues or parents, and the increasing use of technology in teaching (e.g., Fernet, Guay, Senécal, & Austin, 2012; Klassen & Chiu, 2011; Skaalvik & Skaalvik, 2017). Teachers also spend a lot of time on work-related activities outside formal work hours (e.g., Garrick et al., 2018), which limits their recovery opportunities. However, teachers have several vacations during the school year, which gives them opportunities to recover from job strain. In this study, we focused on their one-week winter vacation.

1.1 Theoretical perspectives on recovery

Research presumes two complementary processes underlying recovery from work (e.g., De Bloom, Geurts, & Kompier, 2010). Firstly, the *passive* mechanism, which is based on the Effort-Recovery Model (Meijman & Mulder, 1998), suggests that recovery only occurs when people stop working and rest. Low demands, as well as physical and psychological disengagement from work, enable workers' psychobiological systems to return to baseline levels (Sonnentag & Fritz, 2015). During vacations, employees are free from immediate job demands, which gives them an opportunity for passive recovery. Secondly, the *active* perspective of recovery acknowledges the importance of engagement in pleasant and challenging leisure activities (Geurts & Sonnentag, 2006). The active perspective can be grounded in theories such as Conservation of Resources Theory (Hobfoll, 1989), Broaden-and-Build Theory (Fredrickson, 2001) and Self-Determination Theory (Ryan & Deci, 2000). According to these theories, to recover from work stress, employees need to replenish threatened resources and engage in activities, which produce positive emotions and satisfy their basic needs for autonomy, relatedness and competence. Behavioral activation also highlights the importance of engaging in valued and enjoyable activities (Mazzucchelli, Kane, & Rees, 2010). This therapeutic approach is effective in the treatment of depression, but it can also enhance well-being in non-clinical populations. In summary, recovery not only entails detaching from work and resting, but also building new resources and engaging in meaningful leisure activities.

In addition to leisure activities, psychological experiences underlying these activities are important for recovery. Sonnentag and Fritz (2007) suggested a framework of four major recovery experiences: psychological detachment from work,

relaxation, control, and mastery. Of these experiences, detachment seems to be most consistently associated with positive changes in well-being (for reviews, see Sonnentag & Fritz, 2015; Wendsche & Lohmann-Haislah, 2017). Several studies have also demonstrated positive links between relaxation, control, mastery, and well-being (for a meta-analysis, see Bennett, Bakker, & Field, 2018). Newman, Tay and Diener (2014) recently extended the list of important recovery experiences in their DRAMMA model, which aims to explain the relation between leisure activities and subjective well-being. The assumed explanatory mechanisms are detachment, relaxation (labeled 'recovery' in the original model), autonomy, mastery, meaning, and affiliation. Detachment refers to mental disengagement from work-related thoughts. Relaxation implies low levels of mental or physical activation and little physical or intellectual effort (Sonnentag & Fritz, 2007). Autonomy refers to feelings of decision latitude and is one of the basic psychological needs suggested in the Self-Determination Theory (Ryan & Deci, 2000). It resembles control in Sonnentag and Fritz's (2007) framework but is broader, emphasizing feelings of volition in general instead of merely having control over one's leisure schedule. Mastery encompasses learning opportunities and challenges resulting in feelings of achievement and competence (Sonnentag & Fritz, 2007). Meaningful leisure activities are a means by which individuals gain something valuable in their lives (Iwasaki, 2008). Affiliation refers to feelings of belongingness and the fulfillment of people's innate need for relatedness (Ryan & Deci, 2000). In the present study, we examined all six DRAMMA experiences in the context of a vacation.

1.2 Strengthening and prolonging recovery during vacations
Both shorter and longer vacations have shown beneficial effects on recovery, well-being, and performance (De Bloom, Geurts, & Kompier, 2012, 2013), but these effects soon fade and occasionally fail to manifest at all (De Bloom et al., 2009). For example, negative incidents, engagement in passive activities (De Bloom et al., 2011), and a lack of detachment from work (Kühnel & Sonnentag, 2011) during a vacation may limit positive vacation effects on well-being. It is also possible that, even though vacationers benefit from engaging in pleasant recreational activities during the vacation, maintaining such behaviors during daily life is challenging (Smyth et al., 2018). Experiences of detachment and relaxation during the vacation appear to strengthen its positive effects on well-being (Fritz & Sonnentag, 2006). Also, relaxation during leisure time after the vacation may delay the fade-out of vacation effects (Kühnel & Sonnentag, 2011).

To the best of our knowledge, Holidaily is the first mobile intervention designed to promote recovery during a vacation and to prolong the duration of beneficial vacation effects. Holidaily is designed to promote the previously mentioned DRAMMA recovery experiences (Newman et al., 2014), and in terms of theory is based on positive psychology interventions (see for example Sin & Lyubomirsky, 2009) and behavior modification strategies (Mazzucchelli et al., 2010). In the method section and in Appendix 1 we provide a more detailed description of the app. For example, we provide screenshots showing examples of exercises in the app. Previous studies suggest that it is possible to support recovery from work and enhance recovery experiences with interventions such as relaxation tech-

niques, recovery experience training, and promotion of physical activity (for a review, see Verbeek et al., 2018). For instance, a face-to-face group intervention by Hahn, Binnewies, Sonnentag, and Mojza (2011) strengthened detachment, relaxation, and control after work, and the effects were still visible four weeks after the intervention. Mindfulness exercises can also enhance detachment after the workday (Michel, Bosch, & Rexroth, 2014). During the working day, an intervention including park walks and relaxation exercises supported recovery (De Bloom et al., 2017; Sianoja, Syrek, De Bloom, Korpela, & Kinnunen, 2017).

Our study concerned an occupational e-mental health intervention: the recovery intervention was delivered by mobile technology (i.e., a smartphone application), which supports the smooth and effortless integration of interventions into everyday life. Occupational e-mental health refers to the application of internet- and smartphone-based tools, which aim to improve the well-being of workers (Lehr et al., 2016). Web-based interventions are promising tools in treating various mental health problems (Haug, Nordgreen, Öst, & Havik, 2012; Königbauer, Letsch, Doebler, Ebert, & Baumeister, 2017; Richards & Richardson, 2012) and in promoting psychological well-being and work effectiveness (for a meta-analysis, see Carolan, Harris, & Cavanagh, 2017), but the empirical evidence for the efficacy of smartphone-based interventions is limited so far (Fiordelli, Diviani, & Schulz, 2013).

The few existing studies indicate that it may also be possible to utilize web-based tools to implement interventions targeted specifically at supporting recovery from work. In a web-based intervention focusing on teachers' recovery in the evening after work (Ebert et al., 2015), sleep quality and recovery experiences improved, and rumination decreased. Thiart, Lehr, Ebert, Berking, and Riper (2015) reported that the same intervention decreased the severity of insomnia among employees. An online stress management intervention by Ebert and colleagues (2016) also enhanced detachment from work in the evening and reduced stress, sleeping problems, and worrying among employees with elevated stress symptoms. In the first published study using the same Holidaily app as in the present study, Smyth and colleagues (2018) focused on the importance of user experiences in predicting the effectiveness of the app intervention in a German sample. They found that usability of the app relates to better recovery after the vacation. In summary, the results from previous studies suggest that recovery among teachers, our target group, can be supported with web-based tools.

1.3 Aims of the study

The main aim of this study was to investigate the effects of a one-week vacation on recovery experiences, well-being, and job performance, and to examine whether it is possible to strengthen these effects and prolong their duration with the help of a smartphone-based intervention. The study included two pre-vacation measurements (T1-T2), one measurement during the vacation (T3) and two post-vacation measurements (T4-T5). Low adherence is a common problem in e-health interventions (e.g., Carolan et al., 2017). To control for self-selection effects, we investigated whether the participants who used the app more actively differed from non-users or passive users at baseline (T1) in background factors and in the outcomes men-

tioned above. Secondly, we investigated if there was a dose-response relationship in app use (i.e., whether more intensive use of the app resulted in stronger and longer-lasting effects). That is, we examined, whether the temporal development of outcomes differed between non-users, passive and active app users. Finally, we conducted a few short interviews to find out more about user experiences.

In summary, our main hypotheses were:

Hypothesis 1: Teachers report higher recovery experiences, more well-being and better job performance after a vacation than before.
Hypothesis 2: Active use of the Holidaily app strengthens recovery experiences, well-being and job performance.
Hypothesis 3: Active use of the Holidaily app prolongs recovery experiences, well-being and job performance.

In addition, we sought answers to two explorative research questions in order to understand the characteristics of different user groups and obtain feedback on qualitative user experiences:

Question 1: How do non-users, passive, and active app users differ regarding background characteristics (e.g., age, gender, teacher type), recovery experiences, well-being, and job performance at baseline (T1)?
Question 2: How do participants describe their user experiences?

2 Methods

2.1 Participants
As stated earlier, the participants of this study were teachers and we focused on their one-week winter holiday spent in February-March 2018. We started recruiting them in October 2017 by informing schools in the city of Tampere about the opportunity to take part in the study. In addition, the teachers' trade union published our advertisement in their magazine and on their social media page twice. The most efficient way to recruit participants was social media (84 enrolments). All in all, 100 teachers from all over Finland enrolled to participate. However, only 79 of them responded to the first weekly questionnaire in February 2018 and actually took part in the study. The background information of the participants in three app use groups is presented in Table 1.

2.2 The smartphone-based recovery intervention
We conducted our recovery intervention with the help of a smartphone app called Holidaily (available for iOS and Android). It was developed at Leuphana University in Germany (Lehr, De Bloom, & Syrek, 2016-2018), translated and adapted to the Finnish context as part of this research project. The general aim of the app is to motivate users to integrate recovery-promoting activities and experiences in their vacations and daily lives. The app includes short daily exercises, called 'Dailies'

Table 1 **Participants' background information in three app user groups**

	Non-users (*n* = 51)	Passive users (*n* = 18)	Active users (*n* = 10)
	n (%)	*n (%)*	*n (%)*
Completed all 5 questionnaires	20 (39)	13 (72)	6 (60)
Gender			
Female	46 (96)	18 (100)	8 (80)
Male	2 (4)	0	2 (20)
Job title			
Class teachers	17 (36)	7 (39)	5 (50)
Subject teachers	19 (40)	7 (39)	5 (50)
Other	11 (24)	4 (22)	0
Full-time job	47 (92)	17 (94)	9 (90)
Workplace			
Comprehensive school	40 (83)	16 (89)	9 (90)
High school	5 (10)	1 (6)	1 (10)
Both high school and comprehensive school	2 (4)	0	0
Other	1 (2)	1 (6)	0
Vacation type			
Staying home	20 (42)	6 (33)	6 (60)
Domestic travel	21 (44)	10 (56)	4 (40)
International travel	7 (15)	2 (11)	0
	M (SD)	*M (SD)*	*M (SD)*
Mean age in years	44 (9.61)	45 (8.37)	44 (10.1)
Mean working hours per week	39 (6.33)	40 (8.35)	37 (3.00)

('Daily'), which are designed to promote the six recovery experiences suggested by the DRAMMA model (Newman et al., 2014; see Appendix 1 for examples).

The 'Daily' exercises are based on three approaches. The *first* approach relates to positive psychology interventions, which are treatment methods or self-administered activities aimed at cultivating positive feelings, behaviors, and cognitions (Sin & Lyubomirsky, 2009). Two reviews suggest that these interventions can enhance psychological well-being (Bolier et al., 2013; Meyers, Van Woerkom, & Bakker, 2012). According to Lyubomirsky and Layous (2013), the mechanisms behind these effects are need satisfaction and the elicitation of positive emotions, thoughts, and behaviors. Gander, Proyer, and Ruch (2017) suggest that to successfully promote well-being, positive psychology interventions should both increase positive emotions and foster cognitive changes, such as gaining new insights. The *second* approach utilizes behavioral activation and modification and entails prompts for specific
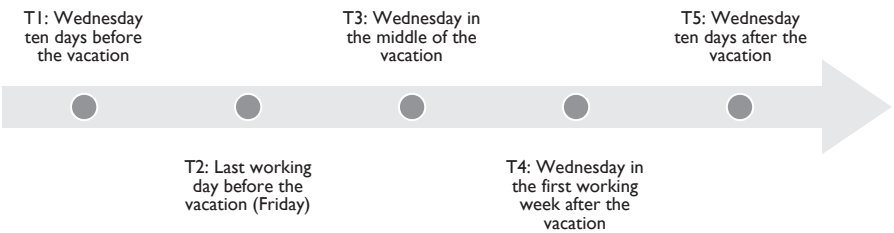
activities that have a positive influence on mental health (Mazzucchelli et al., 2010). 'Dailies' using behavior modification combine a variety of techniques such as meditation, cognitive restructuring, and relaxation exercises, which have also been used in stress management interventions (Richardson & Rothstein, 2008). *Thirdly*, gamification elements (e.g., avatars and collecting 'recovery points') are utilized to motivate users to use the app actively and adopt recovery behavior changes. Evidence so far suggests that gamification can have a positive impact on well-being-related interventions (Johnson et al., 2016), but it has not yet been used widely in stress management apps (Hoffmann, Christmann, & Bleser, 2017).

When the users start using Holidaily, they enter practical information about their upcoming vacation (i.e., dates and destination) in order to receive the 'Daily' suggestions timed according to their individual vacation planning. Each 'Daily' description also includes the targeted DRAMMA needs and the effort required to complete this specific 'Daily'. In the following weeks, the app suggests three different 'Dailies' every day. Users select one 'Daily' per day, can save interesting 'Dailies' to be completed later, and can also create their own 'Dailies'. After completing each 'Daily', users are asked to rate the extent to which it helped them experience DRAMMA dimensions. and to upload their own pictures and notes related to the completion of the 'Daily'. This personal diary can be accessed and reviewed by the user at any time. Users are also encouraged to rate their daily well-being with a few short questions in the app each day. Users can choose to receive push notifications to remind them about the app use. The app is self-guided but includes an instruction video in Finnish and a short description of the main features under the 'Help' function. Screenshots of the main functionalities of the app can be found in Appendix 1.

2.3 Study design

One week before the study started, we sent the participants an email including practical information about the study, links to download the app, and individual enrolment codes for the app. The study started on the Wednesday ten days before the scheduled beginning of the vacation and ended on the Wednesday ten days after the end of the vacation. The participants were instructed to use the app every day (i.e., complete one 'Daily' exercise per day and rate well-being and recovery with a few short questions) or as often as possible throughout the four-week period. In addition to the app use, the study included five electronic questionnaires sent via email at noon (see Figure 1). Participants were instructed to complete the questionnaires in the evening before going to sleep, but the majority did not follow these instructions: average time for completing the questionnaires ranged between 14:24 and 16:02 in the afternoon (many answered only the following morning). On the next day, we also sent a reminder email for those who had not yet completed the questionnaire. All questionnaires were sent on Wednesdays, except the second questionnaire, which was sent on the last working day (Friday) before the vacation. Wednesdays were chosen because they may best represent an average weekday in terms of well-being and recovery: on Mondays, the beneficial effects of weekend respite may still affect employees' well-being, or employees may already be anticipating the demands of the upcoming week (Rook

& Zijlstra, 2006). Likewise, towards the end of the working week, employees' well-being may improve in anticipation of the weekend (Hülsheger et al., 2014). However, the week before the vacation may be particularly stressful due to heavy workload: for example, decline in well-being shortly before a vacation occurred in the study by Nawijn, De Bloom, and Geurts (2013). Therefore, the second questionnaire was sent on the last working day before starting the vacation. Along with the app use and the questionnaires, we conducted nine semi-structured qualitative interviews via phone or email after the study period to find out more about participants' experiences of app use.

T1: Wednesday ten days before the vacation

T3: Wednesday in the middle of the vacation

T5: Wednesday ten days after the vacation

T2: Last working day before the vacation (Friday)

T4: Wednesday in the first working week after the vacation

Figure 1   Study design: Measurement points

2.4 Measures

The weekly questionnaires included the following measures:

Recovery experiences were measured using adaptations of validated scales such as the Recovery Experience Questionnaire (REQ; Sonnentag & Fritz, 2007) and other existing scales (see Table 2 for details).

Well-being was measured using scales for positive and negative affect based on PANAS, sleep quality, and need for recovery. Affect was measured with items including four positive (calm/relaxed, enthusiastic, energetic/vigorous, alive/vital) and four negative emotions (fatigued/tired, irritated, tense, gloomy).

Job performance was measured with single items for task performance and concentration capacity, and a scale for creativity at work. See Table 2 for details.

2.5 Statistical analyses

We used multiple imputations to handle missing data, since only 39 participants responded to all five weekly questionnaires (= 49% of the initial sample). Across all outcome variables, the mean percentage of missing data was 28%. The percentage of missing data varied between 4 and 42%. At T1, the number of missing values was lowest (up to 5%), whereas the number of missing values increased at later time points (up to 42% at T5). Multiple imputation techniques are recommended as they provide the best estimate for missing values (Schafer & Graham, 2002). We used a Markov Chain Monte Carlo multivariate imputation algorithm, using the missing data module in SPSS v. 24, with 100 estimations per missing value. These estimations were aggregated to a single value that was used in all further analyses.

Table 2   *Measures in weekly questionnaires*

Measure	Range	Number of items / α	Time point	Example item	Reference
Recovery experiences	1 (totally disagree) -5 (totally agree)		1-5		
Detachment		3 α = 0.77-0.87		"I forgot about work'	Sonnentag & Fritz, 2007
Relaxation		4 α = 0.83-0.87		'I kicked back and relaxed'	Sonnentag & Fritz, 2007 + one item developed for the study ('I felt at ease and enjoyed what I was doing') Chen et al., 2015
Autonomy		4 α = 0.74-0.87		'I determined for myself how I would spend my time'	Sonnentag & Fritz, 2007
Mastery		5 α = 0.79-0.84		'I did something to broaden my horizons'	Van den Broeck et al., 2010 Sonnentag & Fritz, 2007
Meaning		3 α = 0.65-0.88		'I spent my time in a meaningful way'	adapted from Butler & Kern, 2016 Schulenberg, Schnetzer, & Buchanan, 2010
Affiliation		3 α = 0.74-0.84		'I felt loved and cared about'	La Guardia et al., 2000 Van den Broeck et al., 2010 Chen et al., 2015
Well-being					
Positive affect	1 (not at all) - 7 (very much)	4 α = 0.80-0.93	1-5	calm/relaxed	Warr, 1990 Watson & Clark, 1994
Negative affect	1 (not at all) - 7 (very much)	4 α = 0.78-0.86	1-5	fatigued/tired	Ryan & Frederick, 1997
Sleep quality	1 (very poorly) - 5 (very well)	1	1-5	'How have you slept during this week?'	Åkerstedt et al., 1994
Need for recovery	1 (totally disagree) - 5 (totally agree)	4 α = 0.71-0.87	1, 2, 4, 5	'When I got home from work, I needed to be left in peace for a while'	Van Veldhoven & Broersen, 2003 Van Veldhoven, Prins, Van der Laken, & Dijkstra, 2015

Job performance

	Scale	Items	α	Occasions	Example item	Source
Concentration capacity	1 (not at all) - 7 (very much)	1		1, 2, 4, 5	'I felt that today my concentration capacity was good'	adapted from Van Veldhoven & Broersen, 2003
Task performance	0 – 10	1		1, 2, 4, 5	'How would you rate your work performance this week on a scale from 0 to 10, where 0 is the worst job performance anyone could have at your job and 10 is the performance of a top worker?'	Kessler et al, 2003.
Creativity at work	1 (never) - 5 (always)	4	α = 0.88-0.93	1, 2, 4, 5	'I came up with creative solutions to problems at work'	Jaussi, Randel, & Dionne, 2007 Tierney, Farmer, & Graen, 1999 George & Zhou, 2001

We categorized participants into three groups based on their Holidaily app use (i.e., how many 'Daily' exercises they actually completed): non-users, who did not complete any 'Dailies (n = 51), passive users, who completed 1 to 4 'Dailies' (n = 18), and active users, who completed more than 4 'Dailies' (n = 10). The number of completed 'Dailies' was retrieved from the data provided by the app. The categorization between passive and active was made based on the median (Mdn = 4) of completed 'Dailies' among app users. Since most participants did not use the app despite the instructions, we also compared the two actual app use groups to the non-users. To investigate if there were inter-group differences in background characteristics and outcomes at baseline (T1), we conducted ANOVAs for continuous variables and chi-squared tests for categorical variables (Table 1).

To test whether the beneficial vacation effects persisted (H1), were strengthened (H2) or prolonged (H3) by app use, we conducted multivariate analyses (MANOVA) for repeated measures. We used the three app use groups as inter-subject variable and time as a repeated measure. In addition to group and time effects, we paid special attention to group × time interaction effects to investigate whether, as expected, the temporal development of outcomes differed between groups. All in all, we conducted two MANOVAs. To the first model, we added all outcome variables measured at all five time points: six DRAMMA recovery experiences, positive and negative affect, and sleep quality. Outcomes examined at only four time points (excluding T3, the vacation week) – task performance, concentration capacity, need for recovery, and creativity at work – were included in the second model. When samples are small, interaction effects are not necessarily detected. Therefore, and also because we were testing a new intervention, we also analyzed the within-subject effects in three user groups separately with MANOVA for repeated measures. This way we also examined whether active app use strengthened vacation effects (T1 vs. T3) or prolonged their duration (T1 vs. T4 and T1 vs. T5). Bonferroni corrections were used in all MANOVAs to reduce the chances of family-wise error. All statistical analyses were conducted in SPSS 24 software.

3   Results

3.1 Descriptive results regarding app use
Although all participants were instructed to use the app on a daily basis, 51 of them did not record any 'Daily' exercises in the app (35 participants did not download the app at all). In the whole sample (including non-users), the mean of completed 'Dailies' was 4.49. There was considerable variation (range 0-192, SD = 22.00, Mdn = 0), which means that the distribution of this variable was very skewed. Among those participants who completed at least one 'Daily' (i.e., used the app), the median of completed 'Dailies' was 4. We used this number as a cutoff point to divide the users into active and passive users: active users completed more than four 'Dailies', while passive users completed four or fewer 'Dailies'. It is important to note that even most of the 'active' users only used the app occasionally: only five participants completed more than 10 'Dailies'.

3.2 Differences between non-users, passive, and active app users in background characteristics, recovery experiences, well-being, and job performance before the vacation (T1)

No statistically significant differences were found in background characteristics between the three app use groups. Nor did the app use groups differ significantly in recovery experiences, well-being, and performance-related variables measured at baseline (T1).

3.3 Development of recovery experiences, well-being, and job performance in non-users, passive, and active app users between T1-T5

The results of the repeated measures MANOVAs *including all participants* are presented in Table 3 (recovery experiences), Table 4 (well-being outcomes), and Table 5 (performance-related outcomes). Figures 2 and 3 show the development of the outcomes within the three user groups whenever the time effect was significant.
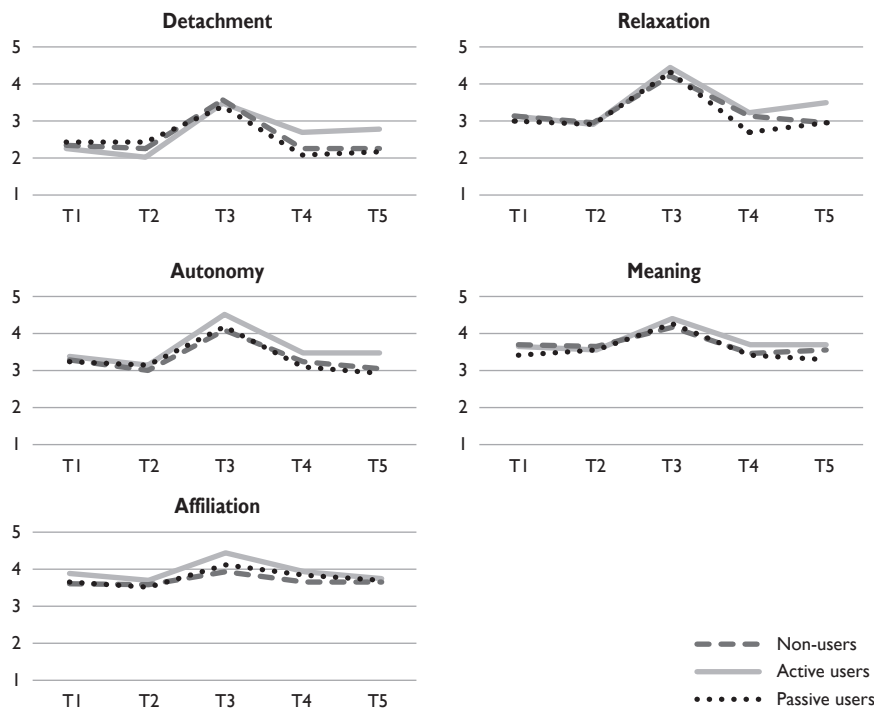

Figure 2   *Changes in recovery experiences among non-users (n = 51), passive app users (n =18), and active app users (n = 10) across the study period (T1-T5)*
*Note. **T1: Wednesday 10 days before the vacation, T2: last working day (Friday) before the vacation, T3: during the vacation, T4: Wednesday of the first week after the vacation, T5: Wednesday 10 days after the vacation.***

Table 3 *Results of repeated measures MANOVAs for effects across time, between groups (non-users, passive and active users), and for time × group interactions on recovery experiences*

Recovery experiences	1) Non-users (n = 51)					2) Passive users (n = 18)					3) Active users (n = 10)					Group effect	Time effect	Group × time effect
	T1 M (SD)	T2 M (SD)	T3 M (SD)	T4 M (SD)	T5 M (SD)	T1 M (SD)	T2 M (SD)	T3 M (SD)	T4 M (SD)	T5 M (SD)	T1 M (SD)	T2 M (SD)	T3 M (SD)	T4 M (SD)	T5 M (SD)	$F, p, (\eta p^2)$	$F, p, (\eta p^2)$	$F, p, (\eta p^2)$
Detachment	2.33 (1.00)	2.20 (0.73)	3.49 (0.87)	2.20 (0.65)	2.23 (0.66)	2.39 (1.07)	2.41 (0.92)	3.34 (0.66)	2.03 (0.72)	2.17 (0.69)	2.20 (1.00)	2.00 (0.82)	3.41 (1.22)	2.62 (1.24)	2.74 (0.79)	ns	26.70, $p < .001$ (0.26)	ns
Relaxation	3.13 (1.06)	2.94 (0.84)	4.18 (0.70)	3.09 (0.72)	2.96 (0.71)	2.99 (0.75)	2.89 (0.83)	4.26 (0.49)	2.69 (0.70)	2.95 (0.70)	3.10 (0.89)	2.89 (1.01)	4.40 (0.45)	3.21 (0.69)	3.44 (0.44)	ns	38.20, $p < .001$ (0.34)	ns
Autonomy	3.34 (0.98)	3.07 (0.64)	4.08 (0.68)	3.29 (0.71)	3.00 (0.90)	3.31 (0.76)	3.21 (0.55)	4.16 (0.68)	3.14 (0.70)	3.00 (0.90)	3.40 (0.87)	3.19 (0.93)	4.48 (0.37)	3.52 (0.65)	3.49 (0.77)	ns	27.75, $p < .001$ (0.27)	ns
Mastery	3.46 (0.77)	3.41 (0.63)	3.27 (0.73)	3.25 (0.57)	3.21 (0.68)	3.34 (0.89)	3.33 (0.64)	3.17 (0.91)	3.47 (0.67)	3.32 (0.67)	3.24 (1.01)	2.93 (1.12)	3.51 (1.00)	3.25 (0.93)	3.33 (0.71)	ns	ns	ns
Meaning	3.75 (0.87)	3.68 (0.59)	4.17 (0.68)	3.49 (0.68)	3.57 (0.61)	3.48 (0.99)	3.59 (0.72)	4.23 (0.62)	3.46 (0.90)	3.35 (0.87)	3.67 (0.72)	3.58 (0.63)	4.37 (0.51)	3.73 (0.87)	3.73 (0.42)	ns	16.00, $p < .001$ (0.17)	ns
Affiliation	3.64 (0.89)	3.61 (0.82)	3.95 (0.75)	3.67 (0.74)	3.66 (0.73)	3.68 (1.02)	3.53 (0.99)	4.13 (0.76)	3.85 (0.68)	3.70 (0.78)	3.90 (0.75)	3.71 (0.85)	4.40 (0.44)	3.94 (0.70)	3.78 (0.63)	ns	7.75, $p < .001$ (0.09)	ns

Note. Degrees of freedom (4, 304) on time effects, (8, 304) on interactions, and (2, 76) on group effects.

Table 4   *Results of repeated measures MANOVAs for effects across time, between groups (non-users, passive and active users), and for time × group interactions on well-being*

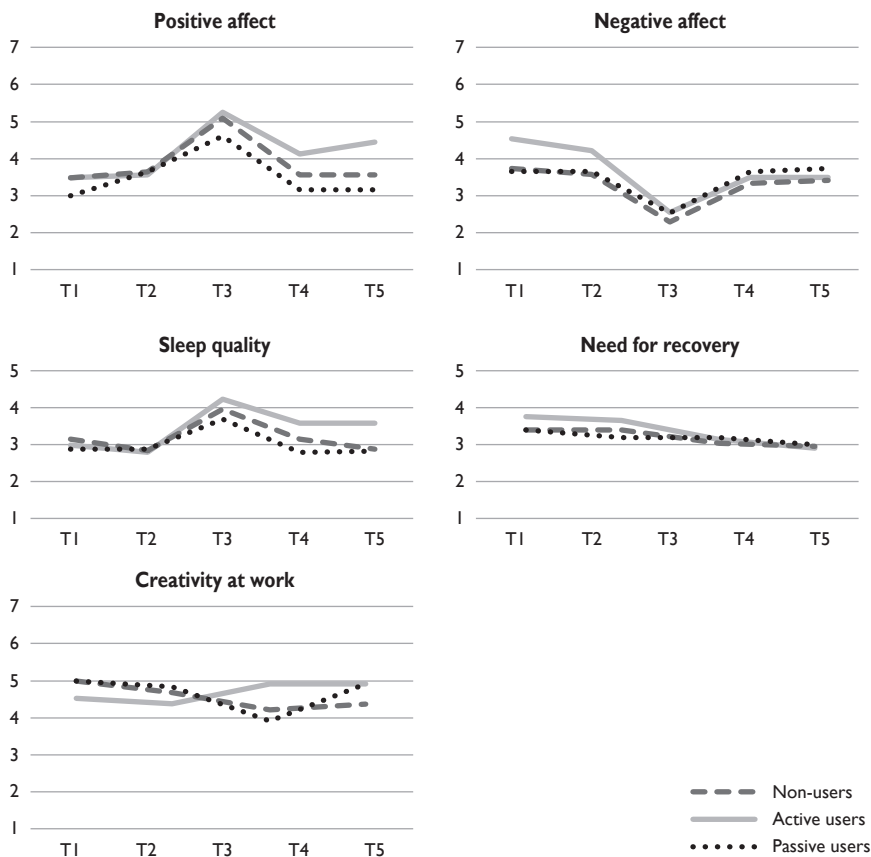| Well-being	1) Non-users (n = 51)					2) Passive users (n = 18)					3) Active users (n = 10)					Group effect	Time effect	Group × time effect
	T1 M (SD)	T2 M (SD)	T3 M (SD)	T4 M (SD)	T5 M (SD)	T1 M (SD)	T2 M (SD)	T3 M (SD)	T4 M (SD)	T5 M (SD)	T1 M (SD)	T2 M (SD)	T3 M (SD)	T4 M (SD)	T5 M (SD)	F, p, (ηp^2)	F, p, (ηp^2)	F, p, (ηp^2)
Positive affect	3.49 (1.20)	3.65 (1.09)	5.01 (1.18)	3.56 (0.87)	3.55 (1.08)	3.03 (1.16)	3.63 (1.28)	4.62 (1.03)	3.17 (0.85)	3.20 (1.04)	3.50 (1.42)	3.59 (1.61)	5.21 (0.96)	4.14 (1.37)	4.45 (1.08)	ns	30.10, $p < .001$ (0.28)	ns
Negative affect	3.74 (1.17)	3.59 (1.04)	2.33 (1.03)	3.34 (1.02)	3.41 (0.94)	3.64 (1.46)	3.68 (1.37)	2.53 (1.16)	3.58 (1.28)	3.73 (1.40)	4.48 (1.45)	4.22 (1.82)	2.58 (1.16)	3.50 (1.43)	3.49 (1.31)	ns	22.42, $p < .001$ (0.23)	ns
Sleep quality	3.18 (1.17)	2.89 (0.93)	3.93 (0.76)	3.17 (0.85)	2.94 (0.96)	2.94 (1.00)	2.91 (1.01)	3.71 (0.96)	2.84 (1.17)	2.85 (0.94)	3.00 (0.82)	2.84 (1.11)	4.22 (0.63)	3.61 (1.08)	3.61 (0.84)	ns	15.34, $p < .001$ (0.17)	ns
Need for recovery	3.37 (0.93)	3.39 (0.54)	-	3.02 (0.72)	2.94 (0.77)	3.40 (1.03)	3.16 (1.14)	-	3.16 (0.91)	2.99 (1.19)	3.73 (1.04)	3.64 (1.02)	-	3.11 (1.27)	2.89 (0.97)	ns	8.66, $p < .001$ (0.10)	ns

Note. Degrees of freedom (4, 304) on time effects, (8, 304) on interactions, and (2, 76) on group effects, except concerning need for recovery, which was in the same model with performance-related outcomes, see the degrees of freedom from Table 3.

Anniina Virtanen, Jessica de Bloom, Jo Annika Reins, Christine Syrek, Dirk Lehr & Ulla Kinnunen

Table 5   *Results of repeated measures MANOVAs for effects across time, between groups (non-users, passive and active users), and for time × group interactions on job performance*

Job performance	1) Non-users (n = 51)				2) Passive users (n = 18)				3) Active users (n = 10)				Group effect	Time effect	Group × time effect
	T1	T2	T4	T5	T1	T2	T4	T5	T1	T2	T4	T5	$F, p,$ (ηp^2)	$F, p,$ (ηp^2)	$F, p,$ (ηp^2)
	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)			
Task performance	7.75 (1.31)	7.53 (0.97)	7.17 (1.53)	7.37 (1.38)	7.61 (0.98)	6.94 (1.99)	6.81 (2.21)	7.24 (1.41)	6.70 (1.49)	6.82 (1.76)	7.49 (0.86)	7.73 (0.92)	ns	ns	ns
Concentration capacity	5.18 (1.31)	5.12 (1.23)	5.26 (0.96)	5.04 (1.03)	5.11 (1.23)	5.05 (1.40)	5.09 (1.30)	5.09 (0.77)	4.80 (1.48)	4.58 (1.13)	5.24 (1.03)	5.25 (1.28)	ns	ns	ns
Creativity at work	4.94 (1.38)	4.66 (0.96)	4.16 (1.04)	4.39 (1.14)	4.96 (1.44)	4.78 (1.34)	3.89 (1.35)	4.86 (1.17)	4.48 (1.18)	4.36 (1.58)	4.91 (1.00)	4.88 (0.92)	ns	2.79, p = .041 (0.04)	2.84, p = .011 (0.07)

Note. Degrees of freedom (3, 228) on time effects, (6, 228) on interactions, and (2, 76) on group effects.

Figure 3 *Changes in well-being and job performance among non-users (n = 51), passive app users (n = 18), and active app users (n = 10) across the study period (T1-T5)*
*Note. **T1: Wednesday 10 days before the vacation, T2: last working day (Friday) before the vacation, T3: during the vacation, T4: Wednesday of the first week after the vacation, T5: Wednesday 10 days after the vacation.***

• *Time effects*

When testing together the temporal effects on recovery experiences and well-being outcomes (except for need for recovery) with MANOVA for repeated measures, the time effect was significant (F (36, 1196) = 5.504, p < .001). All recovery experiences except mastery showed a significant vacation effect: they were rated higher during the vacation (T3; p < .05-.001) than at all other time points. In a similar vein, positive affect (p < .001) and sleep quality (p < .001) were rated significantly higher and negative affects lower (p < .001) during the vacation (T3) than at all other time points. In addition, the negative affect was rated lower at T4 than at baseline (T1)

(p = .042). When testing the temporal effects on performance measures and need for recovery with MANOVA, the time effect was significant (F (12, 681) = 3.345, p = .001). Task performance or concentration capacity did not change over time. Concerning creativity, the time effect was statistically significant. Pairwise comparisons suggest that creativity was somewhat (p = .053; marginally significant) lower after the vacation (T4) than at baseline (T1). Need for recovery was rated significantly lower a few days after the vacation (T4) than at baseline (T1; p = .020). Also, need for recovery was rated lower ten days after the vacation (T5) than at baseline (T1; p = .001) or on the last working day before the vacation (T2; p = .002).

- *Group effects*

The results did not show statistically significant group effects between non-users, active and passive app users.

- *Interaction effects*

No interaction effects were detected in the two MANOVAs for repeated measures, except for one statistically significant time × group interaction concerned creativity at work (see Table 5 and Figure 3). Before the vacation, active users rated their creativity lower than did non-users and passive users, but after the vacation the ratings of active users reached the same level as those of passive users, whereas the ratings of non-users decreased from T1 and T2 to T4.

The repeated-measures MANOVAs in *user groups separately* revealed that the user groups did not differ in the development between T1 and T3. This indicates that app use did not strengthen the beneficial vacation effects on those outcomes measured at T3, i.e., recovery experiences and well-being outcomes (except for need for recovery).

At T4, active users reported significantly lower negative effects than at T1 (F (4, 36) = 6.522, p = .039), but among non-users or passive users this difference was not significant. Among non-users, need for recovery decreased from T1 to T4 and T5 (F (3, 150) = 8.194, p = .037 when comparing T1 & T4 and F (3, 150) = 8.194, p = .024 when comparing T1 & T5). Passive users showed no significant change in need for recovery over time. Among active users, need for recovery decreased from T1 to T5 (F (3, 27) = 4.355, p = .031). Non-users rated their creativity at work lower at T4 than at T1 (F (3, 150) = 8.072, p < .001) whereas among passive or active users there was no significant difference (indicating that creativity remained stable, or slightly increased among active users, which can be seen in Figure 3).

All in all, the results partially support hypothesis 1, expecting beneficial vacation effects: the vacation effects were found on five recovery experiences (detachment, relaxation, autonomy, meaning, affiliation) and well-being (positive and negative affect, sleep quality, need for recovery). Hypothesis 2, expecting that app use would strengthen the beneficial vacation effects, was not supported. Hypothesis 3, expecting that app use would prolong the vacation effects, gained partial support: active app use prolonged the duration of beneficial vacation effects on negative affect. Active use also seemed to protect against a decrease in creativity after the vacation.

3.4 User experiences

Participants had an opportunity to give written feedback in all five weekly questionnaires and also to contact the researchers by email. Written feedback related to the app mostly concerned technical problems (12 mentions), such as slowness or difficulties logging in. Of the nine participants we interviewed after the study, two had completed more than four 'Daily' exercises (one as much as 192, being the most active app user in the sample), six had completed four or fewer 'Dailies', and one had not used the app at all. Of the interviewees, around a half (5 out of 9, 2 active and 3 passive users) stated that the basic idea of the app was good and that it helped them to pay more attention to well-being. Most interviewees (6 out of 9, 1 active and 5 passive users) reported challenges related to recovery (e.g. ruminating about work in the evening hours, sleeping problems), which was an important motive for participating in the study. Opinions were divided on the 'Daily' exercises. Two interviewees (1 active and 1 passive user) enjoyed them and said they were useful and varied. Four interviewees (passive users) stated that there was too much similarity among the 'Dailies'. Six interviewees (2 active and 4 passive users) said that the app was easy to use, but three of them (passive users) also reported some technical problems due to which app use was decreased and sometimes even experienced as stressful. Four interviewees (1 active and 3 passive users) stated that self-ratings of well-being in the app helped them to reflect on their daily well-being.

4   Discussion

The aim of this study was to investigate the effects of a one-week vacation on recovery experiences, well-being, and job performance, and to ascertain if it is possible to strengthen these effects and prolong their duration by means of active use of a smartphone app. We also investigated if there were differences between non-users, passive users, and active users at baseline to learn more about possible factors behind inactive app use, and conducted short qualitative interviews focusing on user experiences.

4.1 Main results

Our results show beneficial vacation effects in terms of recovery experiences and well-being. However, as in previous studies (e.g., De Bloom et al., 2009; Reizer & Mey-Raz, 2018) these effects were short lived. All recovery experiences except mastery were rated higher during the vacation than before and after. The teachers also experienced more positive affect and less negative affect during the vacation than before or after. Sleep quality improved during and need for recovery decreased after vacation. Creativity at work was rated lower a few days after the vacation than at baseline (except among active app users) but increased slightly above baseline ten days after the vacation, matching previous findings demonstrating links between vacationing and cognitive flexibility, a core aspect of creativity (De Bloom et al., 2014).

The results also suggest that although the use of the Holidaily app did not strengthen positive vacation effects, active use may have prolonged the duration of some beneficial vacation effects. Among active app users, creativity at work increased slightly from baseline to after the vacation, whereas among non-users it decreased and among passive users it decreased a few days after the vacation but increased again 1.5 weeks after the vacation. The fading of beneficial vacation effects on negative affect seems to have been slower among active users: a few days after the vacation, they still reported lower levels of negative affect than at baseline, which was not the case among non-users or passive users.

When comparing the three app-use groups in terms of background characteristics and outcome variables at baseline, we found no significant differences. In the short qualitative interviews, several participants described challenges related to recovery from work, and reported that these challenges motivated them to participate in the study and use the app. To the best of our knowledge, Holidaily is the first app designed specifically to promote recovery from work. Based on the feedback from users in Germany (see Smyth et al., 2018) and results from this study, a second version of the app is currently under development (Holidaily 2.0).

4.2 Contributions, limitations, and practical implications

Our results imply that actively engaging in intentional, recovery-promoting activities presented in a gamified app may support employees' recovery, well-being, and performance. However, the effects were marginal, and only few of them were statistically significant. Our results yield limited evidence about the effectiveness of the app because most participants used the app only occasionally and we had no randomized control group. Also, the cut-off point between 'passive' and 'active' users was arbitrary, although based on the median of completed 'Daily' exercises among users. Since most of the participants did not follow our instructions to use the app actively, we were able to compare non-users to passive and more active app users in terms of the temporal development of the outcomes. Thus, the non-user group can serve as a proxy for a control group. No statistically significant inter-group differences in background characteristics or outcome variables at baseline (see Results section 3.3 for more details) were found, which means that the groups were comparable.

Our study constitutes an important advance in the burgeoning field of occupational e-mental health. Most studies so far in this field have utilized internet-based interventions instead of smartphones (Lehr et al., 2016). Smartphone-based technology is cost effective and accessible, and it can facilitate incorporating interventions into daily life: most people have their phones on them 24/7. Mobile interventions are also flexible: for example, in our app people were always able to choose from several different exercises or come up with own ideas for 'Dailies'. This may help to preserve a sense of autonomy over one's leisure time. The wide range of activities also makes an intervention accessible to many different populations, including people who are not able to engage in certain activities (e.g. in physical activities due to illness or disability).

Our study also demonstrated that mobile interventions mean 'easy in, easy out'. The benefit of easy accessibility for large groups of people means that mobile apps have a good reach, but dropout and low adherence are a problem. In a meta-analysis by Carolan and colleagues (2017), the mean reported completion of web-based interventions delivered at the workplace was only 45%. People easily become excited about the use of apps and commit to taking part in interventions. We explicitly recruited participants for a 'mobile recovery intervention using a smartphone app'. Still, more than half of the participants did not complete any exercises in the app, although they did continue to complete our questionnaires. In addition to the number of completed 'Dailies', we retrieved the total number of liked, planned, and completed 'Dailies' from the app data. We assumed that perhaps participants did not always remember to record the 'Dailies' in the app even though they had completed the recommended exercises. The mean of liked, planned, and completed 'Dailies' together was indeed higher (M = 22.05), but again the deviation was very wide (range 0 to 411, SD = 67.35, Mdn = 6), and only a few participants were very active. This shows that getting people to actually use intervention apps is extremely challenging. In addition, 'active' app use in our study means being active at a very low level. On the other hand, our results show that even a small degree of app use may make a positive difference: although most 'active' users only used the app occasionally, a few differences between active users and non-users or passive users were found. Applying a relatively conservative analysis strategy using Bonferroni corrections in all MANOVAs may have also limited the occurrence of statistically significant results. It was not our aim to motivate people to constantly use their smartphones while on vacation, and therefore it is promising to see that even quite infrequent app use may be beneficial. Also, highly stressed individuals may not have time or energy for intense app use, although they probably have the greatest need to change their habits with a view to recovery.

One possible reason for not engaging in the intervention or only using the app infrequently is lack of guidance. Earlier studies suggest that the provision of guidance increases engagement in occupational e-mental health interventions (Carolan et al., 2017). Meta-analyses of e-mental health interventions aimed at alleviating stress and depression also suggest that guidance improves both adherence and effectiveness (Heber et al., 2017; Richards & Richardson, 2012). However, the provision of human support limits the large-scale dissemination of these interventions. We provided instructions for the app by email and our app also includes an instruction video that is automatically shown when people open the app for the first time. Nevertheless, it seems that this did not suffice to engage all participants in using the app. Personal guidance from a research assistant would probably have increased app use, but unfortunately our means were too limited to realize such personal contact. Besides the low adherence in app use, most of the participants did not follow the instructions concerning weekly questionnaires: only 10 to 29% completed the questionnaires in the evening, as instructed. Since most items concerned the week so far, this is probably not very problematic. Future studies could make use of in-company (or in-school) group training sessions to guide participants in using the app and committing themselves to the intervention. Our Holidaily app had an

optional reminder functionality (sending participants one reminder a day), but unfortunately it did not yet work properly due to technical problems.

Once participants started using the app, technical problems discouraged some of them from using it actively. This highlights the importance of user experience in smartphone-based interventions. Smyth and colleagues (2018) showed that the use of Holidaily was related to improvements in recovery experiences after the vacation and that good user experience enhanced these effects. It should also be considered that although smartphone apps are promising tools in promoting well-being, they may not work for everyone. They are probably attractive to people who already enjoy using apps, but on the other hand they may cause stress for those who are not comfortable using mobile technology. Our target group, teachers (especially older ones), often experience stress related to ICT use at work (e.g., Syvänen, Mäkiniemi, Syrjä, Heikkilä-Tammi, & Viteli, 2016), and it is possible that, at worst, smartphone-based interventions could be another source of techno-stress. In addition, smartphone use may sometimes hamper recovery because smartphones blur the boundaries between work and home domains and allow constant access to work-related activities, which prevents detachment from work (e.g., Van Laethem, Van Vianen, & Derks, 2018). Therefore, it may be problematic to set boundaries between beneficial and detrimental smartphone use during leisure time. Smartphone use is pervasive in today's society. It is important for research to take this fact into account, and to aim to promote using smartphones in a way that may be beneficial to well-being. The effectiveness of well-being and recovery apps needs further research in larger and more diverse samples to identify groups of people most likely to benefit from e-mental health approaches.

Many occupational groups, like the teachers in our study, experience high job demands, stress, and difficulties recovering during evenings and weekends (e.g., Garrick et al., 2018; Skaalvik & Skaalvik, 2015, 2017). Accordingly, interventions supporting their recovery from work are undoubtedly needed. Nonetheless, it is often teachers' working environment that causes job stress and burnout (e.g., Skaalvik & Skaalvik, 2015, 2017). This means that occupational well-being cannot be solely the responsibility of the individual employee. Recovery interventions focusing on individuals have only limited means for preventing the serious consequences of accumulating stress.

4.3 Suggestions for future research
The findings of this study suggest several avenues for future research. Our theoretical framework, the DRAMMA model (Newman et al., 2014), is relatively new and more research is needed to investigate how the six recovery experiences jointly affect well-being and job performance (see e.g., Sheldon & Niemiec, 2006). Also, randomized controlled trials would provide more reliable information about the effectiveness of the app. All in all, applications for occupational e-mental health deserve further research as the whole research field is still relatively new. For instance, researchers could examine how adding social media elements to internet- or smartphone-based interventions would impact their effectiveness. It

is also important to identify individuals who would benefit most from smartphone-based interventions, for example, people who already enjoy using apps and are comfortable with mobile technology. A few of our participants reported that they were not 'app persons' and found using new applications stressful. Thus, smartphone-based interventions are presumably not ideal for them. Previous studies show that prior exposure to online services and confidence in using technology predict the intention to use e-mental health services (e.g., March et al., 2018; Mehrotra & Tripathi, 2018). Researchers should pay attention to recruitment strategies and to motivating participants. In addition, it could be worth investigating how to help people find evidence-based smartphone apps among the wide selection of well-being apps available. Although the number of commercial well-being apps in app stores is enormous, most of them are not evidence-based (Firth et al., 2017) and sometimes offer poor quality of information, engagement, and functionality (Donker et al., 2013). It may moreover be difficult for users to identify which apps are evidence based.

4.4 Conclusions

The results of this study suggest that, with the help of a gamified smartphone app providing daily suggestions for recovery activities, it may be possible to prolong the beneficial effects of vacations on well-being and job performance. In the future, the Holidaily app could be available to all those interested in paying more attention to recovery during a vacation. The exercises in the app can potentially also be adapted to promote daily recovery during weekends, evenings, and breaks during the working day. Building new resources and possibly forming new, healthy habits with the help of recovery exercises could in the long run help employees to recover better in their daily lives. Further research on larger and more diverse samples is needed to accumulate more evidence for the effectiveness of mobile interventions targeted at enhancing recovery from work.

Practice box
- It may be possible to support recovery from work, well-being, and job performance with simple, intentional activities presented in a self-guided smartphone app.
- In the future, the content of the Holidaily app could be transformed into more general recovery-promoting exercises (applied during work breaks, evening hours or at weekends), which could help alleviate work stress in hectic everyday life.
- Monitoring development in well-being with an app may help users to pay attention to recovery and well-being.
- Good usability of recovery-promoting apps is essential for smooth and enjoyable use.
- Smartphone interventions may not work for everyone: it is important to identify the target groups most likely to benefit from app use.

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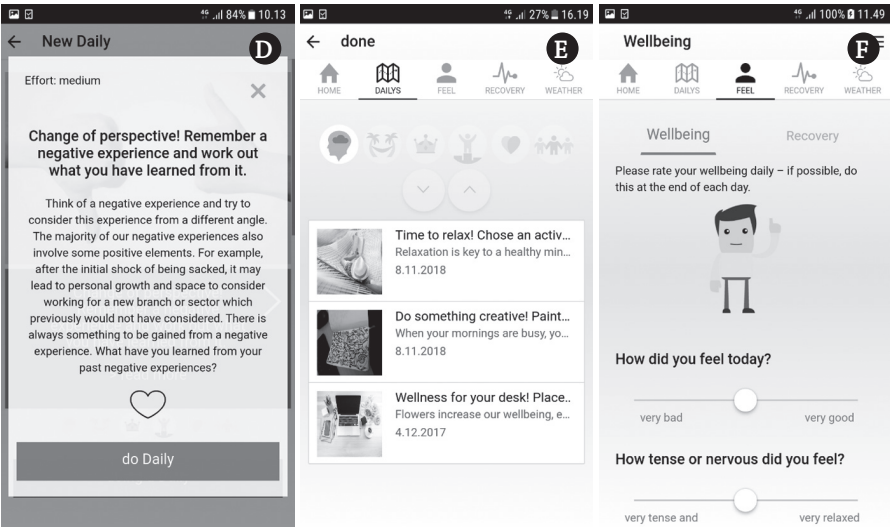
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Appendix 1: Screenshots of main functionalities in the Holidaily app
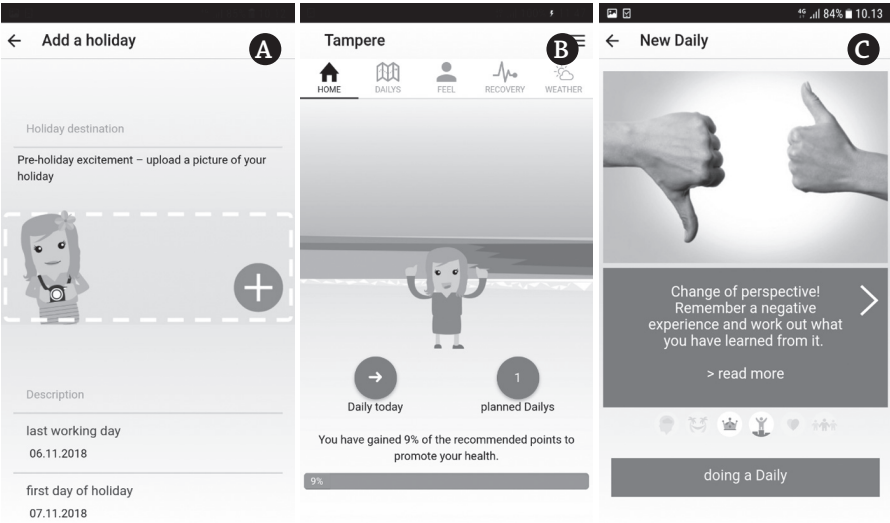
a) Adding a holiday in the app b) Home screen after adding a holiday c) Daily example 1

d) Daily example 2 e) View of a completed Daily f) Well-being ratings

Anniina Virtanen, Jessica de Bloom, Jo Annika Reins, Christine Syrek, Dirk Lehr & Ulla Kinnunen

Promoting and prolonging the beneficial effects of a vacation with the help of a smartphone-based intervention

The aim of this study was to investigate whether beneficial vacation effects can be strengthened and prolonged with a smartphone-based intervention. In a four-week longitudinal study among 79 Finnish teachers, we investigated the development of recovery, well-being, and job performance before, during, and after a one-week vacation in three groups: non-users (n = 51), passive (n = 18) and active (n = 10) users. Participants were instructed to actively use a recovery app (called Holidaily) and complete five digital questionnaires. Most recovery experiences and well-being indicators increased during the vacation. Job performance and concentration capacity showed no significant time effects. Among active app users, creativity at work increased from baseline to after the vacation, whereas among non-users it decreased and among passive users it decreased a few days after the vacation but increased again one and a half weeks after the vacation. The fading of beneficial vacation effects on negative affect seems to have been slower among active app users. Only few participants used the app actively. Still, results suggest that a smartphone-based recovery intervention may support beneficial vacation effects.

Keywords: recovery from work, vacations, occupational e-mental health, recovery intervention, smartphone-based intervention