

ANNIINA VIRTANEN

Teachers' Recovery Processes

Investigating the role of different breaks from work
for well-being and health among Finnish teachers

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ACADEMIC DISSERTATION

To be presented, with the permission of
the Faculty of Social Sciences
of Tampere University,
for public discussion in the auditorium D11
of the Main building, Kalevantie 4, Tampere,
on 3 December, at 12 o'clock.

ACADEMIC DISSERTATION

Tampere University, Faculty of Social Sciences
Finland

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Cover design: Roihu Inc.

ISBN 978-952-03-2188-8 (print)

ISBN 978-952-03-2189-5 (pdf)

ISSN 2489-9860 (print)

ISSN 2490-0028 (pdf)

<http://urn.fi/URN:ISBN:978-952-03-2189-5>

PunaMusta Oy – Yliopistopaino
Joensuu 2021

PREFACE

Doing research about recovery from work has occasioned significant changes in my personal life. Naturally, doing my doctoral research as part of a research project, with experienced supervisors and colleagues, has played a big role in how the whole process has turned out. I was not involved in writing the research plan of the project, meaning that I had limited autonomy in how to choose the overarching research questions and collect the research data. Consequently, not all the choices influencing my dissertation were of my making. On the other hand, I jumped into the project at a relatively early stage, when data collection was still in progress, which meant that I became involved in planning the details concerning two of the four sub-studies. Even though conducting doctoral research on one's own may offer more autonomy, working on a research project with skilled academics was an extremely fruitful start for my career: it allowed constant learning from colleagues, exchanging thoughts on both our own research and our field in general, and of course a lot of practical and emotional support throughout the process.

I started my doctoral studies almost immediately after taking my master's degree, which meant that at that point my personal experience of working life was very limited. How does it feel to jump straight into studying occupational well-being with only limited personal experience of well-being at work? From my perspective, it has been extremely useful to find my own way in working life while simultaneously studying how to stay relatively sane and healthy in this life domain. I have had a wonderful chance to apply in my personal life the lessons I have learned from research in the field of work and organizational psychology. The main theoretical framework of my dissertation, the DRAMMA model, has offered me a useful lens through which to reflect on my own leisure time and breaks at work: if I feel overwhelmed with work, what could I do to detach from it better, relax my mind and body, cultivate autonomy in my daily life, broaden my horizons, do things that are personally meaningful for me, and nurture my relationships? I am confident that learning these valuable lessons so early on in my career will have a positive impact in the future as well. During the last year of my doctoral studies (and in the middle of a global pandemic), I started a new job outside the university. This meant that during the final stages of my PhD, I had to juggle with full-time work, doctoral

studies and also with writing a popular science book about recovery from work (just as time-consuming a combination as one might imagine). It may sound slightly contradictory to be a recovery researcher with such limited time for recovery, but knowing evidence-based ways to support my well-being at and outside work has definitely helped me to stay (mostly) happy and productive.

Now it is time to thank everyone who has offered their guidance, support and practical assistance during my PhD journey. First of all, I wish to thank my supervisors, Professor Ulla Kinnunen and Docent Jessica de Bloom, both of whom have provided invaluable guidance and support throughout these years. You have offered me a great combination of structure and autonomy in my work, and thanks to your kindness, I never hesitated to ask foolish questions. It has been a true pleasure working with you. I wish to express my gratitude to all the co-authors in the original publications included in my thesis: Jo Annika Reins M.Sc, Professor Dirk Lehr, Professor Christine Syrek, and Dr. Michelle van Laethem. Special thanks to Michelle for offering such invaluable support with the statistical analyses in Study 3. I also wish to thank Dr. Kaisa Perko and Dr. Kaisa Törnroos for collaboration in our research project.

I sincerely thank Assistant Professor Madelon van Hooff for kindly agreeing to act as my opponent at my public defence. I also thank Docent Kia Gluschkoff and Associate Professor Anita Keller for their efforts in pre-examining my thesis. In addition, I thank Virginia Mattila for proofreading my dissertation and the original publications.

Completing my PhD would not have been possible without the funders, to whom I am sincerely grateful: the Finnish Work Environment Fund, which covered the funding for our larger research project and offered me a one-year grant to complete my doctoral studies, and the Faculty of Social Sciences, Tampere University. I also thank the Doctoral School at Tampere University for offering a wide variety of useful courses which have supported my PhD journey.

Doctoral studies can be a relatively lonely process. Luckily, I have had wonderful colleagues and friends at Tampere University. I am grateful to all my co-workers in psychology. Special thanks are due to a few fellow early-career researchers at our department: Miika Kujanpää, Merly Kosenkranius, Dr. Tytti Pasanen and Dr. Marjaana Sianoja (during the early stages of my doctoral studies). Your company and our discussions during lunch breaks and coffee breaks made my PhD a much more enjoyable experience.

I want to express my deepest gratitude for all the support I have received in my personal life as well. I wish to collectively thank all my friends inside and outside

academia, who have helped me to detach from work-related thoughts even though the workload has occasionally been overwhelming. It is truly a privilege to be surrounded by so many wonderful people. Finally, thank you, my partner Antti, for your love, support and companionship (and for helping me to relax, which has never been easy for me).

Tampere, Finland

October 2021

Anniina Virtanen

ABSTRACT

The overall aim of my dissertation was to gain new knowledge about recovery processes during different types of recovery settings among teachers: breaks during the working day, off-job time in the evenings and weekends, and a one-week vacation. Special attention was paid to internal recovery occurring during within-workday breaks, which has received far less research attention than has external recovery during leisure time. Another important focus was the role of ageing in recovery, which has so far been little studied. The main theoretical framework utilized in my study is the DRAMMA model (Newman, Tay, & Diener, 2014), which proposes six recovery experiences (i.e., psychological experiences which aid recovery): detachment from work, relaxation, autonomy, mastery, meaning and affiliation. In my dissertation, I approached recovery from work through these experiences in particular.

The target group of the study consisted of Finnish teachers, a highly stressed occupational group. My research is based on data collected on a research project entitled “New Lessons in Recovery: Investigating the Role of Different Breaks from Work for Healthy, Happy and Creative Ageing Teachers”, which was ongoing during the years 2017-2019. The data gathered during the research project come from three sub-studies: a cross-sectional questionnaire study ($N = 909$), a one-week diary study ($N = 107$), and a four-week intervention study ($N = 76$). The participants of all sub-studies were teachers and school head teachers, most of whom worked in comprehensive schools and/or secondary schools.

My dissertation consists of four articles. Firstly, utilizing the questionnaire data, I focused on relationships between leisure-time recovery experiences and well-being among younger and older teachers. Experiences of detachment, relaxation, control, mastery, meaning and affiliation were related to better well-being. Age moderated the relationships between control, mastery, and relaxation and vitality and life satisfaction. Older teachers benefitted more from experiences of control and mastery, whereas younger teachers benefitted more from relaxation during off-job time. The second article, also based on the questionnaire data, focused on relationships between two break recovery experiences (detachment and relaxation) and well-being. Among subject teachers (i.e. teachers teaching only one or few school subjects), age

moderated the relationship between break detachment and relaxation and exhaustion and feelings of inadequacy at work. Older subject teachers benefitted more from detachment and relaxation during breaks than their younger counterparts.

In the third article based on diary data, I investigated recovery experiences as mediators between daily emotional job demands and affect in the afternoon and in the evening. The results suggest that break detachment and meaning act as mediators between these demands and affect both in the afternoon and in the evening. Also, affiliation during breaks was associated with higher afternoon positive affect, but daily emotional job demands were not related to break affiliation. In addition to the original publications, this dissertation includes additional results concerning recovery-promoting activities during breaks. The results showed that almost all break activities examined, except for eating or drinking, were related to several break recovery experiences.

In the fourth intervention study, I examined with the help of a smartphone-based intervention whether it is possible to strengthen and prolong the positive effects of a holiday on well-being. The results showed that most recovery experiences and well-being indicators increased during the holiday, but the effects were short-lived. Among active app users, creativity at work increased from baseline to after the holiday, whereas among non-users it decreased. The fading of beneficial holiday effects on lower negative affect was slightly slower among active app users. The results suggest that a smartphone-based recovery intervention has potential to support beneficial holiday effects.

All in all, my dissertation shed new light on teachers' daily recovery both across working days and evenings after work as well as **after** a one-week holiday. The results can be translated into practical guidelines to improve teachers' working conditions, to facilitate recovery both during the working day and during leisure, and to enhance and prolong the beneficial effects of vacations. Possible practical implications include recovery training and interventions targeted specifically at teachers.

TIIVISTELMÄ

Tämän väitöskirjatutkimuksen päätavoitteena oli tuottaa uutta tietoa suomalaisten opettajien työkuormituksesta palautumisesta vapaa-ajalla, työpäivän aikaisilla tauoilla sekä loman aikana. Tutkimuksellani oli kolme tavoitetta. Ensiksi selvitin, miten ikääntyminen muuntaa vapaa-ajalla ja taukojen aikana tapahtuvan työstä palautumisen yhteyksiä hyvinvointiin. Toiseksi selvitin, miten palautuminen tauoilla työpäivän aikana oli yhteydessä hyvinvointiin iltapäivällä ja illalla. Kolmanneksi selvitin mobiilisovelluksen avulla toteutetun intervention vaikutuksia hyvinvointiin ja palautumiseen viikon mittaisen loman aikana. Tutkimuksen teoreettisena viitekehysenä toimi DRAMMA-malli (Newman, Tay, & Diener, 2014). Tutkin mallissa kuvattujen kuuden palautumisen kokemuksen – työstä irrottautuminen, rentoutuminen, autonomian, taidonhallinnan, merkityksellisyyden ja yhteenkuuluvuuden – merkitystä palautumisessa.

Väitöskirjani koostuu neljästä osajulkaisusta. Ensimmäisessä selvitin, miten edellä mainitut palautumisen kokemukset vapaa-ajalla olivat yhteydessä elinvoimaisuuteen, elämäntyytyväisyyteen ja työkykyyn. Lisäksi tutkin, miten ikä muunsi edellä mainittuja yhteyksiä. Toisessa osajulkaisussa selvitettiin, miten työstä irrottautuminen ja rentoutuminen työpäivän aikaisilla tauoilla olivat yhteydessä työuupumusoireisiin ja palautumisen tarpeeseen. Myös tässä julkaisussa tutkittiin iän muuntavaa roolia näissä yhteyksissä. Kolmannessa osajulkaisussa selvitin, toimivatko päivittäiset palautumisen kokemukset työpäivän aikaisilla tauoilla välittävinä tekijöinä työn emotionaalisten vaatimusten ja iltapäivän ja illan affektiivisen hyvinvoinnin välillä. Neljännessä osajulkaisussa tutkin sitä, miten osallistujien palautumisen kokemukset, hyvinvointi ja työssä suoriutuminen kehittyivät viiden viikon tutkimusjakson aikana, ja onnistuttiinko mobiilisovelluksen käytön avulla vahvistamaan loman myönteisiä vaikutuksia tai pidentämään niiden kestoja.

Väitöskirjassani käytetty aineisto kerättiin osana tutkimushanketta ”Erialaisten taukojen merkitys työkuormituksesta palautumisessa ikääntyvillä opettajilla”. Vuosien 2017 ja 2018 aikana kerättiin kolme tutkimusaineistoa yhteistyössä Opetusalan Ammattijärjestö OAJ:n kanssa: laaja kyselytutkimus ($N = 909$), viikon mittainen päiväkirjatutkimus ($N = 107$) ja interventiotutkimuksen yhteydessä neljän viikon mittainen pitkittäisaineisto ($N = 79$). Kyselyaineistoa hyödynnettiin

ensimmäisessä ja toisessa väitöskirjani osajulkaisussa. Kolmas osajulkaisuni perustui päiväkirjatutkimukseen ja neljäs interventioaineistoon. Tutkimuksen osallistajat olivat suomalaisia opettajia ja rehtoreita, jotka työskentelivät pääsääntöisesti peruskouluissa ja/tai lukioissa.

Ensimmäisen osajulkaisun tulokset osoittavat, että työstä irrottautumisen, rentoutumisen, kontrollin ja taidonhallinnan kokemukset vapaa-ajalla olivat yhteydessä elinvoimaisuuteen. Irrottautuminen, rentoutuminen, merkityksellisyys ja yhteenkuuluvuus puolestaan olivat yhteydessä elämäntyytyväisyyteen. Yksikään palautumiskokemuksista ei ollut yhteydessä työkykyyn. Ikä muunsi yhteyttä joidenkin palautumisen kokemusten ja hyvinvointimuuttujien välillä: vanhemmat opettajat hyötyivät nuorempia enemmän kontrollin ja taidonhallinnan kokemuksista, joka näkyi heidän parempana elinvoimaisuutenaan, kun taas nuoremmat opettajat hyötyivät enemmän rentoutumisesta kaikkien tutkittujen hyvinvointimuuttujien osalta.

Toisessa osajulkaisussa todettiin, että työstä irrottautumisen ja rentoutumisen kokemukset työpäivän aikaisilla tauoilla olivat yhteydessä vähäisempiin työuupumusoireisiin ja palautumisen tarpeeseen. Iän muuntava vaikutus palautumisen kokemusten ja hyvinvoinnin väliseen yhteyteen havaittiin vain aineenopettajilla. Vanhemmat aineenopettajat hyötyivät enemmän sekä rentoutumisen että irrottautumisen kokemuksista vähäisemmän työuupumuksen ja palautumisen tarpeen muodossa.

Kolmannen osatutkimuksen tulokset osoittavat, että vähäinen työstä irrottautuminen tauoilla välitti yhteyttä päiväkohtaisten työn emotionaalisten vaatimusten ja iltapäivän vähäisten positiivisten tunteiden välillä. Vähäinen merkityksellisyyden kokemus tauoilla puolestaan välitti yhteyttä emotionaalisten vaatimusten ja iltapäivän negatiivisten tunteiden välillä. Vähäinen merkityksellisyys tauoilla välitti myös yhteyttä emotionaalisten vaatimusten ja illan vähäisten positiivisten tunteiden välillä. Lisäksi tauoilla koettu työstä irrottautuminen, merkityksellisyys ja yhteenkuuluvuus olivat suoraan yhteydessä opettajien hyvinvointiin. Lisäanalyysit, jotka eivät ole mukana alkuperäisessä julkaisussa, osoittivat, että tutkituista taukoaktiiviteeteista kaikki paitsi ruokailu tai juominen olivat yhteydessä useisiin palautumisen kokemuksiin tauoilla.

Neljännessä osatutkimuksessa selvisi odotetusti, että osallistajat kokivat loman aikana enemmän palautumisen kokemuksia ja arvioivat hyvinvointinsa paremmaksi kuin ennen tai jälkeen loman. Loman vaikutukset työssä suoriutumiseen puolestaan olivat vähäisiä. Interventiosovelluksen käyttö ei onnistunut vahvistamaan loman myönteisiä vaikutuksia, mutta saattoi joissain tapauksissa hieman pidentää niiden

kestoa: esimerkiksi loman vaikutus kielteisten tunteiden vähäisempään määrään pysyi sovelluksen aktiivisilla käyttäjillä yllä pidempään. Lisäksi aktiiviset sovelluksen käyttäjät raportoivat luovuutensa työssä paremmaksi loman jälkeen kuin tutkimusjakson alussa, kun taas niillä, jotka eivät käyttäneet sovellusta, muutosta ei ollut havaittavissa.

Kokonaisuudessaan tulokset tukivat DRAMMA-mallia: kaikki kuusi mallin mukaista palautumisen kokemusta olivat yhteydessä parempaan hyvinvointiin. Tutkimus tuotti uutta tietoa iän ja palautumisen suhteesta. Vaikuttaa siltä, että erikikäiset opettajat hyötyvät jossain määrin erilaisista palautumisen kokemuksista sekä vapaalla että tauoilla, mikä voi olla arvokas tieto esimerkiksi palautumisen edistämiseen suunnattujen interventioden kehittämisessä. Tutkimus myös tarjosi uutta tietoa palautumisen kokemuksista välittävinä tekijöinä työn vaatimusten ja hyvinvoinnin yhteydestä päivätasolla. Lisäksi selvisi, että tauoilla palautumisen myönteinen vaikutus hyvinvointiin voi jossain määrin olla nähtävissä myös illalla, ei ainoastaan iltapäivällä työpäivän päättyessä. Interventiotutkimus antoi viitteitä siitä, että loman aikaista palautumista voidaan tukea mobiilisovelluksella toteutetun intervention avulla, kunhan jatkossa vastaavien sovellusten käytettävyyttä kehitetään eteenpäin. Tutkimuksen tuloksia voidaan soveltaa käytännössä esimerkiksi opettajille suunnattujen palautumista edistävien interventioden ja valmennusohjelmien kehittämisessä.

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ORIGINAL PUBLICATIONS

Publication I

Virtanen, A., De Bloom, J., & Kinnunen, U. (2020). Relationships between recovery experiences and well-being among younger and older teachers. *International Archives of Occupational and Environmental Health*, 93(2), 213-227. doi: 10.1007/s00420-019-01475-8

Publication II

Kinnunen, U., de Bloom, J., & Virtanen, A. (2019). Do older teachers benefit more from workday break recovery than younger ones? *Scandinavian Journal of Work and Organizational Psychology*, 4(1):7, 1-15. doi: 10.16993/sjwop.87

Publication III

Virtanen, A., Van Laethem, M., de Bloom, J., & Kinnunen, U. (2021). Drammatic breaks: Break recovery experiences as mediators between job demands and affect in the afternoon and evening. *Stress and Health*. doi: 10.1002/smi.3041

Publication IV

Virtanen, A., de Bloom, J., Reins, J. A., Syrek, C., Lehr, D., & Kinnunen, U. (2019). Promoting and prolonging the beneficial effects of a vacation with the help of a smartphone-based intervention. *Gedrag & Organisatie*, 32(4), 250-278.

1 INTRODUCTION

1.1 Recovery from work in today's working life

The changing and increasing demands of today's working life pose major challenges for employees' well-being: higher demands result in employees' increasing need for recovery, susceptibility to burnout and poorer work-life balance (e.g., Bakker & Demerouti, 2017; Sonnentag, Venz, & Casper, 2017). This study focuses on recovery from work, which can be defined as "psychophysiological unwinding after effort expenditure" (Geurts & Sonnentag, 2006). Recovery from work has the potential to prevent the accumulation of work-related stress and protect against the harmful effects of job demands on employees' health and well-being (Geurts & Sonnentag, 2006). Longitudinal studies over relatively long time periods show that the accumulation of job strain is related to poorer health and well-being (e.g., Igit et al., 2017). In addition to health and well-being, recovery may also have positive effects on employees' performance at work (e.g., Binnewies, Sonnentag, & Mojza, 2010; De Bloom, Kinnunen, & Korpela, 2015; Fritz, Yankelevich, Zarubin, & Barger, 2010). Stress-related productivity losses are also a substantial economic burden (see for example, Brunner, Igit, Keller, & Wieser, 2019). Recovery from work has recently received increasing attention in the field of work and organizational psychology, but several gaps remain in the scholarly understanding of this phenomenon. The overall aim of my dissertation was to generate new insights on recovery processes – that is, psychological recovery experiences and recovery activities - during working days, off-job time and holidays - based on the recently developed DRAMMA model (Newman, Tay, & Diener, 2014). Specifically, I aimed to address the following four gaps in the literature:

Firstly, the majority of studies so far has focused on recovery occurring outside working hours, which is also called external recovery (for a review, see Sonnentag et al., 2017). However, only recently have researchers directed more attention to recovery processes taking place during workday breaks, called internal recovery. Workday breaks constitute an important recovery setting, because they can potentially help to prevent the harmful accumulation of work stress, maintain energy levels and productivity throughout the day and protect against high need for recovery

at the end of the working day (e.g., Coffeng, van Sluijs, Hendriksen, van Mechelen, & Boot, 2015; Trougakos, Beal, Green, & Weiss, 2008). There is also recent evidence suggesting that a favourable recovery state at the end of the workday has a positive effect on employees' recovery processes in the evening (Van Hooff & Geurts, 2014; Van Hooff & de Pater, 2017). This is noteworthy, given that successful recovery from work during off-job hours is consistently related to higher well-being (e.g., Sonnentag et al., 2017). However, the relationship between break recovery and well-being after the working day has so far received very limited research attention. My aim in this dissertation was to contribute to bridging this gap by investigating whether psychological recovery experiences – i.e., experiences aiding recovery – during breaks were related to affective well-being both in the afternoon and in the evening.

Secondly, although ageing is an important issue in today's working life, its role in psychological recovery from work has received limited attention in previous studies. It is known that the physiological recovery processes slow down with age (Ilmarinen, 1999), but psychological recovery from work in ageing workers is mostly unexplored. In the light of few studies concerning recovery and ageing, it seems that recovery processes may take qualitatively different forms during different stages of the life course. For instance, the most common types of recovery experiences and people's need for recovery vary with age (Kinnunen & Mauno, 2009; Kiss, De Meester, & Braeckman, 2008; Mohren, Jansen, & Kant, 2010). In light of the existing research on age-related changes in emotion regulation (e.g., Scheibe, Sheppes, & Staudinger, 2015; Scheibe & Zacher, 2013), which is closely related to recovery experiences (e.g., Sonnentag & Fritz, 2007; Sonnentag et al., 2017), it can be assumed that age may moderate the relationship between recovery processes and outcomes. My aim was to extend the existing research by investigating psychological recovery experiences in the context of ageing and to examine whether age moderated the relationships between these recovery experiences (both during workday breaks and off-job time) and well-being.

Thirdly, I focused on recovery in an occupational group with a particularly challenging and societally important job: schoolteachers. Finnish schoolteachers have high burnout levels and experience a lot of work stress (e.g., The Trade Union of Education in Finland, OAJ, 2018). Nevertheless, their recovery processes have not so far received much research attention. Although teachers experience many stressors common to all knowledge workers, they also have more job-specific demands, such as conflicts with pupils and their parents (e.g., Bauer, 2007; Skaalvik & Skaalvik, 2017; Unterbrink et al., 2008).

Finding new ways to help them recover from work strain would promote their occupational well-being and likely also their performance as teachers. Therefore, supporting teachers' well-being and recovery is indirectly also beneficial for their pupils.

Fourthly, I examined the possibilities of strengthening and prolonging the beneficial effects of a long recovery episode: holidays. In a four-week intervention study using a smartphone-based application, we aimed to strengthen and prolong the positive effects of holidays on well-being, recovery experiences and performance. Although many studies show that holidays have positive effects on well-being (for a review, see Chen & Petrick, 2013), these effects usually fade within one or two weeks after work resumption (e.g., De Bloom, 2012). To the best of our knowledge, no previous interventions have aimed to increase these effects and extend their duration. Also, smartphone-based interventions have not been utilized much in promoting occupational well-being, although they are often flexible, cost effective and easy to incorporate in everyday life.

In the next chapter I briefly describe teachers' job characteristics, which serve as the background for this study. After that, I will move on to introduce the theoretical background of this study, along with the recovery settings, outcomes and processes investigated. Towards the end of the introduction, I will also discuss the possibilities of promoting recovery with the help of interventions, especially interventions that utilize online- and smartphone-based tools.

1.2 Teachers' job characteristics, resources and demands

According to the Job Demands-Resources (JD-R) model, high and long-lasting job demands are related, for instance, to decreased energy and increased fatigue (e.g., Bakker & Demerouti, 2017). These demands also inhibit recovery processes (Demerouti, Bakker, Geurts, & Taris, 2009), while successful recovery can prevent the detrimental accumulation of stress (Geurts & Sonnentag, 2006; Sonnentag et al., 2017). The target group of this study, schoolteachers, are an example of knowledge workers with high stress and high levels of emotional job demands. Finnish teachers perform well by international standards, as evident in Finnish pupils' success in PISA studies (see for example, Kupiainen, Hautamäki, & Karjalainen, 2009; Simola, 2014). However, according to several studies in Finland and across the world, teachers have high job demands and high levels of work stress and burnout (Kalimo & Hakanen, 2000; Kyriacou, 2001; Skaalvik & Skaalvik, 2015; 2017). Compared to other

professions, including other highly demanding social professions such as nurses and mental health professionals, teachers seem to experience even higher stress and show more signs of poor mental and physical well-being (de Heus & Diekstra, 1999; Johnson et al., 2005). This is attributable, for example, to steadily increasing group sizes, diversity in school classes and financial cutbacks in the education sector (OAJ, 2014; 2018). Teachers' stress is not merely harmful to their own well-being, but is also linked to higher levels of stress among pupils (e.g., Oberle & Schonert-Reichl, 2016) and also poorer academic outcomes and low motivation (e.g., Zhang & Sapp, 2008). Insufficient recovery seems to be an important mechanism which explains why work stress is associated with burnout. For instance, a recent Finnish study showed that poor recovery (i.e., low levels of relaxation and non-restorative sleep) partially mediated the relationship between effort-reward imbalance and burnout in teachers (Gluschkoff et al., 2016). On the positive side, successful recovery can protect against the detrimental effects of high work stressors among teachers (Gu, Wang, & You, 2020). Detachment from work, which is an important part of recovery, may also benefit teachers, who tend to experience negative reactions to imperfection. In a study by Gluschkoff and colleagues (2017), negative reactions to imperfection were related to higher depressive symptoms while lower level of detachment from work played a mediating role in this relationship (both mediation and moderation effects were examined). That is, no association was found between negative reactions to imperfection and depressive symptoms when detachment from work was high.

Teachers' job demands include several stressors also common among other knowledge workers, such as heavy workload and time pressure. For example, a study by Sonnentag and Krueger (2006) demonstrated that high workload was related to lower psychological detachment from work among teachers. In addition to these general stressors, teachers frequently report interpersonal stressors such as disruptive pupil behaviour in the classroom, pupils' low motivation and conflicts with pupils, their parents and colleagues (e.g., Bauer, 2007; Skaalvik & Skaalvik, 2017; Unterbrink et al., 2008). Moreover, there has recently been a lot of debate about the changing nature of the teaching occupation both in Finland and internationally. For example, Finnish teachers report that increasing group sizes and the recent inclusion of pupils with special needs (such as learning difficulties) in regular classrooms has increased job demands and made it more difficult to provide adequate help to each pupil (OAJ 2014; 2018). Also, technostress – stress related to the increasing use of technology in teaching – plays an important role in teacher stress, especially for ageing teachers (e.g., Al-Fudail & Mellor, 2008; Syvänen, Mäkinen, Syrjä, Heikkilä-Tammi, & Viteli,

2016). Despite high demands and stress levels, Finnish teachers also tend to report high job satisfaction and work engagement (Sutela & Lehto, 2014; OAJ, 2018). However, although schoolteachers' levels of job satisfaction and engagement are higher than average (compared to other occupations), they have declined in recent years (OAJ, 2018). In some respects, teachers enjoy relatively high levels of autonomy concerning their work: for example, they can work from home (e.g., planning upcoming lessons, grading pupils' assignments and staying in contact with pupils' parents). Although this flexibility can be regarded as a resource helping to combine work and private life, it may also pose challenges for recovery from work and managing boundaries between different life domains. In addition, teachers tend to spend a lot of time on work tasks outside formal working hours, such as during evenings and weekends (e.g., Garrick et al., 2018), which directly limits the time available for their recovery from work.

Teachers' working days are typically very externally structured by the school system: they cannot decide to take breaks whenever they feel the need to, although they have short pre-scheduled breaks between classes. Moreover, during breaks teachers may need to take care of work-related duties, such as supervising pupils during the lunch break or running errands, or their breaks may often be interrupted, for example by pupils or colleagues asking for help. This may reduce their control over the breaks, which is important for break recovery (Trogakos, Hideg, Cheng, & Beal, 2014), and therefore hamper their recovery. While teachers' recovery during breaks may be problematic, they enjoy a considerable number of holidays and periods free from teaching obligations (Finnish: *koulutyön keskeytys*), such as the autumn and winter vacations. Nevertheless, it is unclear if these periods can compensate for teachers' lack of recovery during busy termtime. Earlier studies (Kinnunen, 1989; Salo, 2002) show that teacher stress follows an identifiable cycle during the academic year: the possibility for sufficient recovery from work is, on average, adequate during the spring term, whereas during the autumn term recovery tends to be insufficient and stress accumulates – even despite the one-week holiday period, which nowadays in most Finnish schools falls in October. These findings concur with those of other studies demonstrating that the positive effects of holidays on well-being are generally small and short-lived. Within one or two weeks after resuming work, employees usually report the same levels of well-being as before their holiday s regardless of its duration (e.g., De Bloom, 2012).

1.3 Theoretical perspectives

1.3.1 Recovery from work

During the last 20 years, recovery from work has received a lot of research attention in the field of occupational health psychology (for a review, see Sonnentag et al., 2017). Recovery from work refers to a process of psychological and physiological unwinding after job demands are no longer present (Geurts & Sonnentag, 2006; Meijman & Mulder, 1998). In my dissertation, I focus specifically on psychological recovery, which refers to psychological unwinding occurring when job demands are no longer present (Geurts & Sonnentag, 2006). High job demands inhibit recovery processes (Demerouti et al., 2009), whereas successful recovery prevents the harmful accumulation of stress, acting as a buffer between job demands and ill-being (Geurts & Sonnentag, 2006; Sonnentag et al., 2017). Short-term stress *per se* is not bad for people's well-being, but prolonged activation of a person's stress-related psychobiological systems due to inadequate recovery is detrimental to well-being in the long term (Brosschot, Gerin, & Thayer, 2006; McEwen, 1998; Ursin & Eriksen, 2004). Recovery from work can be considered successful when employees feel restored and ready to meet new demands (Sonnentag et al., 2017).

Since the beginning of research interest in the topic, two theories – the Effort-Recovery model (Meijman & Mulder, 1998) and the Conservation of Resources theory (Hobfoll, 1989) – have been utilized most in explaining the phenomenon of recovery. Different theoretical perspectives on recovery can also be distinguished as active and passive mechanisms (De Bloom et al., 2010; Geurts & Sonnentag, 2006). The passive mechanism, which is related to the Effort-Recovery model, suggests that recovery occurs when people stop working and rest (Meijman & Mulder, 1998). According to this model, absence of job demands and both mental and physical disengagement from work enable employees' psychobiological systems to return to pre-stressor levels (McEwen, 1998; Sonnentag & Fritz, 2015). This baseline level refers to the level when no specific demands are made on the individual, and he/she has recovered from the effects from any previous demands (Geurts & Sonnentag, 2006; Meijman & Mulder, 1998). In addition to the absence of job demands, to ensure successful recovery, leisure activities should not expend the same resources as those utilized during the working day. This means that people working in different types of jobs likely benefit from different leisure activities. On the other hand, the active perspective on recovery emphasizes the importance of engagement in

pleasant, challenging and meaningful leisure activities (Geurts & Sonnentag, 2006), which helps to replenish personal resources. Conservation of Resources theory (COR; Hobfoll, 1989) suggests that to recover from stress, employees must replenish threatened or lost resources. These resources are broadly defined, for example, as personal characteristics (e.g., high self-efficacy), conditions of employment (e.g., permanent job contract), or energy, which are either intrinsically valuable or of instrumental value to achieve other desired states. According to the COR theory, stress is caused by the depletion of resources, the experience that the resources are threatened, or failure to regain enough resources after expending effort. In the context of recovery from work, internal resources, such as energy or positive mood, can be considered the most important resources, because recovery is closely related to mood regulation (Sonnentag & Fritz, 2007). The active perspective on recovery has also been impacted by other theories, which in recovery research have not been used as extensively as the previously mentioned theoretical frameworks. Broaden-and-Build theory (Fredrickson, 2001) suggests that positive emotions broaden one's awareness and encourage novel and varied experiences, which over time builds skills and resources. According to Self-Determination Theory (Ryan & Deci, 2000), three basic psychological needs – autonomy, competence and relatedness – must be satisfied to foster psychological well-being. Based on these theories, it can be assumed that activities which produce positive emotions and fulfill the basic needs of autonomy, competence and relatedness can be beneficial in terms of recovery. Existing empirical research supports this view: for example, Van Hooff and Geurts (2014) found that basic needs satisfaction during leisure time contributed to employees' recovery status while Oerlemans and colleagues (2014) found that happiness during an off-job activity played a role in predicting a person's recovery level. As I will describe later in this introduction (p. x), these basic needs are closely related to one of the main concepts of my research, psychological recovery experiences.

Summing up, recovery entails resting and detaching from work, but also building new resources and engaging in meaningful and enjoyable leisure activities. The main theoretical framework in my dissertation is the DRAMMA model developed by Newman and colleagues (2014). The DRAMMA model describes six recovery experiences or psychological needs that explain how leisure is related to optimal functioning and subjective well-being (Newman et al., 2014; see also Kujanpää et al., 2020). The acronym DRAMMA stands for Detachment, Relaxation, Autonomy, Mastery, Meaning and Affiliation and the model is based on a meta-analysis of 363 articles within both psychology and leisure sciences. Each of these recovery

experiences is described in more detail in Chapter 1.4.3.1. Recovery experiences (page 34). Newman and colleagues have integrated several theoretical frameworks in order to establish a conceptual model concerning psychological experiences conducive to well-being. These frameworks include the previously mentioned Effort-Recovery model (Meijman & Mulder, 1998), Conservation of Resources theory (Hobfoll, 1989), and Sonnentag and Fritz's (2007) conceptualization of four recovery experiences, but also other theories such as Self-Determination Theory (Ryan & Deci, 2000), Ryff and Keyes' (1995) theory of psychological well-being, and Csikszentmihalyi's (1990) conceptualization of flow experience. Ryff and Keyes' (1995) six dimensions of psychological well-being (i.e., autonomy, environmental mastery, personal growth, positive relationships with others, purpose in life and self-acceptance) support the experiences of autonomy, mastery, meaning and affiliation. Ryan and Deci (2000) argue that the satisfaction of basic needs for autonomy, relatedness and competence promotes psychological well-being; relatedness corresponds to affiliation, while competence can be construed as mastery. Also, flow – the state of total immersion and complete focus in an activity – has a lot in common with mastery experiences. The DRAMMA model combines several important perspectives from these theoretical frameworks. A recent longitudinal validation study by Kujanpää and colleagues (2020) found support to the DRAMMA model by testing its within-person reliability and (construct and criterion) validity. Their study included five measurement points, and the six-factor model (i.e., six DRAMMA experiences) showed good fit to the data. Also, qualitative findings by Loveday and colleagues (2018) using the best possible selves paradigm highlight the importance of meaning and especially affiliation for living a good life.

The six experiences in the DRAMMA model can also be defined as psychological needs (see Kujanpää et al., 2020). Three of these experiences – autonomy, affiliation and mastery (which is very close to competence) – largely correspond to the basic psychological needs proposed by Self-Determination Theory (Ryan & Deci, 2000), an extensively studied framework, which is one of the earlier theories utilized in developing the DRAMMA model. According to Self-Determination theory, the fulfillment of these three innate needs is essential to the maintenance and development of well-being. Hence, it is not surprising that a few recent studies have shown that basic needs satisfaction also contributes to employees' recovery from work (Mojza, Sonnentag, & Bornemann, 2011; Van Hooff & Geurts, 2014; Van Hooff, Flaxman, Söderberg, Stride, & Geurts, 2018). Van Hooff and colleagues (2018) list several reasons possibly explaining why basic needs satisfaction is related to recovery. First, according to Self-Determination theory, needs satisfaction results

in energy maintenance or enhancement (Ryan & Deci, 2008), which in turn facilitates the recovery process. Second, needs satisfaction is accompanied by the experience of positive emotions (Reis, Sheldon, Gable, Roscoe, & Ryan, 2000; Sheldon et al., 1996), which helps to downregulate the stress response (Esch & Stefano, 2004). Third, the Broaden-and-Build theory suggests that positive emotional states broaden people's thought-action repertoires (Fredrickson, 2001). This enhanced ability to interact with the environment can help employees to increase their resources, for example, by engaging in recovery-promoting behaviours. The perspectives from these theories have been brought together in the DRAMMA model, which therefore offers a theoretically rich and practically adaptable viewpoint on recovery from work.

Next, I briefly introduce the additional theoretical background concerning the relationship between ageing and recovery. Since the link between ageing and recovery from work has received very limited attention in previous studies, I rely on emotion regulation theories to explain how age and recovery may be related to each other.

1.3.2 Ageing, recovery and emotion regulation

One of the focuses of this dissertation is to gain new insights on the role of ageing in recovery. First of all, it is important to note that the research streams of lifespan development and work and organizational literature differ in their definitions of "older" or "ageing" people (Doerwald, Scheibe, Zacher, & van Yperen, 2016). In the lifespan literature, age 60 or 65 – close to the age when employees retire from the workforce – is usually used as a cutoff point for when old age begins (Baltes & Smith, 2003). Definitions of older workers usually correspond to the general operationalization of middle age, around 40-60 years (Doerwald et al., 2016). In Finland, age 45 is often used as a threshold for defining ageing employees, because around that age perceived work ability starts to decline (Ilmarinen, 2001; Kooij, de Lange, Jansen, Kanfer, & Dijkers, 2011). The definition of an ageing employee is usually based on the period when major changes start to occur in relevant work-related functions, such as physical and cognitive abilities (Ilmarinen, 2001). The relatively early definition of "ageing" affords better possibilities for preventive measures targeted at maintaining work ability.

Although ageing is a prominent issue in today's working life, the scientific evidence of the role of age in psychological recovery processes is so far limited. Because the share of older people in the workforce is increasing, it is important to

understand their needs and develop solutions which help them to stay happy, healthy and productive in and outside their work. This need is also evident among Finnish teachers: for example, the share of teachers who are at least 50 years old varies between 30.5 and 47.7% in different regions of Finland (Kumpulainen, 2014). There is research evidence suggesting that ageing may entail changing experiences of working life. For example, age is associated with motivation to limit or avoid high arousal or negative situations (Scheibe & Zacher, 2013) and more favourable job attitudes (Ng & Feldman, 2010). Also, some studies have shown job satisfaction to follow a U-shaped pattern with age (Birdi, Warr, & Oswald, 1995).

Socioemotional Selectivity Theory in the life-span developmental literature describes age-related motivational changes suggesting that with age comes a change in individuals' goals, leading to increased emphasis on emotional states and meaning (e.g., Carstensen, 2006). This is related to the assumption that as people grow older, they begin to perceive the time they have left in life as more limited, which causes them to prioritize present-oriented goals, such as maximizing emotional well-being, instead of future-oriented goals such as advancing one's career. Therefore, the experience of work, and the degree to which it can affect people's well-being, can be expected to differ with age.

Although the link between age and recovery specifically has not been much studied, the existing literature concerning aging and changes in emotion regulation can help make sense of this association. Recovery processes are closely linked to emotion regulation (Parkinson & Totterdell, 1999; Sonnentag & Fritz, 2007; Sonnentag et al., 2017), and the motivation and competence for emotion regulation tend to change with age (Scheibe & Zacher, 2013). For instance, older adults seem to be more motivated than younger adults to regulate emotions in a pro-hedonic way, meaning that they aim to maximize positive and minimize negative affect. Also, with age, people seem to increasingly prefer low-arousal emotional states over high-arousal states, such as calmness over excitement (Charles, 2010; Labouvie-Vief, 2003; Scheibe et al., 2013). Due to their longer life experience, older people may have accumulated expertise in regulating their emotions. Indeed, several studies have found that older adults are often able to choose more effective emotion regulation strategies than are younger adults (Blanchard-Fields, 2007; Blanchard-Fields, Mienaltowski, & Seay, 2007; Charles & Carstensen, 2010). Also, a recent study examining emotion regulation profiles in the workplace found that older employees were more likely to be members of emotion regulation profiles that were positively related to well-being (El Khawli, Scheibe, & Keller, 2020). This means that we can assume that ageing may also play a role in recovery from work.

The few existing studies concerning age and recovery have mostly focused on employees' own perceptions of need for recovery. Two studies have shown that need for recovery after the working day tends to increase linearly until the age of 55 and then level out among the oldest workers (Kiss et al., 2008; Mohren et al., 2010). Several possible reasons for this development have been suggested for example by Mohren and colleagues (2010). Firstly, the oldest workers may have already started a process of downshifting in the work environment, for example, by reducing their working hours. Secondly, differences in family situation may, to some extent, explain the varying levels of need for recovery in different age groups. Often the oldest employees no longer have children living at home, which is likely to reduce work-family conflict and the demands of the family domain. Thirdly, older employees may also have developed effective strategies for dealing with work stress and need for recovery due to their long experience and expertise in working life (Silverstein, 2008). Thus, it is possible that older employees have better "recovery skills" and know what works for them in terms of recovery.

The restoration of positive mood and energy are important functions of recovery from work, which supports the link between recovery and emotion regulation (Sonnentag & Fritz, 2007). Research on emotion regulation has identified strategies that individuals use to improve and regulate their mood, including both cognitive and behavioural strategies. Sonnentag and Fritz (2007) refer to the classification by Parkinson and Totterdell (1999), which entails two main categories of emotion regulation: diversionary and engagement strategies. Diversionary strategies aim at avoiding stressful situations or seeking distraction from them, whereas engagement strategies refer to confronting or accepting stressful situations. According to Sonnentag and Fritz (2007), diversionary strategies are more important for recovery from work, because engagement strategies keep the individual cognitively preoccupied with the stressful situation, which makes recovery – especially in terms of psychological detachment from work – less likely. Diversionary emotion-regulation strategies are closely related to at least three recovery experiences: detachment from work, relaxation and mastery (Sonnentag & Fritz, 2007). When employees successfully detach from work, they can avoid stressful work-related thoughts for a while. Also, relaxing leisure activities can be effective in distracting people from thinking about stressors. Distraction can likely also be achieved by engaging in challenging activities, such as hobbies, outside one's work. Higher age seems to be associated with an increased preference to choose distraction (a diversionary strategy) over reappraisal (an engagement strategy) when regulating negative emotions (Scheibe et al., 2015). Another division by Gross (1998)

categorizes emotion regulation strategies into antecedent-focused strategies, which occur before the negative emotion is generated, and response-focused strategies, which are used for response modulation. Based on this division, for example, detachment from work and relaxation can be considered antecedent-focused strategies, since they help to distract attention from the stressful situation. However, relaxation may also sometimes be a response to existing stress, for example, when an employee uses relaxation techniques such as deep breathing to calm down.

Summing up, the literature on age differences in emotion regulation processes, which are closely related to recovery from work, implies that recovery processes may take different forms at different life stages. For instance, it is possible that due to their longer work experience, older employees have developed more efficient strategies to support their recovery (e.g., Silverstein, 2008). This could lead to improved recovery experiences. On the other hand, age may moderate the relationship between recovery experiences and well-being. For example, detachment and relaxation may be more easily achieved by older employees due to their higher motivation to avoid stress, which in turn may be reflected in higher well-being. Nevertheless, it can be argued that younger employees are typically in greater need of detachment and relaxation due to their family demands (e.g., taking care of children or elderly parents, building a career), meaning that they could benefit more from these experiences.

1.4 Recovery settings, outcomes and processes

Recovery from work as a phenomenon has several distinct but intertwined facets: settings where recovery occurs, recovery as an outcome and recovery as a process (Sonnentag et al., 2017; Sonnentag & Geurts, 2009). The viewpoint of recovery settings addresses the questions of when and where employees best recover from work-related effort. Recovery outcomes indicate how successful recovery is. Finally, recovery processes focus on how recovery actually happens: what kind of behaviour, activities and psychological processes support successful recovery?

1.4.1 Temporal settings for recovery

Recovery from work occurs in various temporal settings. It can generally be divided into internal and external recovery, internal recovery taking place during the

workday, and external recovery during off-job time. External recovery includes leisure time typically in the evening after work and weekends, and also longer breaks such as holidays. External recovery occurring during off-job time has received much more research attention than has internal recovery, although recently internal recovery, especially during lunch breaks, has received increasing attention (see for a general review on internal recovery; Sianoja, Kinnunen, de Bloom, & Korpela, 2015; Sonnentag et al., 2017). In this study, I focus on all these temporal recovery settings, excluding only the shortest micro-breaks during the working day.

1.4.1.1 Recovery during breaks

Recovery during within-workday breaks – or internal recovery – includes short informal breaks, such as chatting with colleagues between work tasks or eating a snack, and formal breaks, such as scheduled lunch and coffee breaks. The research on workday breaks started in the ergonomics literature, which has explored, for example, how breaks can alleviate musculoskeletal discomfort and strain associated with prolonged or repeated office-related tasks (for an overview, see Trougakos & Hideg, 2009). However, this line of research has mostly focused on the frequency, timing and duration of these breaks – not break activities or psychological experiences, which have only recently come in for scholarly attention. Also, the demands of knowledge workers' jobs have changed dramatically during the last few decades, which implies new challenges for internal recovery. Breaks can be defined as an episode of the working day during which employees cease working and shift their attention away from work tasks (Hunter & Wu, 2016).

Theoretically, the importance of break recovery can be explained by the same theories as recovery in general: recovery constitutes both replenishing threatened or lost resources (Hobfoll, 1989) and taking a rest break from job demands and work-related efforts (Meijman & Mulder, 1998). Successful recovery during breaks has the potential to prevent the accumulation of work stress (e.g., Coffeng et al., 2015; Kim, Park, & Headrick, 2018) and to replenish self-regulation resources depleted by high job demands (Muraven & Baumeister, 2000; Trougakos & Hideg, 2009) already during the working day. Previous research has shown that successful break recovery is beneficial for employees (Sianoja et al., 2015; Sonnentag et al., 2017) and can indeed prevent the accumulation of stress during the working day (e.g., Kühnel, Zacher, de Bloom, & Bledow, 2017; Trougakos et al., 2008; Von Dreden & Binnewies, 2017). A few studies suggest that a favourable recovery state at the end of the working day has a positive effect on employees' recovery processes in the

evening (De Bloom et al., 2015; Van Hooff & Geurts, 2014; Van Hooff & de Pater, 2017). Also, a longitudinal study by Sianoja, Kinnunen, de Bloom, Korpela and Geurts (2016) implies that break recovery may even have positive consequences as long as one year later.

Most research so far on break recovery has focused on lunch breaks, which are typically the longest breaks during the working day (e.g., Diaz-Silveira, Algoter, Burgos, Marcos, & Santed, 2020; Krajewski, Wieland, & Sauerland, 2010; Sianoja et al., 2016; Sianoja, Syrek, De Bloom, Korpela, & Kinnunen, 2018; Trougakos et al., 2008; Trougakos et al., 2014). In this study I focus on all breaks during the working day which last for at least five minutes. As this study concerns schoolteachers, this means that I focus on lunch breaks and breaks between classes, but exclude the shortest micro-breaks (from the investigation). Even though very short micro-breaks can help employees to stay focused and energized (e.g., De Bloom et al., 2015; Hunter & Wu, 2016; Kim et al., 2017; Kühnel et al., 2017), it is unclear whether breaks this short could produce the same recovery experiences as longer breaks. For example, it is difficult to imagine how experiences of meaning or affiliation could be produced in only two or three minutes.

1.4.1.2 Recovery during leisure time

Of all recovery settings, recovery during leisure time – typically weekends and free evenings for those with a regular nine-to-five job – has received the most attention in research. This makes sense, because compared to the longest recovery settings, namely holidays, free periods between work shifts are available for employees much more regularly. Being able to recover from work-related strain on a daily basis helps employees to prevent the long-term accumulation of stress (e.g., Sonnentag et al., 2017). Previous research has shown that leisure activities and psychological recovery experiences during off-job time are vital for successful recovery (for an overview, see Sonnentag et al., 2017). For instance, job-related activities during off-job time seem to be related to decreases in well-being (e.g., Bakker, Demerouti, Oerlemans, & Sonnentag, 2013; Sonnentag & Zijlstra, 2006; ten Brummelhuis & Bakker, 2012), whereas social leisure activities and physical activity are related to improvements in well-being (e.g., Oerlemans & Bakker, 2014; Sonnentag & Zijlstra, 2006; ten Brummelhuis & Bakker, 2012). Also, intrinsic motivation concerning leisure activities seems to play a role in recovery: ten Brummelhuis and Trougakos (2014) found that time spent on low-effort activities during leisure time showed a stronger association with recovery levels the following morning when intrinsic motivation for

these activities was high. In addition, time spent on physical activities was related to better recovery only when these physical activities were intrinsically motivated but not when they were extrinsically motivated. Moreover, happiness or enjoyment during a leisure activity seems to predict better recovery levels (Oerlemans et al., 2014). All in all, how people spend their free time matters for well-being and recovery. Lately, a myriad of studies has also focused on the psychological experiences underlying different leisure activities (Sonnentag et al., 2017). These studies will be described in more detail below in Chapter 3.4.3.1.

1.4.1.3 Recovery during holidays

Holidays constitute the longest continuous period of leisure, which means that they are excellent opportunities for recovery from work. Finnish teachers are known to enjoy long summer holidays as well as several shorter holidays, such as one-week winter holiday in February or March, during the academic year. Both longer and shorter holidays have been shown to be beneficial to recovery, well-being and performance (de Bloom, Geurts, & Kompier, 2012; 2013). Having a holiday is associated among other things with greater life satisfaction and subjective well-being, fewer health complaints, better self-rated health and lower levels of exhaustion after the holiday (see Chen & Petrick, 2013, for a review) and even with reduced risk of mortality (Gump & Matthews, 2000). Recent studies also show that holidays may weaken the association between stress and increased heart rate (Hruska, Pressman, Bendiskas, & Gump, 2019) and protect against metabolic syndrome and symptoms (Hruska, Pressman, Bendiskas, & Gump, 2020), thus supporting physical health.

Yet the positive effects of holidays unfortunately tend to fade soon after resumption of work and occasionally fail to occur at all (e.g. de Bloom et al., 2009). Some studies have found that the effects of holidays last approximately two to three weeks after return to work (de Bloom et al., 2010; de Bloom et al., 2011), but under certain circumstances the effects may only last for a few days (de Bloom et al., 2011; Nawijn, Marchand, Veenhoven, & Vingerhoets, 2010). The reasons which may limit the positive effects of holidays include negative incidents, (presumably involuntary) engagement in passive activities during an active holiday (de Bloom et al., 2011) and failure to detach from work during the holiday (Kühnel & Sonnentag, 2011).

1.4.2 Recovery outcomes

Recovery as an outcome refers to a person's psychological and physiological state reached after a period of recovery. One indicator of successful recovery much used in earlier studies is the state of feeling recovered which can be directly assessed with self-report measures (see for example Demerouti, Bakker, Sonnentag, & Fullagar, 2012; Kinnunen, Feldt, Siltaloppi, & Sonnentag, 2011; Sianoja et al., 2016). On the other hand, different measures of health, well-being or job performance can be used as indicators of how well employees have recovered. Earlier studies have utilized both physiological (e.g., blood pressure, cortisol, heart rate variability) and psychological measures of recovery (for an overview, see Sonnentag & Geurts, 2009), with an emphasis on self-report measures.

In my dissertation I have focused primarily on recovery outcomes related to psychological well-being. In addition, a few performance-related outcomes were examined. My aim was to offer a rich perspective on recovery outcomes by including several different outcomes across sub-studies. Meta-analyses (Bennett et al., 2018; Steed et al., 2019) show that recovery from work is related to a wide range of well-being outcomes, such as vigour or vitality, fatigue and life satisfaction. However, to the best of my knowledge, only one study (Kujanpää et al., 2020) has examined all six DRAMMA experiences as predictors of various well-being outcomes. Since recovery allows employees to gain new internal resources such as energy and positive mood (Sonnentag & Fritz, 2007), outcomes related to energy and affective well-being are relevant. In addition to the positive aspects of well-being, I have paid attention to indicators of ill-being, such as burnout and negative affect, which can be considered as the opposite of positive outcomes. Although most recovery research has focused on well-being outcomes, a few recent studies have also investigated how recovery from work is related to performance at work (e.g., Binnewies et al., 2010; De Bloom et al., 2015; Eschleman, Madsen, Alarcon, & Barelka, 2014). However, the relationship between certain aspects of recovery and job performance remains ambiguous. For example, relaxation during off-job time was positively related to task performance and creativity in one study (De Bloom et al., 2015) but not in others (Binnewies et al., 2009; Eschleman et al., 2014). A study by Fritz et al. (2010) found that psychological detachment from work showed a curvilinear association with performance: performance was highest at moderate levels of detachment, but low at very high or very low levels of detachment.

In Study 1, I focused on three positive well-being outcomes: vitality, life satisfaction and work ability. Vitality and life satisfaction describe context-free well-

being. Vitality refers to a positive feeling of aliveness and energy (Ryan & Frederick, 1997). Recovery from work helps employees to gain new internal resources such as energy and positive mood (Sonnentag & Fritz, 2007), which can be assumed to manifest in improved levels of vitality. Also, a previous meta-analysis by Bennett, Bakker and Field (2018) supports this view by showing a positive association between recovery processes and vigour. Life satisfaction is a subjective assessment of one's quality of life as a whole (Diener, Emmons, Larsen, & Griffin, 1985) and a central component of subjective well-being (Diener et al., 2017). Earlier research has shown that successful recovery processes are associated with higher life satisfaction (e.g., Sonnentag & Fritz, 2007; Strauss-Blasche, Ekmekcioglu, & Markt, 2002). Work ability refers to a state where workers are mentally and physically capable of performing their current work role and of achieving a balance between their resources and the demands of work (Ilmarinen, Tuomi, & Klockars, 1997; Tuomi et al., 1991). Work ability has its roots in health status (Ilmarinen, 2009). Because recovery mitigates the relationship between work stress and ill-health (Geurts & Sonnentag, 2006; Sonnentag et al., 2017), it can be presumed to promote work ability. To the best of my knowledge, work ability has not previously been specifically studied as a recovery outcome .

Study 2 focused on two well-being indicators as outcomes of break recovery: need for recovery and job burnout. Need for recovery refers to the desire to be temporarily relieved of the demands of work to replenish threatened or lost resources (Sluiter, van den Beek, & Frings-Dresen, 1999; Van Veldhoven & Broersen, 2003). Symptoms of burnout - exhaustion, cynicism, sense of inadequacy - may follow in the long-term if poor recovery persists over a long period of time (Maslach, Schaufeli, & Leiter, 2001). Exhaustion is the stress dimension of burnout and refers to feelings of being overextended with the emotional and physical resources depleted. Cynicism, on the other hand, is the interpersonal component of burnout and is characterized by negative or excessively detached response to various aspects of one's job. Sense of inadequacy indicates feelings of incompetence and a lack of achievement and productivity at work.

Study 3 focused on affective outcomes, that is, positive and negative affect as day-level outcomes of recovery during breaks. High levels of positive feelings and low levels of negative feelings are important parts of subjective well-being, alongside life satisfaction (Diener, 1984; Diener et al., 2017). Affects represent people's real-time evaluations of the events occurring in their lives (Diener, 1984). Positive affect includes, for example, joy and contentment, whereas negative affect includes feelings such as anger, sadness and anxiety. Positive and negative affect measures were also

used in Study 4, in addition to measures of sleep quality and need for recovery. Sleep is an important part of the recovery process (e.g. Litwiller, Snyder, Taylor, & Steele, 2017; Sonnentag, 2018). It is indispensable to long-term health and well-being, and is also related, for instance, to better affective well-being in the short term (e.g., Sin et al., 2017; Konjarski, Murrey, Lee, & Jackson, 2018).

Because this study focused specifically on well-being, performance-related recovery outcomes were only measured as one part of Study 4, examining self-reported ability to concentrate, task performance and creativity at work. Concentration refers to the ability to focus on the current task without the attention being distracted (see, for example, Demerouti, Taris, & Bakker, 2007). Therefore, good concentration capacity is likely to promote job performance. Task performance refers to an employee's performance in work activities that directly contributes to the organization's core mission (such as teaching among teachers) (Motowidlo & Van Scotter, 1994). Creativity, on the other hand, refers to the production of novel, useful ideas or solutions to problems (Amabile, Barsade, Mueller, & Staw, 2005). The Neural Network Model of Creativity (Martindale, 1999) and the Broaden-and-Build Theory (Fredrickson, 2001) suggest that stressed people primarily display routinized behaviour patterns because their attention is focused on stressors – meaning that they are less likely to think in flexible, creative ways.

1.4.3 Recovery processes

1.4.3.1 Recovery experiences

Recovery as a process refers to activities and experiences that bring about a positive change in well-being and stress levels. In this study, special attention was paid to subjective recovery experiences. Naturally, recovery experiences and activities are not independent of each other because certain activities are more likely to produce certain experiences (e.g., Sonnentag et al., 2017). I first describe the theoretical background of these important experiences then briefly review the existing evidence on beneficial recovery activities.

Early recovery research focused mostly on leisure activities, which were assumed to promote recovery from work (for an overview, see Sonnentag et al., 2017). However, the focus of recovery research later shifted in the direction of psychological mechanisms promoting recovery as it is likely that the same exact leisure activities do not help every individual to recover. Building on research on

recovery from job stress (e.g., Hobfoll, 1989; Meijman & Mulder, 1998) and emotion regulation (e.g., Parkinson & Totterdell, 1999), Sonnentag and Fritz (2007) argued that specific psychological experiences conducive to mood regulation should underlie effective recovery processes. They proposed four major recovery experiences – detachment from work, relaxation, control and mastery – which are assumed to underlie different recovery-promoting leisure activities. Sonnentag and Fritz (2007) developed the Recovery Experience Questionnaire, which has been validated in several different countries, including Finland (Kinnunen et al., 2011), and has been widely used in studies focusing on psychological recovery processes, including the present study. Detachment can be defined as mental disengagement from work-related thoughts. Relaxation implies low levels of mental or physical activation and little physical or intellectual effort. Control refers to being able to decide on one's leisure schedule and activities. Mastery encompasses learning opportunities and challenges resulting in feelings of achievement and competence.

Of these four 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 links between relaxation, control, mastery and better well-being (for meta-analyses, see Bennett et al., 2018; Steed, Swider, Keem, & Liu, 2019). Many of these recovery experiences also support employees' recovery during the working day. At least relaxation (Bosch, Sonnentag, & Pinck, 2018; Coffeng et al., 2014), detachment (Coffeng et al., 2014; Rhee & Kim, 2016; Sianoja et al., 2016; Von Dreden & Binnewies, 2017) and control (Bosch et al., 2018; Trougakos et al., 2014; Sianoja et al., 2016) during breaks seem to be beneficial according to earlier studies. A few studies have also focused on the role of recovery experiences during holidays. Detachment and relaxation during the holiday may strengthen its positive effects on well-being (De Bloom, 2012; Fritz & Sonnentag, 2006). Kühnel and Sonnentag (2011) also found that leisure-time relaxation after the holiday may delay the fading of the effects of holidays.

Newman and colleagues in their DRAMMA model (2014) recently proposed adding two further experiences – meaning and affiliation – to the list of recovery experiences, is described in more detail in Chapter 1.3.1. Recovery from work. Meaningful leisure activities help individuals gain a sense of purpose in their lives (e.g., Iwasaki, 2008). Experiencing meaning in life is beneficial to well-being on both trait level (e.g., Hicks & King 2007; King, Hicks, Krull, & Del Gaiso, 2006) and state level (e.g., King et al., 2006; Machell, Kashdan, Short, & Nezlek, 2015). In addition, on day-level, active search for meaning is related to improvements in well-being

(Newman et al., 2018). This means that proactively engaging in activities that add meaning to one's life is likely to improve well-being. Affiliation refers to feelings of relatedness with other people, which in Self-Determination Theory (Ryan & Deci, 2000) is also considered an innate human need. Moreover, affiliation fosters social support, helping to cope successfully with stressful events (e.g., Lakey & Orehek, 2011). According to Newman and colleagues (2014), of all DRAMMA experiences, affiliation has the most support from multiple theoretical perspectives. It was also the most frequently mentioned recovery experience in Loveday and colleagues' (2018) qualitative study mentioned above. However, affiliation has received surprisingly little research attention in relation to recovery from work. One recent study found that relatedness during breaks in the working day can be beneficial to employee well-being (Bosch et al., 2018). Newman and colleagues (2014) replaced control with autonomy, a broader concept which emphasizes feelings of volition besides having control over one's schedule and activities. Autonomy is also one of the basic psychological needs according to Self-Determination Theory (Ryan & Deci, 2000).

Although psychological needs satisfaction has received a lot of research attention, little is known about the interaction of needs satisfaction across life domains: needs can be satisfied both at work and during off-job time, but how are they related to one another? It can be argued that needs satisfaction outside work is especially important for well-being when such needs are not satisfied at work (see for example Hewett et al., 2017). One recent study did indeed find that employees benefitted particularly from satisfaction of their need for competence at home when this need was not satisfied at work, but no such cross-domain interaction was found between autonomy and relatedness need satisfaction (Hewett et al., 2017).

Recovery experiences can also be studied as underlying mechanisms explaining the relationship between job demands and well-being outcomes, which is the focus of Study 3 in my dissertation. Recovery from work is especially important when the demands are high (e.g., Sonnentag, 2018). The negative relationship between high job demands and lower well-being can be explained by the health impairment process in the Job-Demands and Resources model (e.g., Bakker & Demerouti, 2017): according to this model, over time, high or long-lasting job demands lead to depletion of energy, resulting in fatigue or burnout. High job demands have also been shown to inhibit recovery experiences (Bennett et al., 2018; Kinnunen et al., 2011). Because recovery experiences are a crucial mechanism through which recovery occurs (Sonnentag & Geurts, 2009), they can be assumed to act as mediators between job demands and recovery outcomes. For instance, the Stressor-

Detachment model (Sonnentag & Fritz, 2015) suggests that job demands tend to impair detachment from work, and poor detachment, in turn, is associated with poorer well-being.

Several empirical studies support the mediating role of detachment between job demands and various outcomes (Chen & Li, 2019; Chen, Li, Xia, & He, 2017; Kinnunen et al., 2011). The meta-analysis by Bennett and colleagues (2018) shows that, in addition to detachment, relaxation, control and mastery experiences also mediate the relationship between job demands and well-being in terms of fatigue and vigour, corroborated by preliminary evidence from diary studies. Germeys and De Gieter (2016) found that detachment to be an underlying mechanism in the daily relationship between high workload and lower marital satisfaction. Schraub and colleagues (2013) showed that among university undergraduates, recovery experiences partially mediated the negative relationship between stress during a study-related event and affective well-being. However, these studies have solely focused on recovery experiences after working hours. To the best of my knowledge, no studies have investigated break recovery experiences as mediators between daily job demands and well-being outcomes.

1.4.3.2 Recovery activities

Recovery experiences and recovery activities are closely connected. Research shows that, for example, physical activities during off-job time predict higher levels of detachment from work, relaxation and mastery (Feuerhahn, Sonnentag, & Woll, 2014; Ragsdale & Beehr, 2016; ten Brummelhuis & Bakker, 2012). Also, leisure-time social activities are related to higher levels of detachment, relaxation and mastery (Hahn, Binnewies, & Dormann, 2014; Ragsdale & Beehr, 2016; ten Brummelhuis & Bakker, 2012). Conversely, work-related activities are associated with lower detachment, relaxation and control (Hahn et al., 2014; Ragsdale & Beehr, 2016; ten Brummelhuis & Bakker, 2012). A recent meta-analysis by Steed and colleagues (2019) showed that low-dutyactivities (e.g., socializing, taking a walk, or reading a book) were positively correlated with each individual recovery experience (i.e., detachment, relaxation, autonomy, mastery), whereas high-dutyactivities (e.g., taking care of children or completing work-related tasks) exhibited negative relationships only with detachment and relaxation. However, these relationships between different activities and recovery experiences mainly concern leisure after work, not within-workday breaks. Most studies have also found that, in addition to recovery

experiences, work-related activities outside working hours are associated with poorer recovery outcomes, whereas social and physical activities are related to positive outcomes such as improved well-being, vigour or low need for recovery (Bakker, Demerouti, Oerlemans, & Sonnentag, 2013; Sonnentag, 2001; Sonnentag & Zijlstra, 2006; ten Brummelhuis & Bakker, 2012; ten Brummelhuis & Trougakos, 2014).

Although Studies 1-4 focussed on recovery experiences, I have included additional analyses concerning activities conducive to recovery during breaks at work as in earlier work these have received less attention than leisure activities (for an overview, see Sonnentag et al., 2017). However, there is already day-level empirical evidence suggesting that certain break activities can be beneficial to day-level recovery. For example, physical and relaxing break activities (e.g., Kim et al., 2017; Trougakos et al., 2008; 2014) as well as nature or park walks during lunch breaks (Brown, Barton, Pretty, & Gladwell, 2012; Krajewski et al., 2010; 2011; Sianoja et al., 2018; Steidle, Gonzalez-Morales, Hoppe, Michel, & O'Shea, 2017) can support daily recovery from work. Just as during off-job time, work-related activities during breaks may impede recovery during daily breaks. These activities include spending breaks with one's supervisor or talking about work-related topics with colleagues (Von Dreden & Binnewies, 2017). All in all, good person-break fit – a balance between a person's break-related needs (e.g., preferences for activities, experiences or social contacts) and the actual breaks – seems to be conducive to recovery (Venz, Bosch, Pinck, & Sonnentag, 2019).

1.5 Recovery interventions

Research suggests that it is possible to support recovery from work and enhance recovery experiences with interventions such as relaxation techniques, stress management strategies, recovery experience training and by promoting physical activity (for a review, see Verbeek et al., 2018). For instance, a face-to-face group intervention by Hahn and colleagues (2011) strengthened detachment, relaxation and control after work and the effects were still perceptible four weeks after the intervention. Their recovery training programme included four modules, each designed to promote one of the four recovery experiences proposed by Sonnentag and Fritz (2007). The modules encompassed both educational elements and group and individual exercises. Mindfulness exercises, which teach people to be fully present in the moment, for instance by focusing on deep breathing or bodily sensations, can also enhance detachment after the working day (Michel, Bosch, &

Rexroth, 2014). During the working day, an intervention including lunch break park walks and progressive muscle relaxation exercises supported recovery (De Bloom et al., 2017; Sianoja et al., 2018).

The intervention study reported in Study 4 concerned an occupational e-mental health intervention in which the recovery intervention was delivered by mobile technology (i.e., a smartphone application). Occupational e-mental health refers to the application of internet- and smartphone-based tools aiming to improve employees' well-being (Lehr et al., 2016). Web-based interventions are promising tools in treating several mental health problems, such as depression and anxiety (e.g., Haug, Nordgreen, Öst, & Havik, 2012; Königbauer, Letsch, Doebler, Ebert, & Baumeister, 2017; Richards & Richardson, 2012) and in promoting psychological well-being and enhancing job performance (for a meta-analysis, see Carolan, Harris, & Cavanagh, 2017). However, the empirical evidence for the efficacy of smartphone-based interventions is so far limited (Fiordelli, Diviani, & Schulz, 2013), and most web-based interventions conducted in workplace settings have not utilized smartphone-based tools.

Engagement and adherence seem to be major challenges in delivering and evaluating web-based interventions. For example, among 21 intervention studies included in a meta-analysis by Carolan and colleagues (2017) the mean reported completion of interventions was only 45%. Nevertheless, occupational e-mental health interventions have been found to be as effective as more traditional, face-to-face occupational interventions. The advantages of digital interventions include increased accessibility, flexibility and increased anonymity (e.g., Carolan et al., 2017). However, flexibility and lack of monitoring can also have a downside: severely stressed participants may not prioritize the intervention very highly, which leads to lower adherence.

A few studies indicate that it can also be possible to utilize web-based intervention tools targeted specifically at supporting recovery from work. In a web-based intervention focusing on teachers' recovery after work (Ebert et al., 2015), sleep quality and recovery experiences improved and rumination decreased. The same intervention also decreased the severity of insomnia among employees (Thiart, Lehr, Ebert, Berking, & Riper, 2015), enhanced detachment from work in the evenings and reduced stress, sleeping problems and worrying among employees with high stress levels (Ebert et al., 2016). The intervention included strategies aimed to help effective emotion regulation, such as muscle and breathing relaxation, acceptance and tolerance of emotions, time management, sleep hygiene, and reducing rumination and worrying.

In the first published study using the same smartphone app (including daily exercises designed to promote the six recovery experiences proposed in the DRAMMA model, for a more detailed description of the app, see Chapter 2.1.3.1. in the Methods section) as in the present study, Smyth and colleagues (2018) focussed in a German sample on the importance of user experiences in predicting the effectiveness of the app intervention. They found that usability of the app was related to better recovery after the vacation. Summing up, the results from earlier studies suggest that recovery among teachers, our target group, can indeed be supported with web-based tools.

1.6 Research questions

This study consists of four original publications. The overall aim of my dissertation was to gain new insights into psychological recovery during different breaks from work (free evenings and weekends, breaks during the working day, and a during one-week holiday) among Finnish schoolteachers. The exact hypotheses tested in every study are listed in Table 2 in the Results section.

Study 1 focused on the cross-sectional relationships between recovery experiences during off-job time and well-being. Also, I examined the role of age in this relationship. The research questions in Study 1 were:

- 1) How do recovery experiences of detachment, relaxation, control, mastery, meaning and affiliation outside working hours relate to (a) vitality, (b) life satisfaction and (c) work ability?
- 2) Is age related to vitality, life satisfaction and work ability?
- 3) How does age moderate the relationship between recovery experiences and the outcomes described above?

Study 2 examined cross-sectionally the relationship between detachment and relaxation during breaks in the working day and need for recovery and job burnout. As in Study 1, age was examined as a possible moderator in these relationships. The research questions in Study 2 were:

- 4) How do detachment from work and relaxation during within-workday breaks relate to a) need for recovery and b) job burnout?
- 5) Is age related to a) need for recovery and b) job burnout?
- 6) How does age moderate the relationship between break detachment and relaxation and a) need for recovery and b) job burnout?

In Study 3, I aimed to examine break recovery experiences as possible underlying mechanisms (mediators) in the relationship between daily emotional job demands and daily positive and negative affect in the afternoon and in the evening. The research questions in Study 3 were:

- 7) How do daily emotional job demands relate to recovery experiences of detachment, relaxation, control, mastery, meaning and affiliation during breaks?
- 8) How do daily emotional job demands relate to positive and negative affect a) in the afternoon and b) in the evening?
- 9) How do break recovery experiences of detachment, relaxation, control, mastery, meaning and affiliation relate to positive and negative affect a) in the afternoon and b) in the evening?
- 10) Do break recovery experiences mediate the relationship between daily emotional job demands and positive and negative affect a) in the afternoon and b) in the evening?

Study 4 concerned a smartphone-based intervention the aim of which was to strengthen and prolong the beneficial effects of a holiday on recovery experiences, well-being and job performance through exercises aimed at increasing DRAMMA recovery experiences. The research questions in Study 4 were:

- 11) How do recovery experiences (i.e., detachment, relaxation, control, mastery, meaning and affiliation), well-being (i.e., positive and negative affect, sleep quality and need for recovery) and job performance (i.e., task performance, concentration capacity and creativity at work) develop before, during and after the holiday?
- 12) Does the active use of the Holidaily app strengthen the positive effect of a holiday on recovery experiences, well-being and job performance?
- 13) Does the active use of the Holidaily app prolong recovery experiences, well-being and job performance?

In addition to the findings reported in the original publications, I have included additional analyses concerning the break recovery activities in Study 3. Regarding these, I examined a) which break activities were most commonly reported and b) how break activities and break recovery experiences were related to each other. No specific hypotheses were posed, but I anticipated that recovery activities and experiences would be related to each other.

2 METHODS

In this chapter I present the methods of all four sub-studies in my dissertation. The summary of the sub-studies (including study design and data, aims, main variables with reliability information and statistical methods) can be found in Table 1 (page 53).

2.1 Participants and procedure

This study was part of a larger research project entitled “New Lessons in Recovery: Investigating the Role of Different Breaks from Work for Healthy, Happy and Creative Ageing Teachers” conducted at the Faculty of Social Sciences, Tampere University and financed by the Finnish Work Environment Fund (see the research report by Virtanen, Perko, Törnroos, de Bloom & Kinnunen, 2019). The project consisted of three sub-studies: a cross-sectional questionnaire study, a one-week daily diary study and a four-week intervention study. Participants in all sub-studies were Finnish schoolteachers and head teachers, most of whom were working in comprehensive schools or upper secondary schools.

2.1.1 Studies 1 and 2: Questionnaire study

Studies 1 and 2 in my dissertation are based on the cross-sectional questionnaire study conducted in May 2017. The sample was drawn from the register of the Trade Union of Education in Finland (OAJ). Around 95% of Finnish teachers are members of the trade union (OAJ, 2015). The electronic questionnaire was sent to 3,500 teachers all over the country by the union: to 1,500 class teachers (teaching pupils aged 7 to 12 years in comprehensive schools), to 1,500 subject teachers of single specific subjects (teaching in either comprehensive schools pupils aged 13 to 15 years, or upper secondary school pupils aged 16 to 18 years), and to 500 head teachers. In the groups of class teachers and subject teachers the questionnaire was sent to 500 teachers in three age groups: under 45 years, 45 to 55 years and over 55

years. Due to the smaller total number of head teachers, this division into age groups was not used .

The final response rate was 26% ($N = 909$), and was highest among class teachers (30%: $n = 448$). Of the age groups, the response rate was highest (37% among class teachers and 23% among subject teachers) in the middle age group (45 to 55 years). The attrition analyses showed that the study participants were older (the share of teachers over 55 years old was 41.5% vs. 18.6%; $\chi^2 (2) = 278.01, p < .001$), more often women (83.4% vs. 77.6%; $\chi^2 (1) = 14.65, p < .001$) and subject teachers (47.1% vs. 35.6%; $\chi^2 (1) = 12.66, p < .001$) than teachers registered as members of the Trade Union of Education. The age difference is explained by the data collection procedure: because ageing teachers were the target group of the study, the older age groups were given more weight than those under 45.

The sample of Study 1 consisted of all participants in the questionnaire study. Of these, 78% were women. The mean age of the participants was 51 years ($SD = 9.76$). Nearly all (99%) participants had a full-time job, and most (86%) also had a permanent employment contract. On average, participants worked 37.44 hours per week ($SD = 9.24$). The majority (93%) of the participants worked in comprehensive schools (i.e., teaching pupils aged from 7 to 16 years). Most of the participants lived either with a partner (41%) or with a partner and at least one child (36%).

For the purposes of Study 2, which focused on break recovery on a cross-sectional level, head teachers were excluded from the analyses because their break characteristics differed from those of teachers without administrative responsibilities (e.g. head teachers often have greater autonomy as regards break timing). This resulted in a sample of 769 teachers. Of these, 58% worked as class teachers and 42% as subject teachers. Most participants (83%) were women, and the mean age of the participants was 50 years ($SD = 10.2$). Their self-reported average working hours were 36.5 ($SD = 9.30$).

2.1.2 Study 3: Diary study

Study 3 is based on a one-week diary study conducted in November 2017 during three different weeks (based on participants' choice). Before the beginning of the diary study, participants completed an electronic background questionnaire. The actual study period lasted seven days, from Monday to Sunday during a regular working week. On weekdays, participants filled in three daily paper-and-pencil questionnaires: one in the morning before going to work, the second around 4 p.m.

in the afternoon, and the third in the evening before going to sleep. On Saturday and Sunday, they filled in questionnaires only in the morning and in the evening. We also sent the participants text message reminders to fill in the questionnaires. Because Study 3 focused on recovery during work breaks, only measurements from weekdays (from Monday to Friday) were included in the study.

The majority of the participants of the diary study were recruited from the sample of the questionnaire study: participants of the questionnaire study were asked whether they would also be willing to take part in the diary study. Of the whole sample of 909, 208 (23%) consented. In addition to this, we recruited more participants from one municipality with the help of their school administration. All in all, 114 teachers gave their contact information. This included the participants of the earlier study ($n = 108$) and six new participants. The final number of participants who returned the diary questionnaires (i.e. the final sample size) was 107. The mean age was 50 years ($SD = 8.9$). The relatively high mean age was due to the sample selection: the cross-sectional questionnaire focused the role of ageing in recovery, hence the sample included a larger share of older teachers than the general working population of Finnish schoolteachers. Half (52%) of the participants in the diary study were class teachers or special education teachers, 37% specialized in teaching a specific subject and 10% were head teachers. Of the participants 92% worked in comprehensive schools. Most (88%) of the participants were women. The mean number of working hours per week was 37.2 ($SD = 8.0$).

2.1.3 Study 4: Intervention study

The intervention study was conducted around teachers' one-week winter holiday in February-March 2018 (around three different holiday weeks depending on participant's location in Finland). We started recruiting participants in October 2017 by informing schools in the city of Tampere about the opportunity to take part in the study. In addition, the Trade Union of Education (OAJ) published our advertisement in their magazine and on their social media page (Facebook) twice. All in all, 100 teachers from all over Finland registered to participate, most of them through social media (84 registrations). However, only 79 of them responded to the first weekly questionnaire in February 2018 and actually took part in the study. The majority of the participants (91%) were female. The mean age was 44 years ($SD = 9.29$). Most of the participants (67%) worked in comprehensive schools. The majority of the participants worked either as class teachers (30%) or subject teachers

(32%). On average, participants worked 38.9 hours per week ($SD = 6.51$). During the holiday, 40% of the participants stayed at home, 44% engaged in domestic travel and 9% travelled abroad.

One week before the four-week intervention period started, the participants were sent an email including practical information about the study, links to download the *Holidaily* intervention app and individual registration codes for the app. The study started on the Wednesday 1½ weeks before the scheduled beginning of each participant's holiday and ended on the Wednesday 1½ weeks after the end of the holiday. The participants were instructed to use the app every day (i.e., to complete one exercise per day and rate well-being and recovery with a few short questions) or as often as possible throughout the four-week intervention period. In addition to the app use, the study included five electronic questionnaires sent via email.

Weekly questionnaires were sent on Wednesdays, except the second one, which was sent on the last working day (Friday) before the holiday. 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 (Hülshager et al., 2014). However, the week before the holiday may be particularly stressful due to heavy workload (see for example; Nawijn, de Bloom, & Geurts, 2013). Therefore, the second questionnaire was sent on the last working day before starting the holiday to find out how the participants were feeling just before the start of their holiday. Along with the app use and the questionnaires, we conducted nine semi-structured qualitative interviews via phone or email (participants' choice) after the study period to find out more about participants' experiences of app use.

2.1.3.1 The *Holidaily* app

The recovery intervention was conducted with the help of a smartphone app called *Holidaily* (available for iOS and Android). The app was developed at Leuphana University in Germany (Lehr, de Bloom, & Syrek, 2016–2018), and was translated and adapted to the Finnish context as part of our larger research project. The aim of the app is to motivate users to add recovery-promoting activities and experiences to their holidays and daily lives. To the best of our knowledge, *Holidaily* is the first smartphone-based intervention aimed to promote recovery during a holiday and to prolong the duration of the beneficial effects of holidays. *Holidaily* includes daily

exercises, “Dailies” (“Daily”) designed to promote the six recovery experiences proposed in the DRAMMA model (Newman et al., 2014) and to motivate users to integrate recovery-promoting activities and experiences into their holidays and everyday lives. The exercises combine elements from positive psychology interventions (see for example Bolier et al., 2013; Sin & Lyubomirsky, 2009), behavioural activation and modification (Mazzucchelli, Kane, & Rees, 2010). Also, gamification elements (see for example, Johnson et al., 2016), such as collecting “recovery points” or adjustable avatars, are included to motivate users to use the app actively and make positive changes in their lives. The “Dailies” include, for instance, relaxation and breathing exercises, stress management exercises, savouring positive experiences and scheduling recovery-promoting activities. Here are a few examples of “Dailies”:

“Change of perspective! Remember a negative experience and work out what you have learned from it. Think of a negative experience and try to consider this experience from a different angle. The majority of our negative experiences also involve some positive elements. For example, after the initial shock of being sacked, it may lead to personal growth and space to consider working for a new branch or sector which you previously would not have considered. There is always something to be gained from a negative experience. What have you learned from your past negative experiences?”

“Smooth transition! Take a few days off from work before you leave on your holiday. Commonly, during the last day before leaving on a well-deserved holiday, people work long hours at the office, rush home to pack suitcases, set an alarm for the middle of the night to wake up in time to leave for the airport. As a result, the beginning of a holiday leaves people stressed and tense. By spending a couple of days at home, prior to your holiday, you will be able to get organized without additional stress and hassle. This will also allow you to mentally distance yourself from work, even before you have reached your holiday destination. Then, when you finally have arrived at your holiday destination, you will have no difficulties to relax and enjoy your time away. Take a picture of yourself whilst getting ready for your trip.”

“Time to relax! Do something relaxing today. Relaxation is key to a healthy mind and body. Therefore, take a well-deserved break today and choose an “activity”, which you know will do you some good. The chosen activity should make you feel calm and relaxed. For example, you could go for a walk, read a book or enjoy a massage. Try to be mindful during this activity and avoid any interruptions.”!

When the users started using Holidaily, they were asked to enter practical information about their upcoming holidays (i.e., dates and destinations) in order to receive the “Daily” suggestions timed according to their individual holiday planning. After completing each “Daily”, users were asked to rate to what extent the exercise

helped them to experience DRAMMA experiences. More details of the theoretical background and functionalities of the Holiday app can be found in Study 4.

2.2 Measures

2.2.1 Recovery experiences

In Study 1, detachment from work (e.g., “I forget about work”), relaxation (e.g., “I kick back and relax”), control (e.g., “I feel that I can decide for myself what to do”) and mastery (e.g., “I seek out intellectual challenges”) were measured with established items from the Recovery Experience Questionnaire (REQ) developed by Sonnentag and Fritz (2007) and validated in Finland (Kinnunen et al., 2011). These four experiences were measured with three items each. Meaning was measured with three items adapted from the Job Diagnostic Survey (Hackman & Oldham, 1974; e.g., “I do things which are personally meaningful for me”). Affiliation was measured with three items adapted from the Basic Needs Satisfaction in General Scale (Johnston & Finney, 2010), but due to low Cronbach’s alpha (0.44), one item (“There are not many people that I am close to”) was excluded and only two items were used in the analyses (e.g., “I really like the people I interact with” and “I get along with people I come into contact with”). The rating scale for all recovery experiences was from 1 (= totally disagree) to 5 (= totally agree), and the items referred to respondents’ free time outside working hours. In Study 2, detachment and relaxation during breaks were both measured with a single-item measure, separately concerning lunch breaks and shorter breaks between classes (“I distance myself mentally from my work during lunch breaks/breaks between classes”; “I use the time to relax during lunch breaks/breaks between classes”). These items were also based on the REQ (Kinnunen et al., 2011; Sonnentag & Fritz, 2007), but modified to apply to breaks.

In Study 3, detachment (two items, e.g., “I distanced myself from work”), relaxation (two items, e.g., “I did relaxing things”), control (one item, “I determined for myself how I spent my time”), and mastery (one item, “I did something to broaden my horizons”) during within-workday breaks were measured with items from the Recovery Experience Questionnaire (Sonnentag & Fritz), which were adapted to day-level (Bakker, Sanz-Vergel, Rodríguez-Muñoz, & Oerlemans, 2015). Break meaning was measured with one item (“I did something which was important

to me personally”) adapted from Butler and Kern (2016), and Schulenberg and colleagues (2010). Break affiliation was measured with one item (“I felt connected (belonging) with other people”) adapted from the Work-Related Basic Needs Satisfaction Scale (Van den Broeck, Vansteenkiste, De Witte, Soenens, & Lens, 2010). All recovery experiences were rated on a scale from 1 (= totally disagree) to 5 (= totally agree), and the measures referred to all breaks during the working day with the minimum duration of five minutes.

In weekly questionnaires in Study 4, detachment (e.g., “I forgot about work”) was assessed with three items from the REQ (Sonnentag & Fritz, 2007). Relaxation (e.g., “I kicked back and relaxed”) was also measured with three items from the REQ and also one new item developed for this study (“I felt at ease and enjoyed what I was doing”). Control was measured with four items (e.g., “I determined for myself how I would spend my time”) from the REQ and Chen and colleagues (2015). Mastery was assessed with five items (e.g., “I did something to broaden my horizons”) from the REQ and adapted from the Work-Related Basic Needs Satisfaction Scale (van den Broeck et al., 2010). Meaning was measured with three items (e.g., “I spent my time in a meaningful way”) adapted from Butler and Kern (2016), and Schulenberg and colleagues (2011). Affiliation was measured with three items (e.g., “I felt loved and cared about”) adapted from La Guardia and colleagues (2000), the Work-Related Basic Needs Satisfaction Scale (van den Broeck et al., 2010), and Chen and colleagues (2015). These items were partly the same as those used in Study 3 on a daily level, but in Study 4 they referred to the ongoing week.

2.2.2 Recovery activities during breaks

In addition to recovery experiences, in the diary study we examined recovery activities during within-workday breaks. In this dissertation, these results are reported as additional analyses not included in the original article (Study 3). The question concerning activities was: “Considering your lunch break and other breaks today, to what* extent did you use your time to...”. The following categories adapted from Kim and colleagues (2017) were mentioned: relaxing activities (e.g., listening to music), physical activities (e.g., stretching, walking), nutrition-intake activities (i.e., eating or drinking), social activities (e.g., chatting with coworkers, having contact with friends or family members), cognitive activities (e.g., reading newspapers, surfing the web for non-work purposes). These items were rated on a scale from 1 to 3 (1 = not at all, 2 = to some extent, 3 = very much).

2.2.3 Recovery outcomes

In Study 1 I focused on three well-being outcomes: vitality, life satisfaction and work ability. Vitality was measured with four items (e.g., “I felt alive and vital”) from the scale developed by Ryan and Frederick (1997). The items referred to feelings during the past month. The rating scale was from 1 (= very rarely or never) to 5 (= very often or always). Life satisfaction was measured with one item “How satisfied do you generally feel about your life?” (e.g., Cheung & Lucas, 2014), on a scale from 0 to 10. Work ability was measured with one item (“How would you rate your current ability to work?”) from the Work Ability Index (Tuomi et al., 1998). The item was rated on a scale from 1 to 10, where 1 refers to being totally incapable of working and 10 refers to one’s work ability at its best. It has been shown that this one-item measure accurately reflects the total work ability index (e.g., Jääskeläinen et al., 2016).

In Study 2 I focused on two well-being indicators: need for recovery and job burnout. Need for recovery was measured with the shortened scale by van Veldhoven, Prins, Van der Laken and Dijkstram (2015) based on the longer version of the scale (van Veldhoven & Boersen, 2003). The shortened scale consists of six items (e.g., “When I get home from work, I need to be left in peace for a while”), which were rated on a scale from 1 (totally disagree) to 5 (totally agree). Job burnout was measured with the Bergen Burnout Indicator-9 (Salmela-Aro, Rantanen, Hyvönen, Tilleman, & Feldt, 2011; Feldt et al., 2014), which assesses exhaustion (e.g., “I am snowed under with work”), cynicism (e.g., “I feel that I’m gradually losing interest in my pupils”) and sense of inadequacy (e.g., “I feel that I have gradually less to give”), with three items each. The rating scale ranged from 1 (totally disagree) to 6 (totally agree).

In Study 3 I focused on positive and negative affect as outcomes both in the afternoon and in the evening. Affect was assessed with seven adjectives or pairs of adjectives always referring to right now: calm/relaxed, fatigued/tired, enthusiastic, irritable, energetic/vigorous, tense and gloomy based on Warr’s framework (1990). Each item was rated on a scale from 1 to 7 with three verbal anchors (1 = not at all, 4 = to some extent, 7 = very much). These items were combined in variables of positive affect (calm/relaxed, enthusiastic, energetic/vigorous; and negative affect (fatigued/tired, irritable, tense, gloomy) for the analyses.

Study 4 included outcomes related to both well-being and job performance. Concerning well-being, I examined positive and negative affect, sleep quality and need for recovery. Affect was assessed with eight adjectives or pairs of adjectives, seven of which were the same as in Study 2 (adapted from Warr, 1990), and also one

item (alive/vital) adapted from Ryan and Frederick (1997). Sleep quality was measured with one item (“How have you slept during this week?”) from the Karolinska Sleep Index (Åkerstedt, Hume, Minors, & Waterhouse, 1994). This item was rated on a scale from 1 (= very poorly) to 5 (= very well). Need for recovery was measured with four items (e.g., “When I got home from work, I needed to be left in peace for a while”) adapted from the Need for Recovery Scale (Van Veldhoven & Broersen, 2003) and Van Veldhoven and colleagues (2015).

Job performance was examined with three concepts: task performance, concentration capacity and creativity at work. Task performance was measured with one item: “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?” (World Health Organization’s Health and Work Performance Questionnaire HPQ, Kessler et al., 2003). Concentration capacity was assessed with one item (“I felt that today my concentration capacity was good”) adapted from the Need for Recovery Scale (Van Veldhoven & Broersen, 2003). This item was rated on a scale from 1 to 7 with three verbal anchors (1 = not at all, 4 = to some extent, 7 = very much). Finally, creativity at work was measured with four items (e.g., I came up with creative solutions to problems at work) adapted from Jaussi and colleagues (2007), Tierney and colleagues (1999) and George and Zhou (2001). The items referred to the ongoing week and were rated on a scale from 1 (= never) to 7 (= always).

2.2.4 Daily emotional job demands

In Study 3 daily emotional job demands were assessed in the afternoon questionnaire with three items from COPSQ II (Pejtersen, Kristensen, Borg, & Bjorner, 2010) adapted to the current working day (e.g., “Today, my work was emotionally demanding”). The items were rated on a scale from 1 to 5 (1 = strongly disagree, 5 = strongly agree).

2.2.5 Control variables

In Study 1 I used three control variables: workload, job autonomy and having children living at home. Workload was chosen as a control variable because meta-analyses show that people who experience high levels of job stressors report lower well-being and poorer recovery experiences (Bennett et al., 2018; Crawford, LePine,

& Rich, 2010; Nixon, Mazzola, Bauer, Krueger, & Spector, 2011). Job autonomy, on the other hand, is an important job resource and associated with higher well-being (e.g., Wheatley, 2017). Having children living at home was also controlled for because it is likely that a person's family situation is related to recovery opportunities during leisure time. Workload was measured with three items (e.g., "How often does your job require you to work under time pressure?") from the scale by Spector and Jex (1998). The items were rated on a scale from 1 (= very rarely or never) to 5 (= very often or always). Job autonomy was measured with six items (e.g., "I can set my own work pace") from QPSNordic-ADW (Pahkin et al., 2008). The items were rated on a scale from 1 (very rarely or never) to 5 (very often or always). The number of children living at home was elicited with one question: "How many children do you have who live in the same household with you?". The answers to this question were recoded into a dichotomous variable (0 = no children living at home; 1 = at least one child living at home). In Study 2, only workload was controlled for. Workload was also controlled for in Study 3. It was assessed with three items adapted to daily level from Spector and Jex (1998) (e.g., "Today there was a great deal to be done" $\alpha = .79-.89$). The items were rated on a scale from 1 to 5 (1 = totally disagree, 5 = totally agree). In addition, in Study 3 I controlled for positive and negative affect in the morning (measured with same items as in the afternoon and in the evening, see detailed description above).

2.3 Statistical analyses

The data analyses utilized in all four sub-studies are introduced below and summarized in Table 1. A more detailed description of the analyses can be found in the original publications.

The main analysis strategy in Study 1 was moderated hierarchical regression analysis (Aiken & West, 1991), which was used to test the direct effects of recovery experiences and age on three well-being indicators and the moderator effects between age and recovery experiences. Also, simple slope analyses were conducted to test the significance of the relationships among younger (1 *SD* below the mean age) and older (1 *SD* above the mean age) teachers. Moderated regression analysis was also utilized as the main analysis strategy in Study 2 to test the direct effects of break detachment and relaxation and age on two well-being indicators, and again the interactions between age and recovery experiences. The analyses were performed

separately for class teachers and subject teachers. The analyses in Studies 1-2 were conducted using SPSS 24 software.

In Study 3 the diary data from five weekdays were analysed with multilevel path modelling with maximum likelihood (ML) estimation in Mplus 7.4 (Muthén & Muthén, 2015). Daily measurements were nested within individuals and multi-level modelling was used to account for the nested structure of the data. Intra-class correlations confirmed that 37% to 65% of the variance in the study variables was within individuals, which justified the use of the multilevel approach, that is, associations between variables were modelled on the within level. In addition, the pathways from afternoon positive and negative affect to evening affect were modelled on the within level. The predictor in our model (i.e., emotional demands) and the control variables, daily workload and morning positive and negative affect, were person-mean centred (see also Ohly, Sonnentag, Niessen, & Zapf, 2010). All other variables were either outcome variables or mediators and were thus not centred (cf. Aguinis, Gottfredson, & Culpepper, 2013). The model fit was assessed with the root mean square error of approximation (RMSEA), comparative fit index (CFI), and standardized root mean square residual (SRMR). RMSEA values below .07, CFI values above .95 and SRMR values below .08 indicate acceptable model fit (Hu & Bentler, 1999; Steiger, 2007). For a more detailed description of the statistical models, see the original publication. Concerning the additional analyses not reported in the original publication, a multi-level model was estimated in which all break activities were entered as predictors and all break recovery experiences as outcomes.

In Study 4 we conducted multivariate analyses (MANOVA) for repeated measures to test whether beneficial holiday effects were strengthened or prolonged by app use. These analyses were conducted in SPSS 24. We used multiple imputations to handle missing data since only 39 participants responded to all five weekly questionnaires (49% of the initial sample). For the analyses, we categorized participants into three groups based on their app use: non-users ($n = 51$), passive users ($n = 18$) and active users ($n = 10$). These groups were used as a between-subject variable and time as a repeated measure. In addition to group and time effects, we paid special attention to group \times time interaction effects to investigate whether the temporal development of outcomes differed between groups. We also analysed the within-subject effects in three user groups separately with MANOVA for repeated measures to examine whether active app use strengthened holiday effects (T1 vs. T3) or prolonged their duration (T1 vs. T4 and T1 vs. T5).

Table 1. Summary of Studies 1-4

	Study 1 Cross-sectional (N = 909)	Study 2 Cross-sectional (N = 769)	Study 3 One week (Mon-Fri) diary study with 3 daily measurement points (N = 107)	Study 4 4-week intervention study with 5 measurement points (N = 79)
Research aims	<p>To investigate:</p> <ul style="list-style-type: none"> - the relationship between six leisure-time recovery experiences and vitality, life satisfaction and work ability - how age is related to these outcomes - the moderating role of age in this relationship 	<p>To examine:</p> <ul style="list-style-type: none"> - the relationship between break detachment and relaxation and need for recovery and job burnout - how age is related to these outcomes - the moderating role of age in this relationship 	<p>To investigate:</p> <ul style="list-style-type: none"> - whether six break recovery experiences mediate the relationship between daily emotional job demands and positive affect and negative affect a) in the afternoon and b) in the evening. 	<p>To investigate:</p> <ul style="list-style-type: none"> - the effects of a one-week holiday on six recovery experiences, well-being (i.e., positive affect, negative affect, sleep quality need for recovery), and job performance (i.e., concentration capacity, task performance, creativity at work) - whether it is possible to strengthen these effects and prolong their duration with the help of a smartphone-based intervention
Main variables	<p>Recovery experiences outside working hours:</p> <ul style="list-style-type: none"> Detachment ($\alpha = .82$) Relaxation ($\alpha = .80$) Control/autonomy ($\alpha = .78$) Mastery ($\alpha = .68$) Meaning ($\alpha = .69$) Affiliation ($\alpha = .77$) <p>Recovery outcomes:</p> <ul style="list-style-type: none"> Vitality ($\alpha = .89$) Life satisfaction Work ability Age 	<p>Recovery experiences during breaks:</p> <ul style="list-style-type: none"> Detachment ($\alpha = .68$) Relaxation ($\alpha = .64$) <p>Recovery outcomes:</p> <ul style="list-style-type: none"> Need for recovery ($\alpha = .86$) Job burnout: exhaustion ($\alpha = .71$), cynicism ($\alpha = .81$), inadequacy at work ($\alpha = .81$) Age 	<p>Break recovery experiences:</p> <ul style="list-style-type: none"> Detachment ($\alpha = .83-.90$) Relaxation ($\alpha = .81-.87$) Autonomy Mastery Meaning Affiliation <p>Recovery outcomes:</p> <ul style="list-style-type: none"> Positive affect ($\alpha = .56-0.90$) Negative affect ($\alpha = .75-0.90$) Break activities Daily emotional job demands ($\alpha = .81-0.90$) 	<p>Recovery experiences outside working hours:</p> <ul style="list-style-type: none"> Detachment ($\alpha = .77-0.87$) Relaxation ($\alpha = .83-0.87$) Control/autonomy ($\alpha = .94-0.87$) Mastery ($\alpha = 0.79-0.84$) Meaning ($\alpha = .95-0.88$) Affiliation ($\alpha = .74-0.84$) <p>Well-being outcomes:</p> <ul style="list-style-type: none"> Positive affect ($\alpha = .80-0.93$) Negative affect ($\alpha = .78-0.86$) Sleep quality Need for recovery ($\alpha = .71-0.87$) Job performance outcomes: Task performance Concentration capacity Creativity at work ($\alpha = .88-0.93$)
Main data analysis	Moderated hierarchical regression analysis (SPSS)	Moderated hierarchical regression analysis (SPSS)	Multi-level path modeling (Mplus)	Repeated measures MANOVA (SPSS)

Note: Cronbach's alphas are mentioned for sum variables (others are single-item measures).

3 OVERVIEW OF THE RESULTS

In this chapter I present an overview of the main results of all studies. The exact hypotheses and summaries of the results are presented in Table 4 (pages 61-62).

3.1 Study 1

The purpose of this study was, firstly, to examine how six recovery experiences (detachment from work, relaxation, control, mastery, meaning and affiliation) during off-job time based on the DRAMMA model (Newman et al., 2014) are related to well-being (vitality, life satisfaction and work ability). Secondly, I examined how age was related to these well-being outcomes. Thirdly, I investigated whether age moderated the relationships between recovery experiences and well-being outcomes. Of the control variables, workload was negatively related to vitality and job autonomy was positively related to all well-being outcomes. In addition, having children living at home was related to higher levels of all well-being outcomes. None of the six recovery experiences was significantly related to work ability. Older age was related to lower work ability, but not to vitality or life satisfaction. As expected, several recovery experiences during off-job time showed positive associations with the well-being outcomes examined. Detachment, relaxation, control and mastery were related to higher vitality. Together, the recovery experiences explained 16% of the variance in vitality. Detachment, relaxation, meaning and affiliation were associated with higher life satisfaction. Recovery experiences explained 14% of the variance in life satisfaction. In line with expectations, age was found to moderate the relationship between some off-job recovery experiences and well-being. Older teachers benefitted more from experiences of control and mastery than did younger teachers in terms of vitality. On the other hand, younger teachers benefitted more from relaxation in terms of all three well-being outcomes. The interactions added 1% to the explanation rate in the models including vitality and life satisfaction, and 2% in the model including work ability.

3.2 Study 2

The aim of Study 2 was, firstly, to investigate whether experiencing detachment and relaxation during breaks had a negative association with need for recovery and job burnout. Secondly, we examined how age was related to these outcomes and, thirdly, whether age moderated the relationships between two recovery experiences during workday breaks and two well-being outcomes among class and subject teachers. As expected, detachment from work and relaxation during breaks in the working day were associated with lower levels of both need for recovery and burnout. Detachment explained 7–36% of the variance in well-being outcomes, whereas relaxation explained 7–20% of the variance in the outcomes. Of burnout dimensions, age played a role in sense of inadequacy: older teachers reported experiencing inadequacy at work more often than did younger teachers. This concerned both class teachers and subject teachers. Age was not directly related to need for recovery. Age moderated the relationships between break detachment and relaxation and exhaustion, inadequacy at work and need for recovery, but these effects were only found among subject teachers. Interactions added 1–2% to the explanation rate. Older subject teachers benefitted more from break detachment and relaxation in terms of well-being than did their younger colleagues. One reason for the finding may be that both recovery experiences were more common among subject teachers than class teachers.

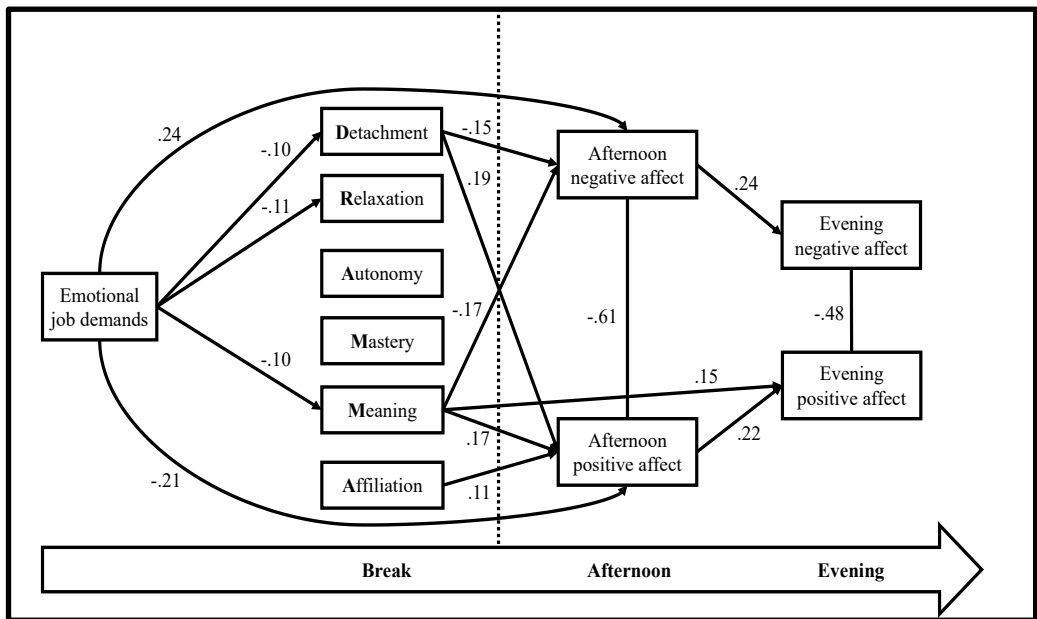
3.3 Study 3

3.3.1 Original results concerning recovery experiences

The purpose of Study 3 was to investigate six recovery experiences (detachment, relaxation, autonomy, mastery, meaning and affiliation) during within-workday breaks as possible mediators between daily emotional job demands and positive and negative affect both in the afternoon and in the evening. An overview of the results is presented in Figure 1 (see page 56). Emotional demands were negatively related to positive affect and positively related to negative affect in the afternoon. Emotional demands were not directly related to positive or negative affect in the evening. In our sample, the most commonly reported break recovery experience was affiliation, whereas detachment was reported least frequently. Concerning afternoon affect, low

break detachment mediated the relationship between high daily emotional demands and low positive affect, and low break meaning mediated the association between high daily emotional demands and high negative affect. Regarding evening affect, only low break meaning mediated the association between high daily emotional demands and low positive affect. In addition, several direct associations were found: High daily emotional job demands were related to lower levels of detachment, relaxation and meaning during breaks. Of the break recovery experiences, affiliation during within-workday breaks also seemed to promote teachers' affective well-being.

Figure 1. Within-level results of the significant relationships between emotional demands, break recovery experiences and afternoon and evening affect.



5.3.2. Additional results concerning break activities

In addition to the results described above and reported in the original article, I examined which break activities were most commonly reported and which activities were linked to each break recovery experience. Break activities were dummy coded so that 0 indicated that a certain activity was not engaged in on a certain day and 1 indicated that this activity was engaged in. A frequency analysis showed

that nutrition intake (i.e., eating or drinking) activities (91% of the 511 occasions) and social activities (87% of the 519 occasions) were the most common, almost daily reported break activities, whereas relaxing (16% of the 517 occasions), cognitive (20% of the 519 occasions) and physical activities (26% of the 518 occasions) were reported less frequently.

Correlations between break activities and break recovery experiences are shown in Table 2. These analyses revealed that almost all break activities, except nutrition intake, were positively correlated with break recovery experiences. The highest correlations were found between social activities and affiliation ($r = .69$), social activities and meaning ($r = .49$) and relaxation activities and relaxation ($r = .48$).

To gain more insight into the unique day-to-day variance a certain break activity explained within break recovery experiences, it was necessary to control for the other break activities. Therefore, another multi-level model was estimated in which all break activities were simultaneously entered as predictors and all break recovery experiences as outcomes. Due to the large number of variables entered into the same model, the model terminated normally but was fully saturated ($\chi^2(0) = 0.000$, CFI > .999, RMSEA < .001, SRMR_{within} < .001, SRMR_{between} < .001). Estimates and standard errors of all relations are presented in Table 3.

The results revealed that on the days when participants engaged in *relaxing break activities*, they reported higher break detachment, relaxation, autonomy and meaning. Daily *physical break activities* were positively associated with all break recovery experiences except for break autonomy. *Nutrition intake break activities* were not related to any of the break recovery experiences, whereas daily *social break activities* were positively associated with all break recovery experiences. Finally, on the days when participants engaged in *cognitive break activities*, they also reported increased break detachment, relaxation, autonomy and mastery.

Table 2. Correlations between day-level break recovery experiences and break activities.

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1. (D) Break detachment										
2. (R) Break relaxation	.64**									
3. (A) Break autonomy	.58**	.62**								
4. (M) Break mastery	.39**	.37**	.37**							
5. (M) Break meaning	.37**	.62**	.50**	.35**						
6. (A) Break affiliation	.30**	.37**	.25**	.29**	.44**					
7. Relaxing activities ^a	.41**	.48**	.33**	.18	.31**	-.01				
8. Physical activities ^a	.36**	.35**	.23	.35**	.40**	.26**	.26**			
9. Nutrition intake activities ^a	.17	.17	.24*	.07	.14	.28**	-.10	.04		
10. Social activities ^a	.31**	.44**	.45**	.34**	.49**	.69**	.04	.25*	.22*	
11. Cognitive activities ^a	.39**	.42**	.41**	.26**	.29**	.05	.43**	.19*	.01	.20*

* $p < .05$, ** $p < .01$ ^a Break activities were dummy coded so that 0 indicated that a certain activity was not engaged in on a certain day and 1 indicated that this activity was engaged in. **Note:** Correlations between day-level variables are average scores across the five measurement days.

Table 3. Multi-level estimates (γ) and standard errors (SE) of the multi-level model including all break activities and break recovery experiences.

	(D) Detachment		(R) Relaxation		(A) Autonomy		(M) Mastery		(M) Meaning		(A) Affiliation	
	γ	SE	γ	SE	γ	SE	γ	SE	γ	SE	γ	SE
Relaxing activities	.14**	.05	.34**	.04	.22**	.05	.07	.05	.19**	.05	.05	.05
Physical activities	.13*	.05	.10*	.05	.03	.06	.18*	.05	.23**	.05	.15*	.05
Nutrition intake activities	-.04	.05	-.04	.04	-.05	.05	-.03	.05	-.02	.05	-.01	.05
Social activities	.11*	.05	.22**	.04	.17**	.05	.18**	.05	.12*	.05	.39**	.04
Cognitive activities	.19**	.05	.22**	.05	.20**	.05	.14*	.05	.09	.05	-.05	.05

3.4 Study 4

The main aim of Study 4 was to ascertain whether beneficial holiday effects on recovery experiences, well-being and performance existed among teachers, and if it was possible to strengthen and prolong these effects with the help of a smartphone-based intervention called *Holiday*. The study consisted of two pre-holiday measurements (T1-T2), one measurement during the holiday (T3), and two post-holiday measurements (T4-T5). Because low adherence was a problem in this study, we investigated whether the participants who used the app more actively differed from non-users or passive users at baseline (T1) in the background characteristics or outcomes mentioned above. No significant differences were found between the three app use groups in background characteristics or outcome variables at baseline. Secondly, we investigated if there was a dose-response relationship in app use: whether more intensive use of the app resulted in stronger and longer lasting effects. Thus, we ascertained if temporal development of outcome variables differed between non-users, passive app users and active app users. Finally, we conducted a few qualitative interviews to find out more about participants' experiences concerning the app use.

As expected, the results showed beneficial holiday effects in terms of recovery experiences and well-being. Of the performance-related outcomes, creativity at work was rated lower a few days after the holiday than at baseline (except among active app users) but increased slightly above baseline 1.5 weeks after the end of the holiday. App use failed to strengthen the beneficial holiday effects in all user groups. However, active app use prolonged the beneficial holiday effects on lower negative affect and also seemed to protect against a decrease in creativity at work immediately after the holiday. In the qualitative interviews, several participants reported challenges related to recovery from work, and told us that these challenges were an important motivation for them to participate in this study.

Table 4. Hypotheses and results.

Study	Hypotheses	Results
1 (questionnaire study)	H1: Recovery experiences are related to higher a) vitality, b) life satisfaction and c) work ability.	Detachment, relaxation, control and mastery → higher vitality (H1a partially supported) Detachment, relaxation, meaning and affiliation → higher life satisfaction (H1b partially supported) H1c: not supported
	H2: Age relates to lower work ability, and likely also to lower life satisfaction and vitality.	Higher age → lower work ability but not related to life satisfaction or vitality (H2 partially supported)
	H3: Age moderates the relationship between recovery experiences and well-being (no specific hypotheses due to explorative nature of the question).	Older teachers benefitted more from control and mastery during off-job time in terms of vitality. Younger teachers benefitted more from relaxation in terms of all well-being outcomes. (H3 partially supported)
2 (questionnaire study)	H1: Experiencing a) detachment from work and b) relaxation during workday breaks relates to lower levels of need for recovery and job burnout.	Break detachment and relaxation → lower need for recovery and burnout (H1 fully supported)
	H2: Age relates to lower levels of need for recovery and job burnout.	No relationship between age and lower need for recovery or burnout (H2 not supported) However, higher age related to higher level of sense of inadequacy.
	H3: Age moderates the negative association between break detachment and relaxation with need for recovery and job burnout so that the association is stronger among older teachers than among younger teachers.	Older subject teachers benefitted more from break detachment and relaxation in terms of lower exhaustion and sense of inadequacy at work than did younger ones. They also benefitted more from break detachment in terms of need for recovery (H3 partially supported)
3 (diary study)	H1: Daily emotional job demands are negatively related to recovery experiences during breaks.	Daily emotional job demands → lower break detachment, relaxation, autonomy, and meaning No association to mastery or affiliation. (H1 partially supported)
	H2: Daily emotional job demands predict lower positive affect (PA) and higher negative affect (NA) a) in the afternoon and b) in the evening.	Daily emotional demands → lower PA and higher NA in the afternoon (H2a fully supported) Daily emotional demands were not related to positive or negative affect in the evening (H2b not supported)

	H3: Break recovery experiences predict higher PA and lower NA a) in the afternoon and b) in the evening.	Detachment and affiliation → higher PA in the afternoon. Meaning and affiliation → lower NA in the afternoon. Detachment and meaning → higher PA in the evening (H3a and H3b partially supported)
	H4: Recovery experiences mediate the relationship between daily emotional demands and PA and NA a) in the afternoon and b) in the evening.	Detachment mediated the relationship between daily emotional demands and afternoon PA Meaning mediated the relationship between daily emotional demands and afternoon NA. Meaning mediated the relationship between daily emotional demands and evening PA. (H4a and H4b partially supported)
4 (intervention study)	H1: Teachers report more recovery experiences, better well-being and better job performance during and after a vacation than before.	Most recovery experiences and well-being variables increased during the vacation and returned to baseline (pre-vacation) levels after the vacation (H1 partially supported)
	H2: Active use of the Holidaily app strengthens the positive vacation effect on recovery experiences, well-being and job performance.	App use did not strengthen the effects (H2 not supported)
	H3: Active use of the Holidaily app prolonged the positive holiday effect on recovery experiences, well-being and job performance.	Among active app users, creativity at work increased slightly from baseline to after the holiday, whereas among non-users it decreased and among passive users it decreased a few days after the holiday but increased again 1.5 weeks after the vacation. The fading of beneficial holiday effects on negative affect was slightly slower among active users. (H3 partially supported)

4 DISCUSSION

The main aim of this collection of four studies was to gain new insights into teachers' recovery processes during within-workday breaks, off-job time and holidays based on the DRAMMA model (Newman et al., 2014).

4.1 Summary of the main findings

The results of Study 1, which focused on leisure-time recovery and ageing, showed that age was significantly related to lower work ability, but not to the other well-being variables examined. Recovery experiences during off-job time were consistently related to vitality and life satisfaction, but not to work ability. Age moderated the relationship between some recovery experiences and well-being: younger teachers benefitted more than older teachers from free-time relaxation in terms of all well-being outcomes (i.e., vitality, life satisfaction and work ability), whereas older teachers benefitted more than younger ones from control and mastery in terms of vitality. Additionally, older teachers seemed to recover better from work during off-job time than did younger ones: age correlated with higher detachment, relaxation, control and mastery during off-job time.

In Study 2, focusing on break recovery and the role of age, it was found that detachment and relaxation during breaks were related to lower need for recovery and burnout. Age was only related to one burnout symptom, namely experiencing inadequacy at work. Moderator effects were also found: older subject teachers benefitted more than their younger colleagues from break detachment and relaxation in terms of need for recovery as well as in terms of exhaustion and sense of inadequacy, two sub-dimensions of burnout.

Study 3 focused on break recovery experiences and affective well-being on a daily level. The results showed that break detachment, affiliation and meaning were associated with higher affective well-being in the afternoon. Meaning during breaks was also related to higher well-being (positive affect) in the evening. Break detachment and meaning acted as underlying mechanisms, that is, as mediators between daily emotional job demands and affective well-being. This means that on

days when teachers experienced higher emotional job demands, they experienced less detachment and meaning during breaks, which, in turn, was associated with lower well-being later in the day. Additional analyses revealed that all break activities (relaxing activities, physical activities, social activities, cognitive activities) except for eating and drinking, were related to higher levels of break recovery experiences.

Study 4, focusing on a digital recovery intervention applied via a smartphone app before, during and after a one-week holiday, found that most recovery experiences and well-being outcomes intensified during the holiday, but these beneficial vacation effects mostly faded during the first few days after resuming work. Active use of the intervention app failed to strengthen the positive holiday effects but seemed to prolong beneficial holiday effects on affect (i.e., lower negative affect) after the holiday and protect against a decrease in creativity after the holiday.

4.2 Theoretical contributions

The findings of this dissertation expand the existing research in several ways. In this chapter I discuss the findings of all four studies in relation to theoretical conceptualizations, earlier empirical studies and the existing gaps in recovery literature identified in the Introduction.

4.2.1 Support for recovery theories and the DRAMMA model

This research project lends further support to the most widely used theories on recovery: the Effort-Recovery Model (Meijman & Mulder, 1998) and Conservation of Resources Theory (Hobfoll, 1989). Most of the hypotheses, which were mainly derived from these theories, gained support in this study. The findings of this study also support the main theoretical model used, the DRAMMA model (Newman et al., 2014). In addition to the four recovery experiences proposed by Sonnentag and Fritz (2007), experiences of meaning and affiliation – both during off-job time and during breaks in the working day – seem to promote recovery from work. This affords a more nuanced and multidimensional perspective on recovery than earlier studies, which have mainly focused on four (or fewer) recovery experiences (for a meta-analysis, see Bennett et al., 2018). It could be argued that the research so far on recovery experiences has focused quite a lot on passive recovery processes, because detachment and relaxation seem to be the most studied recovery experiences so far

(for a review, see Sonnentag et al., 2017). By contrast, the DRAMMA model leans towards a more active perspective on recovery by replacing control with a broader concept of autonomy and adding the experiences of meaning and affiliation to the list of important recovery experiences (Newman et al., 2014).

The findings from Study 1 show that leisure-time DRAMMA experiences were associated with context-free well-being (i.e., vitality and life satisfaction) on a cross-sectional level. Compared to these two outcomes, work ability is more dependent on physical health status (Ilmarinen, 2009). For this reason, it is probably more difficult to influence work ability with leisure recovery experiences. The results also imply that some of the DRAMMA experiences are not only beneficial during off-job time but also during breaks within the working day. Study 2 showed that break detachment and relaxation were related to lower need for recovery and burnout, which is in line with findings from earlier studies (e.g., Bosch et al., 2018; Sianoja et al., 2016; 2018; von Dreden & Binnewies, 2017). The associations concerning need for recovery and exhaustion were stronger than for cynicism or sense of inadequacy. This may be explained by the fact that need for recovery and exhaustion occur at an early phase of burnout and may therefore be easier to alleviate than cynicism and sense of inadequacy (Maricutoiu, Sava, & Butta, 2016; Maslach et al., 2001). In Study 3, DRAMMA experiences during breaks were examined on a daily level. In addition to break detachment, break meaning and affiliation were associated with higher affective well-being. Actually, even a small amount of break detachment may suffice to achieve well-being benefits: detachment was actually the least often reported recovery experience during breaks, but it was still beneficial for affective well-being. The findings of Study 4 showed that even a short holiday (i.e., one week) is a good opportunity to increase most DRAMMA experiences: levels of all recovery experiences except mastery increased during the holiday compared to the situation before or after it.

The DRAMMA model is not originally specifically focused on recovery from work: to be precise, the purpose of the model is to explain how leisure relates to subjective well-being (Newman et al., 2014). It matters whether we conceptualize people's leisure experiences only in relation to work (which happens when we talk about recovery from work) or when we look, for example, at how leisure satisfies people's basic needs – which concerns each and everyone, not only those in the workforce, although this study has focused on practising teachers. Within work psychology, leisure is most often seen as a by-product of work. However, leisure can also be seen as activity generated by an inner attitude of voluntary engagement, self-examination and personal development, which does not only serve the purposes of

economy and working life, but of good life in general (Beatty & Torbert, 2003). The DRAMMA model combines the perspectives of recovery and needs satisfaction and is therefore an important addition to the work psychology literature.

4.2.2 Recovery from work during the workday

The results of my dissertation expand the hitherto limited empirical evidence concerning internal recovery (i.e., recovery during breaks during the working day) and its relationship to well-being after working hours.

In Study 2, break detachment and relaxation during breaks were related to lower need for recovery and burnout. In Study 3, break detachment, affiliation and meaning were associated with higher affective well-being in the afternoon and break meaning was also related to better well-being in the evening. Previous studies have also found that low break detachment hampers internal recovery (Rhee & Kim, 2016; Sianoja et al., 2018; Von Dreden & Binnewies, 2017). The finding that affiliation during breaks was conducive to recovery is in line with earlier studies showing that experiencing relatedness as well as social activities during breaks is beneficial to recovery (Bosch et al., 2018; Kim et al., 2017; Von Dreden & Binnewies, 2017). This study also expanded the existing research by showing that experiences of meaning during breaks are beneficial for internal recovery. Surprisingly, in Study 3 break relaxation and autonomy did not relate significantly to affective well-being, although diary studies suggest that these experiences are important for internal recovery (Bosch et al., 2018; Kim et al., 2017; Sianoja et al., 2018). One explanation for this may lie in strong correlations between detachment, relaxation and autonomy. When these are all taken into account simultaneously, the direct links from relaxation and autonomy to affect (seen at a correlational level) disappeared. Also, earlier studies have focused exclusively on lunch breaks (Bosch et al., 2018; Sianoja et al., 2018) or very short micro-breaks (Kim, Park, & Niu, 2017), whereas we investigated all breaks during the working day.

The results of Study 3 show that of the six DRAMMA experiences, break detachment and meaning functioned as underlying mechanisms between daily emotional job demands and affective well-being. On days when the teachers reported high emotional demands, they experienced less break detachment and consequently experienced less positive affect in the afternoon. Also, on days when the teachers experienced less break meaning due to high emotional job demands, they experienced more negative affect in the afternoon and less positive affect in the

evening. Therefore, this study revealed new pathways through which high emotional demands are detrimental to well-being at the day level. Although research has shown that detachment during leisure time may function as a mediating mechanism (Bennett et al., 2018; Kinnunen et al., 2011; Schraub et al., 2013), this study was the first to show that detachment during breaks also plays a mediating role. Meaning can be considered a new underlying mechanism which has so far received very limited research attention. Additional analyses showed that engaging in relaxing, physical or social activities during breaks was related to experiences of meaning. This suggests that break activities such as listening to music, stretching or walking, and chatting with co-workers can help teachers have more meaningful breaks. Also, studies have shown that good co-worker relations are related to meaningful work among teachers (e.g., Fouché, Rothmann, & Van der Vyver, 2017). It is likely that these relationships can also make workday breaks more meaningful.

The findings of Study 3 show that successful break recovery in terms of recovery experiences is related to affective well-being not only at the end of the working day, but also several hours later in the evening. In this study, I did not specifically investigate recovery experiences or activities in the evening. However, it is possible that when employees have managed to recover from work already during the working day, they may have more energy to engage in recovery-promoting activities during off-job hours. Research has consistently shown that external recovery during off-job time is essential to occupational well-being (e.g., Sonnentag et al., 2017). The findings of this study suggest that it is already possible to support leisure recovery processes during the working day. Potentially, when people finish their working day feeling relatively refreshed instead of completely exhausted, they have more energy to engage in recovery-promoting activities in the evening – which, in turn, produces beneficial recovery experiences (see also Sonnentag & Jelden, 2009).

The cross-sectional findings from Study 2 highlight the fact that working conditions are an important factor in recovery during the working day. The finding that moderator effects between recovery experiences and age were only found among the subject teachers may be associated with the perception that they had better recovery opportunities at work than did the class teachers. Thus, their breaks fulfilled the break criteria better: Hunter and Wu (2016) suggest that during a break attention is distracted from work tasks. Class teachers are often obliged to supervise their pupils during breaks, which limits their opportunities to detach and relax then. It may be that moderator effects only emerge when a certain threshold of recovery opportunities is achieved.

4.2.3 The role of ageing in recovery from work

The findings of this study add to the knowledge regarding the role of ageing in psychological recovery. Only a few studies have so far examined how ageing is related to recovery, and these studies focused on the age-related changes in need for recovery rather than on the recovery processes (such as recovery experiences) as such (Kiss et al., 2008; Mohren et al., 2010). To the best of my knowledge, no previous studies have investigated age as a moderator between recovery experiences and well-being. I found that age plays a role with regard to which recovery experiences are the most beneficial for employees. Concerning recovery during off-job time (Study 1), younger teachers benefitted more from relaxation and older ones benefitted more from control and mastery in terms of well-being. In addition, older subject teachers benefitted more from detachment and relaxation during breaks than their younger colleagues in Study 2.

Both Studies 1 and 2 suggest that older teachers, on average, are able to recover from work more successfully than younger teachers. In Study 1, older teachers seemed to have higher levels of leisure-time recovery experiences than their younger colleagues: age correlated positively with detachment, relaxation, autonomy and mastery. This may be attributable to older teachers' longer work experience: they may have learned more effective recovery skills and know what helps them to relieve work-related stress. This is compatible with findings suggesting that age is often associated with better emotion regulation competence (Scheibe & Zacher, 2013). However, the older teachers in our sample did not always benefit more from recovery experiences than younger teachers. There are several possible explanations for the moderator effects we found. Firstly, family demands usually change with age: younger teachers more often have children living at home, which likely increases family demands and may result in a higher need for relaxation. This may explain why the younger teachers benefitted more from relaxation than did the older ones. Secondly, life-span theories can be utilized to explain why we found age-related differences in leisure-time control and well-being. Socioemotional selectivity theory (Carstensen, 2006) and dynamic integration theory (Labouvie-Vief, 2003) suggest that older people prioritize emotional goals over achievement goals. It may be that control over one's leisure time was more important for the older teachers than the younger ones, who may be more focused on work and family related goals. Different family situations may also explain why the older teachers benefitted more from mastery experiences than did the younger teachers. Due to lower family demands, older teachers may have more opportunities for these experiences, such as engaging

in hobbies. Younger teachers may also have more mastery experiences at work (e.g., building up a career and learning new skills), while older teachers start gradually to engage in downshifting and preparing for retirement (see for example, Scheibe & Zacher, 2013). In addition, older teachers usually have longer work experience and therefore it may be more difficult for them to have mastery experiences at work than it is for their younger colleagues. A recent diary study showed that people benefit particularly from satisfaction of their need for competence outside work when this is not satisfied at work (Hewett et al., 2017). This may partly explain our finding that the older teachers benefitted more from mastery during off-job time than did the younger teachers.

In Study 2, experiencing detachment and relaxation during breaks seemed to depend more on working conditions (i.e., working as class vs. subject teachers) than on age. Nevertheless, age played a minor role, which is in line with theoretical considerations on age differences in emotion regulation: older subject teachers benefitted more from both detachment and relaxation in terms of need for recovery, exhaustion and sense of inadequacy. The use of strategies related to distracting from the stressful situation – such as detachment and relaxation – tends to increase with age (Scheibe & Zacher, 2013). This is probably related to older adults' emotion regulation competence, which helps them to choose appropriate emotion regulation strategies (Blanchard-Fields, 2007; Blanchard-Fields et al., 2007; Charles & Carstensen, 2010). Distraction strategies are helpful for recovery as they allow employees to avoid work-related cognitions which maintain negative psychophysiological activation (Sonnentag & Fritz, 2015). The moderator effects were in line with the findings from Study 1: again, the older teachers benefitted more from relaxation, and also detachment. Age likely gave the teachers more competence and experience to initiate detachment and relaxation during breaks and benefit from them (see Scheibe & Zacher, 2013).

4.2.4 Occupational e-mental health

Study 4 constitutes an important advance in the relatively new, developing field of occupational e-mental health. Our intervention study was one of the first smartphone-based interventions specifically designed to support recovery from work. Moreover, to the best of my knowledge *Holidayly* is also the first intervention designed to strengthen and prolong the beneficial effects of holidays. Most studies focusing on occupational e-mental health have utilized internet-based interventions

instead of smartphones (Lehr et al., 2016). Smartphone-based technology is not only cost-effective, but also easily accessible to employees, meaning that it can facilitate incorporating interventions into everyday life. Mobile interventions offer high levels of flexibility: for instance, in the *Holidaily* app, users were always able to choose from several different exercises. This freedom of choice may help participants to preserve a sense of autonomy over their leisure time.

The findings of Study 4, which showed beneficial but short-lived holiday effects in terms of recovery experiences and well-being, concur with the results of earlier studies (e.g., De Bloom et al., 2009; Reizer & Mey-Raz, 2018). In addition, the result that creativity at work was rated lower immediately after the holiday but increased slightly above baseline ten days later is in line with findings showing links between taking a holiday and creativity (De Bloom, Ritter, Kühnel, Reinders, & Geurts, 2014). These results tentatively suggest that engaging in intentional recovery-promoting activities presented in a gamified app may prolong some beneficial holiday effects, although the effects were marginal. A few intervention studies have suggested that recovery from work can be supported with web-based interventions (Ebert et al., 2015; 2016; Thiart et al., 2015). However, none of the previous interventions focused specifically on recovery processes during a holiday. The first study using the same *Holidaily* app (Smyth et al., 2018) found preliminary evidence suggesting that app use may prolong recovery, but the focus of their study was more on user experiences.

The results from Study 4 demonstrated that, in addition to their advantages, mobile interventions also have challenges. Mobile interventions may be accessible to large groups of people, but dropout and low adherence are common problems (for a meta-analysis, see Carolan et al., 2017). Because of low adherence and a scarcity of active participants, “active” app use in our study refers to being active on a very low level (i.e., using the app sporadically and not necessarily every day). However, the results of Study 4 show that even a small amount of app use can make a positive difference: even though most active users only used the app occasionally, a few differences between active users and non-users or passive users were still found. This suggests that more intensive, daily app use could increase and prolong beneficial holiday effects on well-being. One possible reason for not engaging in the intervention actively is lack of guidance. The provision of guidance usually increases engagement in occupational e-mental health interventions (Carolan et al., 2017). Meta-analyses of online interventions targeted at alleviating stress and depression also suggest that guidance improves adherence and effectiveness (Heber et al., 2017; Richards & Richardson, 2012). The *Holidaily* app includes an instruction video, and

we also provided additional instructions for the app by email. This apparently did not suffice to engage all participants in using the app. Personal guidance would probably have increased adherence, but unfortunately our financial and personnel resources did not suffice for this. Future research could benefit from combining e-health tools with in-company group sessions or individual coaching.

4.3 Methodological evaluation of the study

This study has several limitations, which need to be considered when drawing conclusions. I next discuss a few important issues concerning the methodological aspects of this dissertation.

First of all, all the data I utilized were based on self-reports, which means that common method variance may have affected the results. Nevertheless, self-reports may be the most important and appropriate measures of recovery experiences and outcomes related to psychological well-being. These are, after all, internal experiences, which means that they are difficult to capture using “objective” measurements. Physiological measures such as blood pressure or cortisol levels have previously been used in recovery research (for an overview, see Sonnentag & Geurts, 2009), but physiological studies do not always yield unequivocal results. Moreover, in addition to quantitative studies like ours, qualitative studies concerning recovery from work would offer new perspectives on employees’ subjective experiences. According to Spector and Pindek (2016), qualitative approaches should be used more widely in work psychology, especially in more explorative studies concerning questions that have previously received little attention. In addition, some of the measures utilized (especially concerning recovery during within-workday breaks) were single-item measures. One-item measures have often been found valid (Fisher, Matthews, & Gibbons, 2016) and they reduce the burden on participants. Yet one-item measures can be criticized because they may not adequately represent the content of complex constructs, and their internal consistency estimates of reliability cannot be calculated (see for example, Fisher et al., 2016). Thus, using multiple-item measures in future studies would give a more nuanced perspective on recovery processes. Also, the relatively low Cronbach’s alphas of some measures may limit the reliability of the results. In Study 3, the timing of daily measurements can to some extent be considered a limitation. Affective outcomes in the afternoon were

measured at the same time as break recovery experiences and daily emotional job demands. Even though the participants were requested to rate their break recovery experiences during the whole workday and affect at the exact time of filling in the questionnaire, it is possible that current affective state also played a role in the retrospective ratings of break experiences. Moreover, we did not differentiate between different types of breaks. Thus, I was not able to compare recovery processes during lunch breaks and shorter breaks between classes. Regarding the measures, it is also possible that we disregarded certain characteristics which may play a role in recovery. For instance, no measures regarding personality or other individual characteristics were included. Therefore, it was not possible to take into account their possible role in recovery or in predicting the outcomes used. Many studies show that personality is associated with health and well-being (e.g., Strickhouser, Zell, & Krizan, 2017; Sun, Kaufman, & Smillie, 2018). For example, more marked conscientiousness, extroversion and less neuroticism are consistently related to better well-being (Strickhouser et al., 2017). However, little is known about the role of personality in recovery from work (Sonnetag et al., 2017). It is possible, for instance, that employees with higher levels of neuroticism (i.e., tendency to be emotionally unstable and prone to negative emotions) may find unwinding after a stressful workday especially difficult. In addition, there is some preliminary evidence suggesting that among teachers some aspects of perfectionism may be associated in lower levels of detachment from work (Gluschkoff et al., 2017). Moreover, traits such as extroversion and introversion may play a role in which recovery activities people find the most restorative: for example, extroverts may prefer group hobbies more than introverts. In addition to personality, motivational factors may play a role in recovery processes. For example, recent findings by Olafsen and Bentzen (2020) suggest that low detachment from work may not be detrimental when combined with high levels of autonomous work motivation. Actually, in their study individuals with both high levels of detachment and low levels of autonomous motivation showed poorer well-being outcomes than individuals with low levels of detachment but high levels of autonomous motivation. Future studies could add to this knowledge by investigating the interplay between motivational factors and other recovery experiences.

Studies 1 and 2 were based on cross-sectional data, which means that causal conclusions should not be drawn. Nevertheless, cross-sectional designs have been recommended when conducting exploratory research such as ours (Spector, 2019): the relationship between ageing and recovery in particular has received so little scholarly attention that our investigation concerning these issues can be considered

exploratory. Studies 3 and 4 provide stronger evidence of causal relationships than Study 1 because these studies were within-person longitudinal studies. However, Study 3 did not include manipulation of variables, like an intervention. Study 4, the intervention study, allowed us to compare recovery, well-being and performance over time in different app user groups. The group of non-users could be considered a proxy for a control group – especially because their background characteristics did not differ from the characteristics of app user groups. However, this was still not an actual control group, which limits the causal interpretation of the results. Technical problems hampered the implementation of the study and likely also had an impact on the results; many participants stopped using the app due to its slowness and other technical problems. This highlights the importance of effortless user experience in online or smartphone-based interventions (see also Smyth et al., 2018).

Additionally, the sample selection entails some limitations. The response rate in Studies 1 and 2 was low but comparable to those of earlier studies in organizational research (see for example, Baruch & Holtom, 2008). One possible reason for the low response rate was the timing of the questionnaire: the data were collected during May, very close to the end of the academic year, which is an exceptionally busy time period for schoolteachers. Despite the low response rate, only a few differences were found when we compared the questionnaire participants' background information to data on the members of the Trade Union of Education: the participants were slightly older (which is explained by how our sample was selected), more commonly women and subject teachers than those teachers registered as members of the Union. Naturally, it is possible that the most overburdened teachers lacked the energy and motivation to participate in our study, especially at a time when they most likely had a lot of important work-related duties (e.g., grading exams, progress discussions with parents for the next school year). The majority of the participants in Study 3 were teachers who participated in Study 1 and who expressed their interest in taking part in the diary study as well. This means that this was a selective convenience sample. The same applies to the sample of the intervention study. Of all three studies, the recruitment of participants for this intervention study proved the most challenging. This is not surprising given that the study was time-consuming and required effort on the part of the participants: the research period lasted five weeks and included both app use and filling in several questionnaires. The majority of the participants in the intervention were recruited via the Teachers' Union's social media (Facebook); other recruitment methods, such as advertising at a teachers' event and in the Union's magazine, did not yield the desired results. Therefore, the sample was not representative of all Finnish schoolteachers.

Concerning the intervention, it is also important to consider that although smartphone apps are promising tools in promoting well-being, they may not be ideal for everyone. It is possible that they cause stress for individuals who are not comfortable using mobile technology. Older teachers in particular frequently experience technostress, i.e., stress related to ICT use at work (e.g., Syvänen et al., 2016). It is possible that at worst, smartphone interventions could just be another source of technostress for them. Furthermore, smartphone use can sometimes impede recovery because technology blurs the boundaries between work and home domains and allows constant access to work-related activities, thereby preventing detachment from work (e.g., Van Laethem, van Vianen, & Derks, 2018). From this perspective, it may be difficult to set boundaries between beneficial and detrimental smartphone use during off-job time.

Finally, because this study focused exclusively on schoolteachers, the results cannot be generalized to other occupations. On the other hand, this was not my purpose: the main goal of this study was to contribute new insights into teachers' recovery processes, which likely differ from those of other knowledge workers because of differences in job characteristics.

4.4 Directions for future research

In the earlier parts of the discussion I already mentioned various ideas which deserve further research. In the following, I propose a few more directions for future research which have not previously been discussed in detail.

The findings of this dissertation suggest several avenues for future research. The relationship between age and recovery from work deserves further attention because the workforce is ageing rapidly in many countries. Longitudinal studies could offer a more detailed picture of how ageing impacts recovery and how healthy ageing in terms of occupational well-being could be supported. Within-person studies over longer time spans would yield more information about how recovery processes change during an individual's life course. Also, future studies could investigate non-linear relationships between ageing and recovery because studies concerning need for recovery show that ageing and this need do not necessarily have a linear relationship with each other (Kiss et al., 2008; Mohren et al., 2010). Studies on recovery also suggest that some recovery experiences show curvilinear rather than linear relationships with well-being (Shimazu et al., 2016). Thus, more of an experience is not necessarily better, but there may be some optimal levels. More

research to investigate these complex relationships between recovery and well-being are warranted. In addition, since this research project only focused on schoolteachers, future studies could expand our results by investigating the relationship between recovery and ageing in other occupational groups.

Another issue that deserves more scholarly attention is the relationship between different temporal settings of recovery: recovery during within-workday breaks and recovery during off-job hours. For example, it would be interesting to investigate whether break recovery experiences and activities are related to experiences and activities in the evening, or maybe even well-being, sleep quality and state of recovery the subsequent morning. In addition, break recovery deserves further research attention from the perspective of reattachment to work after breaks. A few recent studies have found that reattachment to work in the morning (i.e., rebuilding a mental connection to work after detaching from it) is important for work engagement during the day (Sonnentag, Eck, Fritz, & Kühnel, 2020; Sonnentag & Kühnel, 2016), but little known about reattachment to work after each break, which may require mental effort. Also, even though we know that break recovery can be beneficial for well-being, not much is known about its relationship to performance-related outcomes. Recovery from work has generally been studied in relation to well-being rather than to job performance (Sonnentag et al., 2017). Knowing more about the possible direct associations between recovery and performance would likely encourage employers to provide better recovery opportunities for employees during the working day.

Concerning recovery-promoting activities, the role of media use, including social media, in recovery deserves further research attention, given that these are very common leisure-time activities. Panova and Lleras (2016) argue that information and communication technologies can sometimes provide a “security blanket” in uncomfortable or stressful situations. A few studies suggest that recreational media use may help to positively influence recovery and psychological well-being (for an overview, see Reinecke & Rieger, 2020). In an experimental study, Rieger and colleagues (2017) found that smartphone use in waiting situations enhanced experiences of control but reduced experiences of relaxation. On the one hand, smartphones allow constant connectivity to work, which challenges recovery – but on the other hand, smartphones also allow, for example, relaxing activities such as listening to music or watching funny videos or connecting with friends and family. Smartphone use may sometimes function as a micro-break during the working day, but according to a recent study by Rhee and Kim (2016), these smartphone breaks are not as effective in promoting well-being as “conventional” breaks. On the other

hand, a recent diary study showed that using social media for non-work purposes during breaks helped employees to recover during breaks and was related to lower exhaustion during work (Xanthopoulou, Foti, & Papagiannidis, 2020). Another study utilizing ecological momentary assessment found that personal social media use at work was associated with better work-nonwork balance (Kühnel, Vahle-Hinz, de Bloom, & Syrek, 2017). Future studies could expand these findings by investigating how media and smartphone use are associated with recovery experiences in individuals' daily lives and how they relate to other leisure or break activities. Furthermore, future studies could expand recovery literature by paying more attention to individual differences in recovery processes. Personality is related to health and well-being (e.g., Strickhouser et al., 2017; Sun et al., 2018), but the knowledge about its role in recovery remains limited (Sonnentag et al., 2017). A recent meta-analysis by Steed and colleagues (2019) showed that personal resources such as self-efficacy and high self-esteem had the largest effect sizes with recovery compared to all other resources or demands they examined. Stable personal characteristics might also help to explain the high levels of temporal consistency often found for recovery experiences (Steed et al., 2019).

Researchers could also delve more into the question of recovery experience profiles with the help of person-based methods such as Latent Profile Analysis: How do all six DRAMMA experiences work together? Are certain combinations of recovery experiences more beneficial than others? So far, at least two studies by Bennett and colleagues (2016) and Siltaloppi and colleagues (2011) have investigated profiles of employees' recovery experiences, but have only focused on the four experiences proposed by Sonnentag and Fritz (2007) and problem-solving pondering. Concerning the basic psychological needs described in Self-Determination Theory (Ryan & Deci, 2000), it has been shown that besides the absolute level of needs satisfaction, balanced satisfaction (i.e., that all psychological needs are satisfied to some degree) is also positively related to well-being (Milyavskaya et al., 2009; Sheldon & Niemiec, 2006). A recent longitudinal study by Kujanpää and colleagues (2020) suggests that this may also be true for DRAMMA experiences. These authors also found that the relative importance of each DRAMMA experience in predicting well-being varies depending on the outcome: for example, relaxation was the strongest predictor of life satisfaction, whereas detachment played the biggest role in predicting (lower levels of) tension and vitality was predicted by all DRAMMA experiences. It is likely that different experiences serve different purposes in regulating the stress response, such as relaxation and detachment down-regulating activation levels, whereas mastery or affiliation, for

example, could increase positive activation. With respect to promoting successful recovery, future studies could examine how employees can proactively support their internal and external recovery and balanced and comprehensive needs satisfaction with the help of crafting behaviours (e.g., Kosenkranius, Rink, de Bloom, & van den Heuvel, 2020; Petrou & Bakker, 2016; Petrou, Bakker, & van den Heuvel, 2017).

Future recovery research could investigate even more diverse outcomes including aspects of eudaimonic well-being in addition to the most often utilized outcomes such as affective well-being, well-being at work (e.g., work engagement, burnout) and performance-related measures such as concentration capacity. The role of meaning in the recovery process especially deserves further research. Although in this study and in the DRAMMA model (Newman et al., 2014) meaning is seen as an experience which promotes well-being, it has actually been more often considered a well-being outcome: for example, Martela and colleagues (2018) recently showed that the basic needs in Self-Determination Theory are key elements in explaining the experience of meaning in life. Also, meaning in life is a multidimensional construct, which, according to some scholars, can be divided into three facets: purpose, coherence and significance (Martela & Steger, 2016). How can all these different aspects of meaningfulness be incorporated into recovery research?

Lastly, the COVID-19 pandemic and its aftermath offer various interesting avenues for occupational health psychology, including research on recovery from work. What is the role of DRAMMA recovery experiences in changed work settings, where the amount of telework across different occupations, including teaching, has exploded? At least one study has already examined how different recovery experiences can help people deal with negative mood related to the pandemic and lockdown measures (Ménard, Foucreault, Leduc, Meunier, & Trépanier, 2021): when participants experienced psychological detachment from pandemic-related thoughts, relaxation, mastery, control, pleasure, or relatedness, their mood improved later the same day.

4.5 Practical implications

The findings of this study have various possible practical implications. Here I present a few ideas on the implications at the level of individual employees then continue by discussing broader organizational and societal aspects.

4.5.1 Individual level

At the individual teacher's level, the findings of this study can be translated into tentative guidelines on how to support recovery from work both during leisure time and within-workday breaks. Firstly, avoiding performing work tasks during breaks whenever possible is important for break recovery, since recovery is not possible in the presence of immediate job demands. Also, positive social interactions with colleagues are likely to produce experiences of affiliation, which, in turn, are conducive to employees' daily well-being. Thus, teachers could be encouraged to spend their breaks with colleagues as often as possible – assuming that the atmosphere at the workplace is good. According to the findings, doing something one finds meaningful during breaks also supports break recovery. According to my additional results concerning break activities, meaningful break activities might include, for example, having discussions with colleagues or taking care of one's well-being with physical activity. If teachers had the opportunity to spend at least some of their workday breaks as they wish, they would likely benefit from spending even just a few minutes doing something they really enjoy or find personally important. Unfortunately, employees tend to take fewer breaks when demands are high and they would actually be in greatest need of a break. Overall, it seems that recovering from stress is most challenging when people need it the most (see “recovery paradox” as described by Sonnentag (2018)). My results also imply that even when teachers take breaks, these breaks may not be as beneficial when emotional demands are high. It is an intriguing question how we could help teachers to have restorative breaks particularly when stressors are high and, for example, detaching from work is especially difficult. Regarding recovery outside working hours, my findings suggest that to recover successfully from work, it is beneficial for teachers to engage in activities that produce experiences of detachment, relaxation, control, mastery, meaning and affiliation. Five of these experiences (with the exception of mastery) were shown to increase during a one-week winter holiday, which means that even a relatively short period away from work has a positive effect on recovery processes. Unfortunately, though, the positive effects of the holiday mostly faded out in a few days after resuming work. This means that although holidays are important opportunities for recovery, it is still essential for take care of one's recovery and well-being on a daily basis and find behaviours that produce recovery experiences.

Employees can proactively shape their leisure-time behaviours to meet their recovery needs. This idea is closely related to a recently developed concept of leisure crafting: the proactive pursuit of leisure activities, which is targeted at goal setting,

human connection, learning and personal development (Petrou & Bakker, 2016). Crafting is considered a fundamentally self-initiated process motivated by the person themselves (e.g., De Bloom, Vaziri, Tay, & Kujanpää, 2020). Possibly, the concept of crafting could also be applied to break recovery. Crafting is proactive and intentional in nature, which distinguishes it from concepts like coping, which is a reactive response to stressful events (e.g., De Bloom et al., 2020). Recovery from work can be understood from a crafting perspective: employees can intentionally shape their leisure and break activities in order to facilitate their recovery processes and satisfy their psychological needs. Yet putting a lot of emphasis on crafting on the individual level may even increase the pressure that stressed workers may already experience: under these circumstances, crafting may become an additional obligation among other duties. Recent research on job crafting also suggests that not all proactive crafting has positive effects: for instance, prevention-focused job crafting, which focuses on avoiding negative end-states rather than approaching positive changes, seems to be related to lower work engagement and higher burnout (Lichtenthaler & Fischbach, 2019). It seems that most beneficial crafting focuses on seeking and acting to achieve positive aspects (i.e., approach crafting), not escaping and moving away from negative aspects (i.e., avoidance crafting) (Zhang & Parker, 2018). It is possible that the same applies to leisure crafting, although the topic still requires further investigation.

4.5.2 Organizational level

Although there are many things individual employees can do to protect and promote their occupational well-being and create opportunities for recovery, employers and organizations should also pay attention to ensuring working conditions which support well-being and recovery. This is important, because high job demands are significant predictors of poor recovery and work-related stress (Bakker & Demerouti, 2017; Demerouti et al., 2009; Sonnentag et al., 2017). In a highly demanding work situation, it is unreasonable to expect individual employees to take care of their well-being on their own. Organizational actions are especially important when it comes to internal recovery during the working day. For example, teachers are currently obliged to supervise their pupils while having lunch. Recruiting assistants to oversee pupils during breaks would allow teachers more opportunities to recover during breaks. Also, supporting a good workplace atmosphere would help teachers to experience affiliation and get social support from their colleagues. If

teachers were able to recover better, they might need fewer sick leaves and be able to work in a more effective way. Therefore, supporting recovery and well-being in the workplace would likely also pay off financially. Teachers' occupational well-being matters not only to the teachers themselves but also to the pupils: teacher stress is associated with pupil stress (e.g., Oberle & Schonert-Reichl, 2016), impaired academic outcomes and lower motivation (e.g., Zhang & Sapp, 2008).

Working conditions and organizational guidelines likewise matter when it comes to recovery outside working hours. For example, online tools that allow teachers to easily stay in contact with pupils' parents are undoubtedly convenient, but since these tools are available anywhere and at any time, teachers may feel obliged to be available at all times. To support leisure-time disengagement from work-related demands, organizations could offer clear guidelines on how to limit work tasks to actual working hours. These could include measures such as not requiring employees to answer work-related calls or e-mails in the evening or at weekends or offering all teachers a work phone, which they could leave at the workplace or switch to silent mode at the end of the working day. In addition to leadership behaviours at work, supervisors may have an important role in setting a good example of a good work-life balance. For example, Koch and Binnewies (2015) found that supervisors who showed more segmentation behaviour to separate work and home were perceived as work-life-friendly role models, and their employees were more likely to segment between work and home and to feel less exhausted and disengaged. A recent study by Sonnentag and Schiffner (2019) also showed that leaders' psychological detachment from work was directly related to subordinates' detachment and indirectly to subordinates' low exhaustion and need for recovery. In addition, the workplace is also a good place to implement interventions targeted at improving break recovery and recovery opportunities available at the workplace. These interventions should take into account the specific demands of certain occupations. For example, recovery interventions targeted specifically at teachers could take into account those demands of their job which differ from those of other knowledge workers (such as not being able to decide when to take a break).

4.5.3 Societal level

On a societal level, the role of work in our lives has changed drastically in recent decades. One of the major trends affecting our working life is the intensification of work, which poses challenges for work-related well-being. According to many

scholars, the intensification and acceleration of working life are mostly due to technological acceleration pervading the whole of society (e.g., Franke, 2015; Korunka, Kubicek, Paškvan, & Ulferts, 2015; Kubicek, Paškvan, & Korunka, 2015), including teaching (Minkkinen et al., 2019). The work-related implications of this development include, for example, increased pace of work and other intensified job demands, such as cognitive demands and learning demands (e.g., Kubicek et al., 2015). Work extends to other spheres of life: technology use is incorporated into organizational practices, which enables work to enter non-work time and space, making it more and more difficult to disengage from work (see e.g., Chesley, 2014). These changes make successful recovery from work more crucial than ever. Moreover, according to Berkelaar and Buzzanell (2015), contemporary discourses of work and career emphasize that careers should be one's calling, and calling should be enacted through one's career instead of through other life domains. Although experiencing one's work as meaningful or as a calling (i.e., meaningful engagement in one's job originating from a sense of duty, destiny or identity) is related to various favourable outcomes, it may also have a dark side (Berkelaar & Buzzanell, 2015; Duffy & Dik, 2013). Experiencing one's work as a calling may be positively associated with positive organizational outcomes and productivity, but not always employee well-being. *Calling may sometimes be related to workaholism and difficulty in maintaining work and non-work balance (Cardador & Caza, 2012), and defending one's overinvestment in work to the detriment of other life domains (Duffy et al., 2012). When calling is considered necessary on the societal level, it may increase the psychological burdens for employees who are unemployed, unable to work, retired, have not found or for some reason cannot enact their *calling (Berg, Grant, & Johnson, 2010).

In addition to the societal role of work, I wish to take a moment to critically consider the role of leisure in today's society. In work psychology, and also throughout society, leisure usually constitutes the time that is left after all obligatory functions have been accounted for (see e.g., Beatty & Torbert, 2003). Seeing daily life only as work and recovering from work is a rather limited perspective, and we should not take it for granted, although occupational health psychology research obviously focuses on work-related phenomena. Some scholars have recently criticized the often implicitly neoliberal ideology underlying work and organizational psychology research (e.g., Bal & Doci, 2018). Aligning with this ideology, leisure is often portrayed as a means to re-establish work performance and well-being, ultimately serving work purposes. It is impossible for social research to be ideologically neutral, but it is essential at least to be aware of how ideologies affect

the field. It is important to acknowledge that leisure does not have value merely because it supports work ability and productivity, but because it helps us live a good, meaningful life (e.g., Iwasaki, 2008; Iwasaki Messina & Hopper, 2018). It has a potential to temporarily liberate employees from serving the needs of the employer and the wider economy. Leisure plays an important role in quality of life, because leisure activities provide individuals with opportunities to meet?? their life values and needs (Brajša-Žganec, Merkaš, & Šverko, 2011). From leisure sciences we know that enjoyable and meaningful leisure activities also support well-being and quality of life among people who are not part of the workforce, such as retired people or people with mental or physical disabilities (e.g., Kuykendall, Tay, & Ng, 2015; Pinquart & Schindler, 2009).

Although leisure is usually defined in relation to work, it can also be defined more broadly. For example, in an article focusing on leisure from a positive psychology perspective, Iwasaki and colleagues (2018) define leisure as a freely chosen, meaningful activity, which actively engages people to gain a variety of benefits such as liberation from productivity (Deschenes, 2011), well-being (Carruthers & Hood, 2007; Newman et al., 2014), and positive personal and social change (Sharpe & Lashua, 2008; Stewart, 2014). Iwasaki et al. (2018) argue that leisure has an important role in meaning-making, a process by which a person derives meaning from activities to find their purpose of life and make sense of their life. This is made possible by the potential of leisure, for example, to foster positive emotions, build connections between people, build identity and self-discovery, instill a sense of autonomy and help to cope with stress and build resilience (see for example, Iwasaki et al., 2018).

Furthermore, even though both work and leisure are undeniably integral parts of our lives, and domain-specific well-being deserves scholarly attention, we must not forget to consider well-being from an holistic perspective. The domains of work and leisure influence and interact with each other. One approach to holistic well-being is *ikigai*, which is a Japanese concept of eudaimonic well-being, “life worth living”, which encompasses life affirmation, existential value and meaning in life (see for example, Kono, Walker, Ito, & Hagi, 2019). In a recent mixed-methods study, Kono and colleagues (2019) found that enjoyable and/or effortful leisure pursuits enhance the perception of *ikigai* among Japanese students. They also emphasize the importance of striking a balance between enjoyment and effort in achieving a worthy life – which most likely applies to various life domains, including both work and leisure. A good, fulfilling life includes both hedonic and eudaimonic aspects: hedonic pursuits relate more to purely affective outcomes and being disengaged from worries while eudaimonic pursuits are more related to feelings of significance and

appreciation and feeling connected with a broader whole (e.g., Huta & Ryan, 2010). It could be argued that research on recovery from work has mostly focused on the hedonic aspects of well-being, although adding meaning and affiliation to the list of recovery experiences expands the concept to a direction that also includes eudaimonic aspects of well-being.

During the last year of my dissertation process, the world – both at and outside work – has changed drastically due to a global pandemic. Covid-19 forced nearly all academics and knowledge workers, including teachers, to do telework, cancelled all travel and gatherings, cut down our social contacts and made us live in a state of constant stress, worry, even fear. This global crisis challenges not just our physical and mental health, but also our occupational well-being. Recent preliminary findings in Finland (Finnish Institute of Occupational Health, 2021) show that after a slight increase in occupational well-being during the first nationwide lockdown in spring 2020, occupational well-being started to decline in autumn 2020: burnout symptoms have become more common, work engagement has decreased, and more and more people experience boredom at work. Younger teleworkers and teleworkers living alone seem to be especially vulnerable to worsening occupational well-being. For many knowledge workers, telework changes the context of recovery from work. When working and spending one's leisure time in the same space, it may be more difficult to detach from work and maintain healthy boundaries between work and personal life. In addition, it may be deceptively easy to forget regular breaks during the working day, when one has no opportunity to enjoy a lunch break with colleagues or have a cup of coffee together. Also, social distancing significantly curtails our access to many hobbies and pastimes, which would, in ordinary circumstances, help us recover from work. In many cases, the pandemic has forced us to come up with alternative ways to de-stress, to take care of our occupational and mental well-being and to foster the relationships with our loved ones. Although the specific recovery activities must change in accordance with changing circumstances, we can still turn to the findings from recovery research: right now, considering all the threats and challenges we are facing, how can we achieve, for example, the DRAMMA recovery experiences or psychological needs in our everyday lives?

4.6 Concluding remarks

The aim of my dissertation was to expand the existing research literature concerning recovery from work while focusing on recovery among schoolteachers, who are a

particularly stressed and societally important occupational group. All in all, the findings from the four sub-studies support the DRAMMA model, which implies that experiences of detachment, relaxation, autonomy, mastery, meaning and affiliation are important for recovery both during leisure-time, including holidays, and breaks during the working day. Although job characteristics are important antecedents of recovery, individual differences such as age appeared to play a role in recovery. Due to their longer work and life experience, ageing employees may even have more effective recovery skills than younger ones. The findings of my dissertation also suggest that smartphone-based interventions have potential in promoting recovery from work. When these tools are developed further, they could help employees to support their recovery and well-being and to integrate recovery-promoting behaviours into their daily lives. When we look at recovery from work from the perspective of the DRAMMA experiences, we can easily conclude that recovery from work is not merely passive rest and relaxation, but also for personal development, self-actualization, engaging in meaningful activities and cultivating connection to others and ourselves. Research inspired by the DRAMMA model could steer recovery research to a wider, needs satisfaction perspective which highlights the notion that meaningful leisure should not only serve the purposes of working life, but of flourishing life in general. In the future, I look forward to seeing more research that integrates perspectives from work and organizational psychology and other related fields, such as leisure sciences, positive psychology and clinical psychology. Although we may perform our roles as employees, leaders and subordinates, we are still the same person in and outside work.

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Relationships between recovery experiences and well-being among younger and older teachers

Virtanen A., De Bloom, J. & Kinnunen, U.

International Archives of Occupational and Environmental Health, 93(2), 213-227
doi: 10.1007/s00420-019-01475-8

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Relationships between recovery experiences and well-being among younger and older teachers

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Received: 27 March 2019 / Accepted: 16 September 2019 / Published online: 24 September 2019
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Abstract

Purpose The study had three aims. We investigated, first, how six recovery experiences (i.e., detachment, relaxation, control, mastery, meaning, and affiliation) during off-job time suggested by the DRAMMA model (Newman et al. in *J Happiness Stud* 15(3):555–578. <https://doi.org/10.1007/s10902-013-9435-x>, 2014) are related to well-being (i.e., vitality, life satisfaction, and work ability). Second, we examined how age related to these outcomes, and third, we investigated whether age moderated the relationships between recovery experiences and well-being outcomes.

Methods A sample of 909 Finnish teachers responded to an electronic questionnaire (78% women, average age 51 years). The data were analyzed with moderated hierarchical regression analyses.

Results Detachment from work, relaxation, control, and mastery were associated with higher vitality. Detachment, relaxation, meaning, and affiliation were related to higher life satisfaction. Older age was related to lower work ability, but not to vitality or life satisfaction. Older teachers benefited more from control and mastery during off-job time than did younger teachers in terms of vitality, whereas younger teachers benefited more from relaxation in terms of all well-being outcomes.

Conclusions Detachment, relaxation, control, mastery, meaning, and affiliation during off-job time were related to higher well-being, supporting the DRAMMA model. Age moderated the relationships between control, mastery, and relaxation and vitality and life satisfaction. The role of aging in recovery from work needs further research.

Keywords Recovery from work · Recovery experiences · Aging · Teachers

Introduction

Recovery from work is an important factor in mitigating the relation between high job demands and ill-health (Geurts and Sonnentag 2006; Sonnentag et al. 2017). It refers to the process of alleviating strain symptoms caused by job demands (Sonnentag and Fritz 2015) and restoring employees' energy and mental resources (Zijlstra and Sonnentag 2006). Aging is known to slow down the recovery process on a physiological level (Ilmarinen 1999), but the scientific evidence on the effects of aging on psychological recovery processes remains very limited. Due to the increasing number of aging people in the workforce, it is crucial to understand the

challenges that older workers face and to generate strategies to support longer, healthy careers and prevent early retirement. Recovery from work can be assumed to help prolong working careers, because it is closely related to health and well-being (e.g., de Bloom et al. 2015; Fritz and Sonnentag 2006; Geurts and Sonnentag 2006). However, we do not have yet a clear understanding of psychological recovery processes among aging workers.

The target group of this study was teachers, who, according to several international studies, seem to be an especially stressed occupational group (e.g., Kinnunen et al. 1994; Kyriacou 2001; Salo 2002; Skaalvik and Skaalvik 2015). Teachers face job demands slightly different from those of other knowledge workers, although, for example, high workload is present in their daily working lives as it is in many other occupations. Typical teacher stressors mentioned in several studies include time pressure, students' behavioral problems and low motivation, value conflicts, lack of recognition, lack of autonomy, conflicts with colleagues or parents, and the increasing use of technology in teaching (e.g.,

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Betoret 2009; Fernet et al. 2012; Friedman 1995; Hakanen et al. 2006; Klassen and Chiu 2011; Kokkinos 2007; Skaalvik and Skaalvik 2009, 2011, 2017). Teachers also tend to spend a lot of time on work-related activities outside formal work hours (e.g., Garrick et al. 2018), which limits the time available for recovery from work. It is, therefore, important to find new ways to promote teachers' recovery and specifically to identify experiences aiding recovery which have not received much attention in earlier research on aging employees or teachers.

The aim of this study is to contribute to recovery research in three ways. First, we focused on recovery from work among teachers, a highly loaded occupational group, whose recovery processes are under-examined. There is evidence showing that recovery is especially important when job stressors are high (Sonnentag 2018). Second, this is one of the first studies to investigate psychological recovery experiences (detachment, relaxation, control, mastery, meaning, and affiliation) suggested by the recently developed DRAMMA model (Newman et al. 2014) in the context of aging. Third, we examined whether age moderated the relationships between these recovery experiences and well-being. Thus, our study produces novel information about aging teachers' recovery from work during off-job time.

Recovery from work

Research so far has distinguished two complementary processes underlying recovery from work (De Bloom et al. 2010; Geurts and Sonnentag 2006; Sonnentag 2001). First, the passive mechanism suggests that recovery only occurs when people stop working and rest (Meijman and Mulder 1998). Low demands and disengagement from work are assumed to enable employees' psychobiological systems to return to baseline levels (McEwen 1998; Sonnentag and Fritz 2015). Second, the active perspective of recovery highlights the importance of engagement in pleasant or challenging leisure activities (Geurts and Sonnentag 2006). The active perspective suggests that to recover from work stress, employees need to replenish threatened or lost resources (Hofböll 1989), and engage in activities which produce positive emotions and satisfy their basic needs for autonomy, relatedness, and competence (Fredrickson 2001; Ryan and Deci 2000). Summing up, recovery entails resting and detaching from work, but also building new resources and engaging in meaningful leisure activities.

Recovery can be elicited by certain subjective experiences, leisure-time activities, and physiological processes occurring during sleep (Sonnentag 2018). In this study, we focus on psychological recovery experiences underlying different leisure activities. Sonnentag and Fritz (2007) suggested a framework of four major recovery experiences: psychological detachment from work, relaxation, control,

and mastery. Detachment refers to mental disengagement from work-related thoughts. Relaxation implies low levels of mental or physical activation and little physical or intellectual effort. Control refers to being able to decide on one's leisure schedule and activities. Mastery encompasses learning opportunities and challenges, resulting in feelings of achievement and competence. Of these four experiences, detachment seems to be most consistently associated with positive changes in well-being (for reviews, see Sonnentag and Fritz 2015; Wendsche and Lohmann-Haislah 2017). Several studies have also demonstrated links between relaxation, control, mastery, and better well-being (for a meta-analysis, see Bennett et al. 2018).

Based on a meta-analysis of 363 articles within psychology and leisure sciences, Newman et al. (2014) added the experiences of meaning and affiliation to this list of recovery experiences in their DRAMMA model, which aims to explain how leisure activities relate to subjective well-being. They also replaced control with autonomy, which refers to feelings of decision latitude. Autonomy is also one of the basic psychological needs suggested in Self-Determination Theory (Ryan and Deci 2000). Autonomy closely resembles control, but is broader by emphasizing feelings of volition in general instead of merely having control over one's leisure schedule (Newman et al. 2014). Meaningful leisure activities are a means by which individuals gain something valuable in their lives (Iwasaki 2008). Experiencing meaning in life is beneficial for well-being on both trait level (e.g., Hicks and King 2007; King et al. 2006) and state level (e.g., King et al. 2006; Machell et al. 2015; Thrash et al. 2010). Also, at day level, active search for meaning is related to improvements in well-being (Newman et al. 2018). This means that proactively engaging in activities that add meaning to one's life is likely to improve well-being. Affiliation refers to feelings of belongingness with other people and the fulfillment of people's innate need for relatedness (Ryan and Deci 2000). According to Newman et al. (2014), of all DRAMMA experiences, affiliation has the most support from multiple theoretical perspectives. In addition to fulfilling the basic psychological need for relatedness (Ryan and Deci 2000), social affiliation also fosters social support, which helps to mitigate against stressful events (Lahey and Orehek 2011). In this study, we investigated how these DRAMMA recovery experiences during leisure time (i.e., evenings after working hours) are related to three aspects of well-being: vitality, life satisfaction, and work ability.

Vitality and life satisfaction describe context-free well-being. Vitality refers to a positive feeling of aliveness and energy (Ryan and Frederick 1997). Since recovery from work allows employees to gain new internal resources such as energy and positive mood (Sonnentag and Fritz 2007), recovery experiences can be assumed to promote vitality. A meta-analysis by Bennett et al. (2018) showed that recovery

experiences are related to higher vigor, which includes vitality and positive activated affect. Life satisfaction is a subjective global judgement of one's quality of life (Diener et al. 1985) and a central component of subjective well-being (Diener et al. 2017). Previous studies show that recovery-related experiences are associated with higher life satisfaction (e.g., Sonnentag and Fritz 2007; Strauss-Blasche et al. 2002).

Work ability can be defined as the degree to which employees are mentally and physically capable of performing their current work role and of achieving a balance between a person's resources and work demands (Ilmarinen et al. 1997; Tuomi et al. 1991). Work ability has its roots in health status (Ilmarinen 2009). Since recovery from work mitigates the relation between work stress and ill-health, and helps to build new resources (Geurts and Sonnentag 2006; Sonnentag et al. 2017), it can be presumed to promote work ability.

In addition, we examined whether age is related to these three well-being outcomes. Earlier research has shown that age is associated with decreases in work ability (e.g., Alavinia et al. 2009; Ilmarinen et al. 1997; Kinnunen and Nätti 2018). Some studies suggest that life satisfaction tends to reach a low point in mid-life but increases again after reaching retirement age (Blanchflower and Oswald 2008; Stone et al. 2010). This means that in our sample consisting of working people aged up to 68 years, aging may be associated with lower life satisfaction. Earlier studies suggest that although aging is generally related to higher affective well-being, this mostly applies to low-arousal positive states (e.g., relaxation, peace of mind), not more energized states like vitality (Kessler and Staudinger 2009; Scheibe and Zacher 2013). Some studies also show that aging may bring a shift in preference away from high-arousal positive emotions and towards low-arousal positive emotions (e.g., Scheibe et al. 2013). It could, therefore, be assumed that aging is either not related to vitality or related to lower vitality.

Age, recovery, and emotion regulation

As stated previously, scientific evidence of the effects of age on psychological recovery processes remains limited so far. However, recovery processes are closely linked to emotion regulation (Parkinson and Totterdell 1999; Sonnentag and Fritz 2007; Sonnentag et al. 2017), and the motivation and competence for emotion regulation tend to change with age (Scheibe and Zacher 2013). Consequently, it can be assumed that aging may play a role in recovery from work.

It is important to note that the research streams of life-span development and organizational literature differ in terms of the definitions of "older" or "aging" people (Doerwald et al. 2016). In the life-span literature, age 60 or 65 is often used as a cut-off for when old age begins (Baltes

and Smith 2003), whereas definitions of older workers correspond to the general operationalization of middle age, around 40–60 years (Doerwald et al. 2016). As this study is about teachers who are still working, we adhere to the definition for aging workers as it appears in the organizational literature (Doerwald et al. 2016).

The few existing studies about age and recovery have mostly focused on individuals' own perceptions of their need for recovery, which seems to change during the life course. Two studies have shown that employees' need for recovery after the working day increases linearly until the age of 55 and then stabilizes for the oldest workers approaching retirement age (Kiss et al. 2008; Mohren et al. 2010). Explanations for these findings can be found in three domains (Mohren et al. 2010). First, in the work environment, the process of downshifting may have been initiated, for example, in terms of a reduction in working hours. Second, differences in the family situation may account for varying levels of need for recovery: often, the oldest employees no longer have children living at home, which is likely to reduce work–family conflict and the demands of the family domain. Third, older employees may have developed better strategies for dealing with need for recovery due to their longer experience and expertise in their working careers (Silverstein 2008). Consequently, it is possible that older employees have better "recovery skills". These skills relate to leisure crafting, which refers to the proactive pursuit of leisure activities targeted at goal setting, human connection, and personal development (Petrou and Bakker 2016).

The restoration of positive mood and energy are core functions of recovery from work, which supports the link between recovery and emotion regulation (Sonnentag and Fritz 2007). Research on emotion regulation has identified a range of strategies that individuals use to improve their mood, including both cognitive and behavioral strategies. Sonnentag and Fritz (2007) refer to the classification by Parkinson and Totterdell (1999), which proposes two main categories of emotion regulation: diversionary and engagement strategies. Diversionary strategies aim at avoiding a stressful situation or seeking distraction from it, whereas engagement strategies refer to confronting or accepting the stressful situation. According to Sonnentag and Fritz (2007), diversionary strategies are more relevant for work-stress recovery, because engagement strategies keep the individual cognitively occupied with the stressful situation, which makes recovery less likely. Diversionary strategies relate closely to three recovery experiences: detachment from work, relaxation, and mastery (Sonnentag and Fritz 2007). Higher age seems to be related to an increased preference to choose distraction (a less effortful, diversionary strategy) over reappraisal (an engagement strategy) when downregulating negative emotions (Scheibe et al. 2015).

Aging entails changes in emotion regulation motivation. Older adults seem to be more motivated to regulate emotions to optimize well-being, whereas younger adults are generally more focused on the achievement of goals (e.g., goals related to work and career development) (Carstensen 2006; Labouvie-Vief 2003). These changes are assumed to be driven by changes in future time perspective and cognitive abilities. In sum, higher age is associated with a higher motivation to avoid affective states that are negative and/or high in arousal (Scheibe and Zacher 2013). This is likely to have consequences for recovery, which focuses on dealing with job stress, a highly aroused negative state. It is possible that older employees, for example, have higher motivation to engage in detachment and relaxation during off-job time to distract from job stress.

Due to their greater life experience, older adults may also be more effective in implementing emotion regulation strategies and more competent in emotion regulation (Scheibe and Zacher 2013). Prominent life-span psychology theories, such as socioemotional selectivity theory (Carstensen 2006) and the model of selection, optimization, and compensation (Baltes and Baltes 1990), propose that aging triggers proactive behavior and is related to prioritizing emotional goals. These proactive behaviors, especially when they relate to emotion regulation and goal setting, may also be associated with recovery from work. Due to their long work and life experience, older workers may have a clearer understanding of what helps them to recover more successfully and make the most of their leisure time.

The present study: research questions and hypotheses

In the present study, we sought answers to three research questions. First, we asked: How do recovery experiences of detachment, relaxation, control, mastery, meaning, and affiliation outside working hours relate to (a) vitality, (b) life satisfaction, and (c) work ability? Basing our examination on the DRAMMA model (Newman et al. 2014) and the existing research on recovery experiences (e.g., the meta-analysis by Bennett et al. 2018), we predict (H1) that all recovery experiences are related to higher well-being. Of the well-being outcomes, there is most evidence concerning the positive links to vitality.

Second, we asked: Is age related to vitality, life satisfaction, and work ability? We expect (H2) that age relates to lower work ability (e.g., Alavinia et al. 2009; Ilmarinen et al. 1997; Kinnunen and Nätti 2018), and likely also to lower life satisfaction (Blanchflower and Oswald 2008; Stone et al. 2010), and possibly to lower vitality (e.g., Kessler and Staudinger 2009; Scheibe and Zacher 2013), as discussed above.

Our third research question concerned the role of age in the relationship between recovery experiences and well-being outcomes. Thus, we asked: How does age moderate the relationship of recovery experiences and the outcomes described above? To the best of our knowledge, this issue has not yet been examined. Therefore, we did not formulate specific hypotheses regarding each recovery experience. In light of the existing literature about age-related changes in emotion regulation, we assume, for example, that detachment and relaxation may be more easily (i.e., with less effort) achieved by older teachers due to their greater motivation to avoid stress, which in turn is reflected in their higher levels of well-being. However, younger teachers may be in a greater need of detachment and relaxation due to their heavier family demands and, therefore, benefit more from these recovery experiences. All in all, concerning the last research question, our study can be considered explorative, although we expect (H3) to find moderator effects.

Methods

Participants and procedure

The participants of this study ($N=909$) were teachers and school principals working in Finnish comprehensive or upper secondary schools. The sample was drawn in May 2017 from the register of the Trade Union of Education (OAJ). In Finland, around 95% of teachers are members of the trade union (OAJ 2015). The electronic questionnaire was sent to 3500 teachers all over the country by the union: to 1500 class teachers (teaching grades 1–6, i.e., pupils aged 7–12 years in comprehensive school), to 1500 subject teachers (teaching in either comprehensive school grades 7–9, i.e., pupils aged 13–15 years, or upper secondary school, i.e., pupils aged 16–18 years), and to 500 school principals. In the groups of class teachers and subject teachers, the questionnaire was sent to 500 teachers in three age groups: under 45 years, 45–55 years, and over 55 years. Due to the smaller total number of principals, this age division was not used in their group.

The response rate was 26% ($N=909$). Among class teachers, it was 30% ($n=448$), among subject teachers 28% ($n=321$) and among principals only 21% ($n=140$). The response rate was highest (37% among class teachers and 23% among subject teachers) among the middle-age group (45–55 years). The attrition analyses showed that the study participants were older (the share of teachers over 55 years old was 41.5% vs. 18.6%; $\chi^2(2)=278.01$, $p<0.001$), more often women (83.4% vs. 77.6%; $\chi^2(1)=14.65$, $p<0.001$), and subject teachers (47.1% vs. 35.6%; $\chi^2(1)=12.66$, $p<0.001$) than teachers registered as members of the Trade Union of Education. The age difference is explained by the

procedure through which the sample was drawn: as aging teachers were the target group of the study, the older age groups were given more weight than those under 45.

Of all the participants, 78% were women (86% of class teachers, 80% of subject teachers, but only 49% of the principals). The mean age of the participants was 51 years ($SD=9.76$). Nearly all (99%) of the participants had a full-time job, and most (86%) also had a permanent employment contract. On average, participants worked 37.44 h per week ($SD=9.24$). The majority (93%) of the participants worked in comprehensive schools (i.e., teaching students aged from 7 to 16 years). Most of the participants lived either with a partner (41%) or with a partner and at least one child (36%).

Measures

Recovery experiences

Each recovery experience was measured with three items referring to one's free time outside working hours. Psychological detachment ($\alpha=0.82$, e.g., "I forget about work"), relaxation ($\alpha=0.80$, e.g., "I kick back and relax"), control ($\alpha=0.78$, e.g., "I feel that I can decide for myself what to do"), and mastery ($\alpha=0.68$, e.g., "I seek out intellectual challenges") were measured with items from the Recovery Experience Questionnaire (Sonnentag and Fritz 2007), which has been validated in Finland (Kinnunen et al. 2011). Meaning ($\alpha=0.69$, e.g., "I do things which are personally meaningful for me") was measured with three items adapted from the Job Diagnostics Survey (Hackman and Oldham 1974). Affiliation ($\alpha=0.77$, e.g., "I really like the people I interact with") was measured with three items from Basic Needs Satisfaction in General Scale (Johnston and Finney 2010), but one item ("There are not many people that I am close to") was excluded from the analyses due to low Cronbach's alpha ($\alpha=0.44$). All recovery experiences were rated on a scale from 1 (totally disagree) to 5 (totally agree). All Cronbach's alphas reported for the scales of recovery experiences and other variables were calculated from our sample.

Moderator

Age as a moderator was used as a continuous variable in our analyses. Age was calculated from year of birth.

Well-being

Vitality was measured with four items from the scale by Ryan and Frederick (1997) ($\alpha=0.89$, e.g., "I felt alive and vital"). The items refer to feelings during the last month. The rating scale was from 1 (very rarely or never) to 5 (very often or always). Life satisfaction was measured with one item: "How satisfied do you generally feel about your life?"

(e.g., Cheung and Lucas 2014) on a scale from 0 to 10. Work ability was measured with one item ("How would you rate your current ability to work?") from the Work Ability Index (Tuomi et al. 1998). The item was rated on a scale from 1 to 10, where 1 refers to being totally incapable of working and 10 refers to one's work ability at its best. It has been shown that this one-item measure accurately reflects the total work ability index (e.g., Jääskeläinen et al. 2016).

Controls

Several meta-analyses (e.g., Crawford et al. 2010; Nixon et al. 2011) indicate that individuals who are exposed to a higher level of job stressors report poorer well-being and poorer recovery experiences (Bennett et al. 2018). We, therefore, controlled for an important job stressor, workload, in our analyses. In addition, we controlled for one job resource, job autonomy, which is related to higher subjective well-being (e.g., Wheatley 2017). We also controlled for whether the participants had child(ren) living at home, because family situation may be related to recovery opportunities during off-job time. Finally, we controlled for leadership status, i.e., whether the participant was a school principal (= 1) or not (= 0), because managers may have heavier workload and, therefore, more problems with recovery than employees without leadership responsibility (e.g., Sonnentag and Fritz 2007).

Workload was measured with three items ($\alpha=0.87$, e.g., "How often does your job require you to work under time pressure?") from the scale by Spector and Jex (1998). The items were rated on a scale from 1 (very rarely or never) to 5 (very often or always). Job autonomy was measured with six items ($\alpha=0.78$, e.g., "I can set my own work pace") from QPSNordic-ADW (Pahkin et al. 2008). The items were rated on a scale from 1 (very rarely or never) to 5 (very often or always). The number of children living at home was elicited with one question: "How many children do you have who live in the same household with you?". The answers to this question were recoded into a dichotomous variable (0, no children living at home; 1, at least one child living at home).

Statistical analyses

First, we calculated means, standard deviations, and correlations between all study variables. Moderated hierarchical regression analyses (Aiken and West 1991) were used to test the direct effects of recovery experiences and age on three well-being indicators and the moderator effects between age and recovery experiences. We conducted hierarchical multiple regression analysis for each dependent variable using the following procedure: control variables (workload, job autonomy, having children living at home, and leadership status) were entered into the model at step

1, recovery experiences at step 2, age at step 3, and finally, the interaction terms of each recovery experience with age were entered at step 4 (6 interactions in total). Finally, we performed simple slope analyses to test the significance of the relationships among younger (1 SD below the mean age) and older (1 SD above the mean age) teachers. All recovery experiences, workload, job autonomy, and age were standardized in the regression analyses. All analyses were conducted in SPSS 24 software.

Results

Descriptive results

Means, standard deviations, and correlations between all the study variables are presented in Table 1. All recovery experiences correlated positively with vitality ($0.18 \leq r \leq 0.42$), life satisfaction ($0.08 \leq r \leq 0.34$), and work ability ($0.10 \leq r \leq 0.26$). Recovery experiences correlated positively with each other ($0.09 \leq r \leq 0.55$), with the exception that the correlation between mastery and affiliation was not statistically significant. Well-being outcomes (vitality, life satisfaction, and work ability) were highly correlated with each other ($0.48 \leq r \leq 0.55$). However, none of these correlations between the six recovery experiences or the outcomes is over 0.85, which is considered a limit for concepts not being separate from each other (Hair et al. 2010). Age correlated negatively with work ability ($r = -0.08, p < 0.05$), but was not significantly associated with vitality or life satisfaction. In addition, age correlated with higher detachment ($r = 0.11, p < 0.01$), relaxation ($r = 0.10, p < 0.01$), control ($r = 0.07, p < 0.05$), and mastery ($r = 0.08, p < 0.05$). Higher age was related to not having children living at home ($r = -0.24, p < 0.01$). Workload correlated negatively with all well-being outcomes ($-0.15 \leq r \leq -0.25$), most strongly with vitality, and with recovery experiences ($-0.09 \leq r \leq -0.30$), except for mastery and affiliation. Job autonomy was positively related to all outcomes ($0.21 \leq r \leq 0.33$) and all recovery experiences ($0.09 \leq r \leq 0.29$). Having children at home correlated negatively with relaxation ($r = -0.17, p < 0.01$), control ($r = -0.19, p < 0.01$), and mastery ($r = -0.08, p < 0.05$), but positively with affiliation ($r = 0.14, p < 0.01$). It was not significantly related to well-being outcomes. Leadership status correlated with higher age ($r = 0.14, p < 0.001$), workload ($r = 0.11, p < 0.01$), job autonomy ($r = 0.31, p < 0.001$), and vitality ($r = -0.13, p < 0.001$).

Table 1 Means, standard deviations, and correlations between variables

Variable (range)	M	SD	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.
1. Workload (1–5)	4.01	0.73	1													
2. Autonomy at work (1–5)	2.75	0.71	-0.33***	1												
3. Having child(ren) living at home (0, no; 1, yes)	-	-	0.08*	-0.03	1											
4. Leadership status (0, no; 1, yes)	-	-	0.11**	0.31***	-0.01	1										
5. Detachment (1–5)	2.83	0.91	-0.29***	0.24***	-0.06	0.02	1									
6. Relaxation (1–5)	3.93	0.70	-0.25***	0.20***	-0.17**	0.01	0.54***	1								
7. Control (1–5)	3.93	0.74	-0.30***	0.29***	-0.19**	0.02	0.41***	0.65***	1							
8. Mastery (1–5)	3.34	0.73	-0.04	0.11**	-0.08*	0.05	0.15***	0.24***	0.20***	1						
9. Meaning (1–5)	4.36	0.57	-0.09**	0.10**	-0.04	-0.02	0.23***	0.55***	0.43***	0.29***	1					
10. Affiliation (1–5)	4.58	0.51	-0.06	0.09*	0.14**	0.00	0.09**	0.29***	0.33***	0.05	0.47***	1				
11. Age (18–68)	50.55	9.76	-0.05	0.05	-0.24**	0.14***	0.11**	0.10**	0.07*	0.08*	0.01	0.04	1			
12. Vitality (1–5)	3.25	0.83	-0.25***	0.33***	-0.01	0.13***	0.31***	0.42***	0.39***	0.27***	0.33***	0.18***	0.03	1		
13. Life satisfaction (0–10)	8.80	1.39	-0.17***	0.21***	0.05	0.02	0.28***	0.34***	0.31***	0.08*	0.28***	0.23***	0.02	0.52***	1	
14. Work ability (1–10)	8.71	1.31	-0.15***	0.27***	0.04	0.07	0.21***	0.26***	0.25***	0.11**	0.16***	0.10**	-0.08*	0.48***	0.55***	1

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 2 Results of regression analyses, β 's from the last step of the model

Independent variables	Vitality		Life satisfaction		Work ability	
	ΔR^2	β	ΔR^2	β	ΔR^2	β
Step 1	0.13***		0.07***		0.09***	
Workload		-0.08*		-0.04		-0.04
Autonomy at work		0.16***		0.12**		0.20***
Child(ren) living at home		0.07*		0.11**		0.09*
Leadership status		0.08*		-0.02		0.02
Step 2	0.16***		0.13***		0.06***	
Detachment		0.08*		0.10*		0.07
Relaxation		0.15**		0.10		0.09
Control		0.14**		0.13**		0.09
Mastery		0.14***		-0.01		0.05
Meaning		0.08		0.11*		0.02
Affiliation		0.02		0.09*		0.02
Step 3	0.00		0.00		0.01*	
Age		-0.01		0.01		-0.08**
Step 4	0.01*		0.01		0.02*	
Age \times detachment		0.03		-0.02		0.08
Age \times relaxation		-0.14**		-0.12*		-0.19**
Age \times control		0.09*		0.08		0.04
Age \times mastery		0.08*		0.03		0.03
Age \times meaning		0.03		-0.03		0.09 ($p = 0.058$)
Age \times affiliation		0.01		0.03		0.01
Total R^2	0.30***		0.21***		0.17***	

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Regression analyses: direct associations and interactions between age and recovery experiences

The results of regression analyses are presented in Table 2.

Vitality

At step 1, job autonomy, having children living at home, and being a school principal were related to higher vitality. Controls explained 13% of the variance in vitality. At step 2, four recovery experiences predicted higher vitality: detachment, relaxation, autonomy, and mastery, with relaxation and mastery playing the major roles. Therefore, concerning vitality, H1 got partial support. Together, the recovery experiences explained 16% of the variance in vitality. Age did not predict vitality. In terms of this outcome, H2 was not supported. There were three statistically significant interactions between age and recovery experiences at step 4, giving partial support to H3. The graphical presentations of the interactions were derived using the unstandardized regression coefficients of the regression lines for teachers high (1 SD above the mean age, that is, over 60 years) and low (1 SD below the mean age, that is, under 40 years) on the moderator variable of age. As shown in Fig. 1, younger

participants seemed to benefit more from relaxation experiences during off-job time than did older participants in terms of higher vitality (see Fig. 1a). However, older participants benefited more from control and mastery experiences than did younger ones (see Fig. 1b, c). The interactions added 1% to the explanation rate, and totally, the model explained 30% of vitality. The simple slope analyses (10) confirmed the age differences: the positive unstandardized regression coefficients (Bs) were higher and statistically significant for older teachers [control: $B = 0.187$, $p < 0.001$ (older) vs. $B = 0.039$, ns (younger); mastery: $B = 0.183$, $p < 0.001$ (older) vs. $B = 0.057$, ns (younger)], suggesting that older teachers benefit more from control and mastery than younger ones. The relationship between relaxation and vitality was positive in the younger age group ($B = 0.245$, $p < 0.001$), whereas the relationship was not significant in the older group ($B = -0.005$, ns), suggesting that younger teachers benefit more from relaxation in terms of vitality.

Life satisfaction

At step 1, job autonomy and having children living at home were related to higher life satisfaction, explaining 7% of the variance in life satisfaction. At step 2, four recovery experiences (detachment, control, meaning, and affiliation) were

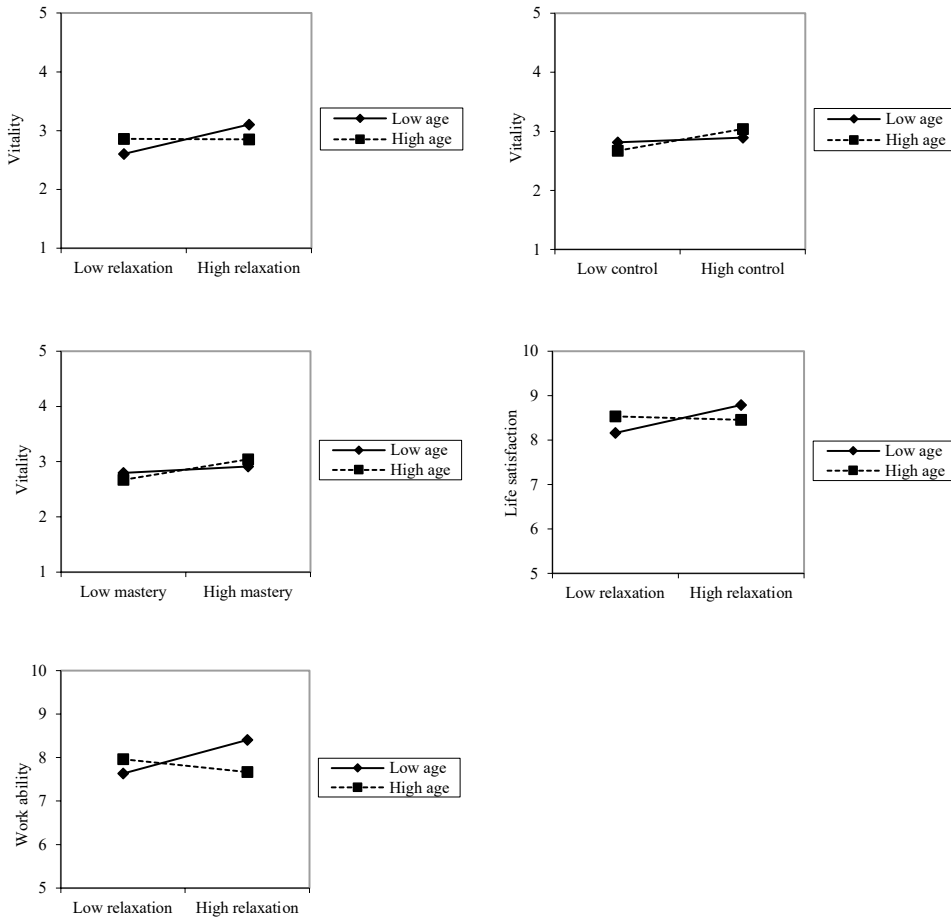


Fig. 1 Interactions between age and recovery experiences

related to higher life satisfaction, control playing the biggest role. Recovery experiences added 14% to the explanation rate. This gives support to H1. At step 3, age did not predict life satisfaction. Therefore, H2 was not supported in terms of life satisfaction. At step 4, one interaction effect turned out to be significant; H3 gained partial support, showing that younger participants benefited more from relaxation experiences than did older ones (see Fig. 1d). The simple slope analysis showed that in the younger age group, there was a significant positive relationship between relaxation and life satisfaction ($B=0.316$, $p<0.01$), whereas among the older group, the relationship was not significant ($B=-0.036$, ns). This interaction added 1% to the explanation rate. In total, the model explained 21% of the variation in life satisfaction.

Work ability

At step 1, job autonomy and having children living at home were related to higher work ability, explaining 9% of the variation in work ability. In terms of work ability, H1 did not get support. At step 2, none of the recovery experiences predicted work ability significantly, but together they added 6% to the explanation rate. At step 3, greater age significantly predicted lower work ability, adding 1% to the explanation rate. This was in line with H2. At step 4, there was one significant interaction effect between age and relaxation, lending partial support to H3: again, younger participants seemed to benefit more from relaxation experiences than older participants (see Fig. 1e). The simple slope analysis showed that in the younger age group, there was a significant positive relationship between relaxation and work ability

($B = 0.382$, $p < 0.001$), whereas among the older group, this relationship was not significant ($B = -0.148$, ns). Also, in terms of work ability, older participants seem to benefit slightly more from detachment, although this interaction was only marginally significant ($p = 0.058$). The interactions added 2% to the explanation rate, and in total, the model explained 17% of the variation in work ability.

Discussion

The first aim of this study was to investigate how six recovery experiences—detachment, relaxation, control, mastery, meaning, and affiliation—during off-job time relate to vitality, life satisfaction, and work ability. Second, we examined whether age is related to these outcomes. Third, we investigated whether age moderated the relationship between recovery experiences and well-being outcomes.

Main results

The results show that recovery experiences during off-job time are consistently related to context-free well-being, that is, feelings of positive energy, vitality, and a general cognitive evaluation of one's life as a whole, life satisfaction. However, none of the recovery experiences predicted work ability, although at a correlational level, they had positive associations with this aspect of work-related well-being. Therefore, H1 got only partial support from the results. Empirical evidence on these links has also been presented (see Bennett et al. 2018, for a meta-analysis). Compared to vitality and life satisfaction, work ability is based more on physical health status (Ilmarinen 2009), which likely makes it more difficult to impact with leisure recovery experiences. All in all, the results of this study give support to the DRAMMA model (Newman et al. 2014): in addition to the four recovery experiences suggested by Sonnentag and Fritz (2007), leisure-time experiences of affiliation and meaning also promote well-being. Meaning was associated with both higher vitality and life satisfaction, whereas affiliation was only related to life satisfaction.

Age was not significantly related to vitality or life satisfaction, but, according to our expectations, higher age was related to lower work ability. This means that H2 also received partial support. Earlier research has also shown that work ability tends to decrease with age (e.g., Alavinia et al. 2009; Ilmarinen et al. 1997; Kinnunen and Nätti 2018). A few existing studies suggest that life satisfaction often reaches a low point in mid-life (which corresponds to 40–60-year old workers), whereas other hedonic aspects of well-being, like positive affect and happiness, are on an

upward trajectory from youth to old age (Blanchflower and Oswald 2008; Stone et al. 2010). Our results did not show these age-related changes, which may be partly related to the fact that our study only included working people, while many earlier studies investigating age-related differences in psychological well-being have focused on older, retired individuals. In addition, we did not specifically study affective well-being (e.g., positive or negative affects), which tends to increase with age (e.g., Charles and Carstensen 2010; Scheibe and Carstensen 2010). Some studies have found no age-related differences in high-arousal positive affect (Kessler and Staudinger 2009). This is in line with our result, showing that age was not related to vitality.

All in all, older teachers seemed to recover better from work during off-job time than did their younger counterparts: age correlated with higher detachment, relaxation, control, and mastery. It is possible that due to their longer work and life experience, older teachers have learned more effective recovery skills and know what works best for them in relieving work-related stress. This is in line with earlier studies, suggesting that age is associated with higher competence in emotion regulation (Scheibe and Zacher 2013). Recovery skills can be linked to leisure crafting, the proactive pursuit of leisure activities targeted at addressing basic psychological needs (Petrou and Bakker 2016). The crafting perspective suggests that recovery from work is a process which can be actively shaped—it is not something which just automatically happens. Given that older teachers generally had higher levels of recovery experiences, it is an interesting question why they did not always benefit more from these than did younger teachers. In line with our third hypothesis (H3), we found that age moderated the relationship between some recovery experiences and well-being. Younger teachers seemed to benefit more than older teachers from relaxation experiences in terms of all three well-being outcomes. However, older teachers benefited more than younger teachers from control and mastery experiences during leisure time in terms of vitality.

There are several possible explanations for these moderator findings. First, age-related changes in family demands may play a role. Younger teachers more often have children living at home, which likely increases the demands of the family domain. Having high demands at both work and home, younger teachers may need relaxation more than do older teachers. Having children living at home and having relaxation experiences during off-job time were negatively correlated in our sample. The younger teachers may, therefore, have been in greater need of relaxation and, therefore, benefited more from it than did the older teachers. Second, the age-related differences in the relationship between leisure-time control and well-being may be explained by life-span theories. Socioemotional selectivity theory (Carstensen 2006) and dynamic integration theory (Labouvie-Vief 2003)

suggest that older people prioritize emotional goals over achievement goals. It may be that leisure-time control is more important for older teachers than for younger ones, who are likely to focus more on work-related goals and raising children. Earlier research has also shown that striving for control, especially secondary control, such as changing one's motives and goals, tends to increase with age (i.e., Heckhausen et al. 2010). Older teachers also seemed to benefit more from mastery experiences outside work than did younger ones. In terms of correlations, older teachers reported more mastery experiences than did younger ones, whereas having children living at home was related to fewer mastery experiences. It is probable that, due to differences in family situation, older teachers have more opportunities for these experiences (e.g., engaging in challenging hobbies) in their everyday lives. It is also possible that younger teachers have more mastery experiences at work (e.g., building up a career and learning new work-related skills), whereas older teachers start little by little to engage in downshifting and preparing for retirement. A diary study by Hewett et al. (2017) demonstrated that individuals benefit particularly from satisfaction of their need for competence in the home domain when it is not satisfied at work. This may be one reason why older teachers benefit more from mastery experiences during leisure time than do younger teachers, who may better satisfy their need for competence at work.

Contributions and practical implications

The results of this study contribute to the literature in the following ways. First, our results lend further support to the recently developed DRAMMA model (Newman et al. 2014). In addition to the four recovery experiences suggested by Sonnentag and Fritz (2007), meaning and affiliation also seem to enhance well-being, which provides a more detailed perspective on recovery. Recovery may not only be a reaction to high job demands and experienced stress, but also preventive. For example, building personal resources through meaningful leisure activities and relatedness with other people may help employees to cope with upcoming stress. Affiliation or relatedness is often seen as a basic psychological need (Ryan and Deci 2000). It also fosters social support, which is consistently linked to good mental health (e.g., Lakey and Orehek 2011). In addition, several studies highlight the importance of meaning in life for psychological well-being (e.g., Machell et al. 2015; Newman et al. 2018; Thrash et al. 2010). Therefore, these two experiences are an important addition to the list of psychological experiences conducive to recovery from work.

Second, our results provide new insights into the role of aging in the psychological recovery processes, which has so far received limited attention in research. Our study showed

that age played a role, as younger teachers benefited more from relaxation and older teachers benefited more from control and mastery during leisure time in terms of well-being. Third, we gained new information about recovery from work among teachers, who seem to suffer from high stress (e.g., Kinnunen et al. 1994; Kyriacou 2001; Salo 2002; Skaalvik and Skaalvik 2015). All six DRAMMA experiences were related to better well-being among teachers, which suggests that many different activities may be utilized to improve recovery.

In terms of practical implications, the results of this study suggest that to recover successfully from work, it is beneficial for teachers to engage in leisure activities that produce experiences of detachment, relaxation, control, mastery, meaning, and affiliation. Existing studies demonstrate that recovery from work can be supported with interventions such as relaxation techniques, recovery experience training, and promotion of physical activity (for a review, see Verbeek et al. 2018). In the future, the DRAMMA model and the findings of this study could be utilized to design more multidimensional recovery interventions addressing all six recovery experiences. In addition, recovery interventions targeted at specific occupational groups, like teachers, would be useful. It seems that among teachers, techniques related to distinguishing between work and private life and to reducing work-related rumination help people to detach and recover from work (see Ebert et al. 2015). Targeted interventions could take occupation-specific stressors into account and focus on specific strategies directed towards this occupational group. For example, one important stressor in teachers' job is challenging interactions with pupils, so future interventions could possibly invent ways of mitigating the negative effects of these stressors on well-being and recovery.

Outside of interventions, employees can also proactively shape their leisure-time behaviors to meet their recovery-related needs. This is closely related to leisure crafting, a relatively new concept which deserves more attention in future studies. The findings regarding age-related changes in recovery processes suggest that different leisure activities may be beneficial for different age groups. Younger teachers may benefit more from engaging in relaxing activities, whereas older teachers especially would likely benefit from spending time on learning new things and developing their skills outside the work domain (e.g., engaging in challenging hobbies), because they benefited more from mastery experiences during off-job time. These age-related differences could be taken into account in designing recovery interventions. However, it has to be noted that personal preferences regarding specific activities likely also play a role in recovery processes. Moreover, it is possible that preferences for certain recovery experiences vary between individuals.

Limitations and ideas for future research

One important limitation of this study is its cross-sectional nature: given that we only measured recovery experiences and well-being at one time-point, causal conclusions cannot be drawn. Longitudinal studies are needed to gain a more detailed picture of how and why aging impacts recovery from work. Within-person studies utilizing long time spans would also yield more information about how leisure experiences and recovery processes change during an individual's life course. However, cross-sectional designs are recommended when conducting exploratory research such as ours (Spector 2019). In cross-sectional studies, generational effects may also play a role in explaining age-related differences: for example, research has previously addressed differences between generations in work and life values (Costanza and Finkelstein 2015; Zabel et al. 2017). It could be that for generations who put more emphasis on non-work values, recovery processes are more important (Sonnentag et al. 2017). Different age groups may also have different habits and preferences in terms of leisure-time activities, which may have an impact on recovery from work.

Another limitation relates to the sample of this study. The response rate was fairly low, and it is debatable whether, for example, the most stressed teachers did not have the energy to complete a relatively long questionnaire. In addition, the questionnaire was sent to the target group in May, which is an exceptionally busy time for teachers due to the end of the academic year. This study focused on teachers in Finland, which means that the results can be generalized to teachers only and that generalizing the results to teachers in different countries requires caution. Although teachers seem to have same job stressors worldwide, there are also certain differences between countries concerning, for example, the amount of technology used in teaching, students' assessment practices, and the level of engagement required in extracurricular activities (OECD 2019). Future studies could pay more attention to the role of emotional job demands in teachers' recovery processes, because the teacher's job is emotionally demanding (e.g., Kokkinos 2007; Skaalvik and Skaalvik 2015, 2017). All in all, future research could examine recovery processes in different (aging) working populations in different countries around the globe.

In addition, our data were based on self-reports, and therefore, common method variance may affect the results. However, a number of factors in our study reduced the risk of common method bias (see Podsakoff et al. 2003). All our measures were derived from established questionnaires with good psychometric properties. In the questionnaires that we used the items for recovery experiences and outcomes had different scale anchors and the scale items were printed on different pages. Concerning interaction effects, according to Siemsen et al. (2010), common

method variance actually deflates regression estimates of interaction effects, which means that these effects are not artificially created by common method variance. Although the use of self-reports has its limitations, it is indispensable when the focus of the study is on psychological experiences. Nevertheless, in future studies, it would be useful, for example, to combine physiological measurements like blood pressure or cortisol levels (which yield more detailed information about recovery processes on a physiological level) with the self-report data (for an overview of measurements in recovery research, see Sonnentag and Geurts 2009).

As we did not measure the participants' personality or other individual characteristics in the questionnaire, we were unable to take into account their possible role in recovery and in predicting the well-being outcomes which we used. Many studies show that personality is related to health and well-being (e.g., Strickhouser et al. 2017; Sun et al. 2018), but little is known about the role of personality in recovery from work (Sonnentag et al. 2017). Future studies could pay more attention to this issue.

Although recovery from work has received a lot of scholarly attention, the role of specific leisure activities in supporting recovery could still be studied further. It is known that physical and social activities are usually conducive to recovery, but findings regarding most other types of leisure activities (e.g., passive activities, like watching TV) are inconsistent (e.g., Sonnentag 2001; Sonnentag et al. 2017). Although recovery experiences are presumed to underlie off-job activities (Sonnentag and Fritz 2007), little is known about which activities are linked to which experiences (e.g., Ragsdale and Beehr 2016). It is probably possible to get the same experiences from different activities and that the same activities may generate different experiences in different individuals (e.g., someone may find reading relaxing, whereas for someone else, it may produce mastery experiences). This issue deserves further investigation.

Age-related differences in recovery processes also need to be studied further. Further research is needed to find possible explanations for the interactions identified in this study. In addition, non-linear patterns could be taken into account in future studies. Earlier studies imply that the relationship between age and occupational well-being may be characterized by a U-shaped pattern, with younger and older employees experiencing better well-being than those in mid-career (see Zacher and Schmitt 2016). A wide age distribution is a prerequisite for such studies. In our sample, the mean age was relatively high and the number of young teachers was quite small. Also, several other relevant recovery outcomes, like burnout, could be taken into account. It would also be worth examining whether there are age-related differences in which leisure activities are beneficial in terms of recovery. In

addition, personal preferences concerning recovery activities may change with age. This issue should be studied further. Previous studies have shown that motivational (e.g., extrinsic vs. intrinsic motivation) and affective attributes (e.g., enjoyment) associated with off-job activities play a decisive role in how specific activities support recovery from work (e.g., Sonnentag et al. 2017; Oerlemans et al. 2014; van Hooff and de Pater 2017; Waterman 2005).

Conclusions

The results of this study suggest that six recovery experiences—detachment, relaxation, control, mastery, meaning, and affiliation—during off-job time are related to higher well-being among teachers. Older teachers seemed to benefit more from control and mastery experiences, whereas younger teachers seemed to benefit more than their older counterparts from relaxation. Possible practical implications include recovery interventions taking into account the role of age and occupation. Longitudinal studies are needed to learn more about the causal processes in recovery from work during an individual's life course.

Funding This study was supported by the Finnish Work Environment Fund (Grant no. 116373).

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethical approval Ethical approval was not deemed necessary, because the study did not contain any of the following six features: (1) study involves an intervention in the physical integrity of subjects, (2) study deviates from the principle of informed consent, (3) subjects are under the age of 15 and the study is not part of their normal activities, (4) study exposes subjects to exceptionally strong stimuli and evaluating possible harm requires special expertise, (5) study may cause long-term mental harm, and (6) study can represent a security risk to subjects, which would necessitate ethical approval in non-medical research according to National Advisory Board on Research Ethics in Finland.

Informed consent Informed consent was included on the first page of the questionnaire.

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PUBLICATION II

Do older teachers benefit more from workday break recovery than younger ones?

Kinnunen, U., de Bloom, J., & Virtanen, A.

Scandinavian Journal of Work and Organizational Psychology, 4(1):7, 1-15.
doi: 10.16993/sjwop.87

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ORIGINAL ARTICLE

Do Older Teachers Benefit More From Workday Break Recovery Than Younger Ones?

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Age has not received much attention in research on work stress recovery. The present study addressed this research gap by studying whether age moderates the relationship between recovery experiences (detachment from work and relaxation) during workday breaks and recovery outcomes (need for recovery and job burnout) among teachers. Both lunch breaks and breaks between classes offer teachers recovery opportunities during workdays. The cross-sectional data were collected via an electronic questionnaire among Finnish class and subject teachers ($N = 769$) working in publicly funded comprehensive schools (83% female, mean age 49.8 years). Moderated hierarchical regression analyses showed that older subject teachers benefitted more from break detachment and relaxation than their younger colleagues in terms of lower levels of exhaustion and sense of inadequacy at work. In addition, break detachment was more strongly related to a lower need for recovery among older subject teachers. These moderator effects were not found among class teachers who had fewer opportunities to detach and relax during workday breaks than subject teachers. In conclusion, age seems to play a minor role in internal recovery occurring during workdays among teachers.

Keywords: burnout; detachment; need for recovery; relaxation; teachers; workday breaks

Recovery from work stress is essential to stay healthy (Geurts and Sonnentag, 2006; Sonnentag, Ventz, and Casper, 2017). However, in today's working life there are several factors threatening successful recovery. Lack of time for resting is among the most important threats (Meijman and Mulder, 1998; Zijlstra and Sonnentag, 2006). Due to blurring boundaries between work and private life, work is extending its effects on private life, decreasing quantity and impairing quality of leisure (Allvin, Aronsson, Hagström, Johansson, and Lundberg, 2011). In addition, working life is often hectic and demanding (see Eurofound, 2019, for an overview), with less time for breaks during work. Leisure time after work and workday breaks constitute the most important settings for recovery from work (Sonnentag et al., 2017).

Although recovery from work stress has recently received a lot of research attention (see Sonnentag et al., 2017, for a review), there are still gaps in research. The present study addresses some of these. First, it focuses on internal recovery occurring during breaks at work, which has received much less attention than external recovery occurring during leisure time after work. Second, we pay attention to the role of aging in recovery, which has been an under-examined issue, although the challenges of an

aging working population have been widely recognized (e.g., Ilmarinen, 2001; Truxillo, Cadiz, and Hammer, 2015). Third, the target group in our study are teachers, whose recovery from work stress has seldom been examined. One exception is the interview study by Skaalvik and Skaalvik (2015), in which middle-aged teachers reported problems in recovering during weekends and vacations. Another longitudinal study showed that teachers had difficulties with unwinding during weekends in the fall term but not during the spring term, which, in contrast to the fall term, included longer breaks from work (Kinnunen, 1989).

Teaching is a highly stressful occupation (e.g., Klassen, 2010; Skaalvik and Skaalvik, 2017; Tang, Leka, and MacLennan, 2013) and it is especially important to recover from work when job stressors are high (Sonnentag, 2018). Job stressors reported by the teachers themselves seem to include the following: 1) poor quality of interaction (e.g., conflicts, misbehavior, lack of support) with pupils, colleagues, and school administration; 2) high time demands and large amount of work; 3) inadequacies in the working conditions and prerequisites of work (e.g., problems with indoor air, lack of materials and equipment); and 4) problems related to social status, professional pride, and salary (e.g., Fernet et al., 2012; Hakanen, Bakker, and Schaufeli, 2006; Klassen and Chiu, 2011). International comparisons (OECD, 2019) show, for example, that Finnish teachers are highly educated, as teachers typically have a master's degree either in education or some other

subject (e.g., mathematics or languages), with compulsory additional studies in education. Finland, in addition to Iceland and Sweden, is among the countries that between 2013 and 2018 achieved the greatest increase in the share of teachers using digital technologies to support student learning.

Teachers' work offers a fruitful starting point to examine internal recovery as teachers have—besides lunch breaks—structured breaks between classes, which, at least in principle, should provide them with opportunities to recover. Successful recovery during the working day may be an important means to prevent early retirement and to prolong the working career. Our study results can be utilized in finding new ways to improve teachers' opportunities to recover from work stress.

Recovery from work stress during breaks

Recovery is a process during which depleted resources (e.g., energy, mood) are replenished after expending effort and energy at work (Zijlstra and Sonnentag, 2006). In replenishing depleted resources, recovery experiences and activities during off-job time play a key role (Sonnentag, 2001; Sonnentag and Fritz, 2007; Sonnentag and Geurts, 2009). According to Sonnentag and Fritz (2007) recovery experiences are especially important, as it is not the activity (e.g., physical activity) *per se* but its underlying experiences, such as relaxation or psychological detachment from work, that help to recover from work stress. Several recovery experiences have been identified (e.g., Sonnentag and Fritz, 2007; Newman, Tay, and Diener, 2014), of which we focused on psychological detachment and relaxation. Based on the review by Sonnentag and colleagues (2017), these two seem to be the most beneficial recovery experiences in terms of well-being. This is confirmed by the meta-analysis by Bennett, Bakker and Field (2018), which showed that detachment and relaxation during off-job time were especially closely related to lower fatigue. In addition, during the relatively short timeframes of school breaks, achieving detachment and relaxation is more feasible than, for example, having such recovery experiences as mastery and control.

Psychological detachment refers to the subjective experience of leaving work behind, to 'switching off,' and to forgetting about work during non-work time, while *relaxation* refers to the experience of low sympathetic activation and positive affect (Sonnentag and Fritz, 2007). Both experiences have their roots in the effort-recovery (E-R) model (Meijman and Mulder, 1998). According to the E-R model, effort at work leads to acute load reactions (e.g., excretion of stress hormones, feelings of fatigue), and when an individual is no longer exposed to depleting work demands, load reactions are released and recovery occurs. Because psychological detachment and relaxation imply that no further demands are made on the functional systems (e.g., neuroendocrine and cardiovascular systems) and internal resources (e.g., self-regulation) called upon during work, they may be helpful. Current evidence based on recent meta-analyses (Bennett et al., 2018; Wendsche and Lohmann-Haislah, 2017) supports their beneficial effects during off-job time.

Workday breaks constitute an important recovery setting as breaks can prevent resource depletion early on and protect against major need for recovery at the end of a working day. Lunch breaks constitute the longest respite episode during the working day. Maybe therefore lunch breaks have so far received more research attention than other breaks. Earlier cross-sectional and diary studies (e.g., Coffeng et al., 2015; Sianoja et al., 2016; von Dreden and Binnewies, 2017) have shown that detachment from work during lunch breaks is associated with better recovery outcomes (i.e., more vigor, less need for recovery and fatigue). Also, relaxation during lunch breaks has contributed to improved well-being (i.e., more vigor, less strain and fatigue) in diary and intervention studies (e.g., Bosch, Sonnentag, and Pinck, 2018; de Bloom et al., 2017; Krajewski, Sauerland, and Wieland, 2011; Sianoja et al., 2018). Thus detachment from work and relaxation also have beneficial effects during work breaks and not only during off-job time.

Moreover, shorter breaks during the working day may have beneficial effects (see Sonnentag et al., 2017). Teachers in Finnish schools have both lunch breaks, lasting about 30 minutes, and breaks between classes, lasting about 10 minutes. Both break episodes can be categorized as offering opportunities for mesorecovery to occur after 10 minutes to 1 hour (Sluiter, Frings-Dresen, and Meijman, 2000). There is evidence showing that even so-called microbreaks (lasting under 10 minutes) may be beneficial particularly during the afternoon at work (Kühnel et al., 2017). However, it remains so far unknown which recovery experiences are then most beneficial during short breaks.

The participants in the present study worked as teachers in comprehensive schools teaching pupils in classes 1–9, that is, from age 7 to 16. Class teachers take care of classes 1–6 and subject teachers mainly of classes 7–9. As class teachers usually have their lunch with their pupils, their recovery opportunities during lunch breaks are limited. In addition, both teacher groups are required to oversee pupils during breaks between classes on a regular basis, implying that these breaks, too, cannot be fully utilized for recovery purposes. Therefore breaks during the school day do not always fulfill the definition of a break: A break is an episode of the working day during which employees shift their attention away from work tasks (Hunter and Wu, 2016).

The role of aging in recovery from work stress

The role of age has not received much attention in recovery research apart from its role as a control variable or a predictor of need for recovery (Kiss, De Meester, and Braeckman, 2008; Mohren, Jansen, and Kant, 2010). According to Sonnentag and colleagues (2017), because recovery processes are closely linked to mood regulation (Parkinson and Totterdell, 1999; Sonnentag and Fritz, 2007) and because motivation and competence for mood regulation change with age (see Scheibe and Zacher, 2013, for a review), it is reasonable to assume that the effectiveness of specific recovery activities or experiences will change with age.

Stressful work often leads to high negative activation, reflected in negative affective states such as irritability, anger and tension (Sonnentag, 2018). Mood repair is therefore one of the core functions of recovery (Sonnentag and Fritz, 2007). Parkinson and Totterdell (1999) have suggested that regulation strategies can be divided into diversionary and engagement strategies. Diversionary strategies aim at avoiding a negative or stressful situation and seeking distraction from it. Engagement strategies are characterized by confronting or accepting the negative stressful situation. According to Sonnentag and Fritz (2007), diversionary strategies are more relevant for stress recovery because engagement strategies keep the individual cognitively preoccupied with the stressful situation and its potential effects, which makes recovery less likely (Meijman and Mulder, 1998). Psychological detachment from work and relaxation can be seen as diversionary strategies helping to avoid negative work-related cognitions (Parkinson and Totterdell, 1999). Based on another division (Gross, 1998a, b), psychological detachment and relaxation may be categorized into antecedent-focused strategies, which take effect before the negative emotion is actually generated. They both represent attentional deployment in which one distracts attention away from the stressful situation. However, relaxation may also belong to response-focused strategies, for example, in the case when relaxation techniques (e.g., deep breathing) are used for response modulation.

There is evidence indicating that older adults use antecedent-focused emotion regulation strategies more often than do younger adults (see Scheibe and Zacher, 2013, for a review). These strategies are generally more effective and less cognitively demanding than response-focused strategies used for response modulation because in the latter case the full emotional response has developed (Gross, 1998a, b). A meta-analysis comparing the effectiveness of emotion regulation strategies confirmed that distraction—as one type of attentional deployment—was an effective way to regulate emotions (Webb, Miles, and Sheeran, 2012). It is also known that older adults shift to using secondary control strategies that change the self (e.g., motives and goals) in order to adjust to environmental demands instead of using primary control strategies that change external circumstances (Freund and Baltes, 2000; Hechhausen, Wrosch, and Schulz, 2010). Secondary strategies are less cognitively demanding than primary control strategies (Scheibe and Zacher, 2013). Detachment and relaxation are more akin to secondary than primary strategies.

Implementation of any mood or emotion regulation strategy requires self-control to some extent (Scheibe and Zacher, 2013). However, the amount of control needed may decrease if people successfully use these strategies over time as then the strategies should become activated more automatically and they are therefore less effortful (Senescac and Scheibe, 2014). Altogether, this means that people's emotion regulation competence may increase with age, implying that fewer resources are needed to reach the same regulatory outcome. Adapting the knowledge of the links between age, mood and emotion regulation to

recovery from work stress suggests that older employees may utilize detachment from work and relaxation—representing attentional deployment—more often than younger employees. Older employees may also benefit from these recovery experiences more than younger ones in terms of well-being as the use of these strategies should require less effort (i.e., less self-control is needed) due to the accumulated expertise of older employees.

However, it is worth noting that chronological age derives its meaning from the association with normative changes in different domains of functioning (Scheibe and Zacher, 2013). Even though normative changes (e.g., physiological slowing, motivational shifts, life context changes) occur, there are large inter-individual differences in age-associated change. This is especially true for the lifespan covering working age (Scheibe and Zacher, 2013). Consistent with this notion, several meta-analyses in the work context have found either no age differences or only minimal differences in favor of older employees with regard to work-related stress, motivation and job attitudes (Kooij et al., 2011; Moghimi et al., 2017; Ng and Feldman, 2010; Rauschenbach et al., 2013). This is in line with the idea that different age-related losses and gains may compensate each other. Chronological age also relates to organizational age, i.e., aging in an employee role in an organization (De Lange et al., 2006). Thus it is closely related to tenure and work experience.

The present study: Hypotheses tested

The main aim of the present study was to examine whether age plays a role in the relationship between recovery experiences (detachment, relaxation) during workday breaks (i.e., lunch breaks and breaks between classes) and recovery outcomes (need for recovery, job burnout) among Finnish teachers. We examined need for recovery and job burnout as the outcomes as they are theoretically the most likely consequences of poor recovery (Meijman and Mulder, 1998). Need for recovery refers to the desire to be temporarily relieved of work demands in order to replenish internal resources (Sluiter, van den Beek, and Frings-Dresen, 1999; Van Veldhoven and Broersen, 2003). Need for recovery increases towards the end of the working day and is considered an early sign of poor recovery (Van Veldhoven and Broersen, 2003). Symptoms of burnout (exhaustion, cynicism, sense of inadequacy) may follow in the long-term if poor recovery persists (Maslach, Schaufeli, and Leiter, 2001).

We posed three hypotheses. The first (H1) is based on the E-R model (Meijman and Mulder, 1998) and research on work breaks showing that both break detachment and relaxation have beneficial effects on well-being (e.g., Bosch et al., 2018; Sianoja et al., 2016; 2018).

H1: Experiencing a) detachment from work and b) relaxation during workday breaks has a negative association with need for recovery and job burnout.

The second hypothesis (H2) is in line with the results of meta-analyses on age differences in the work context, which report either no age differences or only minimal differences in favor of older employees (e.g., Ng and Feldman, 2010).

One reason for these favorable results may lie in a healthy worker effect: only the healthiest employees continue to work. Earlier studies on need for recovery suggest that need for recovery is greatest among 46- to 55-year-old employees, but decreases among older employees (Mohren et al., 2010). Older employees generally report lower levels of job burnout (Ng and Feldman, 2010).

H2: Age has a (weak) negative association with need for recovery and job burnout.

The third hypothesis (H3) is set on the basis of changes perceived in emotion and mood regulation across age (see Scheibe and Zacher, 2013, for a review). Consistent with the literature, we expect that detachment and relaxation may be more easily (i.e., with less effort) achieved during work breaks among older teachers due to their greater competence and experience, which in turn is reflected in higher levels of well-being.

H3: Age moderates the negative association between break detachment from work and relaxation with need for recovery and job burnout in such a way that the association is stronger among older teachers than among their younger colleagues.

Methods

Participants and procedure

The participants of this study ($N = 769$) were teachers working in Finnish publicly funded comprehensive schools, which provide nine-year compulsory basic education. The sample was drawn in the spring of 2017 from the register of the Trade Union of Education (OAJ) stratified by age (under 45-year-olds, 45- to 55-year-olds and over 55-year-olds), and teacher group (class teacher and subject teacher). Age 45 was used as a threshold for defining aging teachers, as around that age perceived work ability starts to decline (Ilmarinen, 2001; Kooij et al., 2011). An 'early' definition also affords better opportunities for preventive measures (Ilmarinen, 2001). Age 55 or over has been emphasized as an age after which early action is needed to prevent employees from leaving working life (Ilmarinen, 2001).

Of Finnish teachers, 95% belong to the Trade Union of Education. The electronic questionnaire was sent by the trade union to 3,500 teachers, who were randomly selected representing all parts of the Finnish-speaking areas of the country. Among class and subject teachers the questionnaire was sent to 500 teachers' e-mail addresses in each age group. The response rate was 28% among class teachers and 21% among subject teachers. The attrition analyses showed that the study participants were older (the share of over 55-year-old teachers 41.5% vs. 18.6%), more often women (83.4% vs. 77.6%) and subject teachers (47.1% vs. 35.6%) than teachers registered as members of the Trade Union of Education. The age difference is explained by the procedure by which the sample was drawn, i.e., as aging teachers were the target group of the study, the older age groups were given more weight than under 45-year-olds.

Of the study participants, 58% worked as class teachers and 42% as subject teachers in comprehensive schools. Of the teachers, 83% were women and 17% were men and they belonged to the three age categories as follows: 25% were under 45 years old, 39% 45 to 55 years old and 36% were over 55 years old. Their self-reported average working hours were 36.5 ($SD = 9.3$) covering teaching (lessons and their preparation) and administrative tasks. Class and subject teachers did not differ in working hours [$M = 36.4$ ($SD = 9.0$) vs. $M = 36.8$ ($SD = 9.7$), $t(767) = -0.639$, ns].

The participants were informed about the study goals and assured that their responses would be treated in confidence and that participation was voluntary. Informed consent was included on the first page of the questionnaire.

Measures

Break recovery experiences

Detachment from work and *relaxation* occurring during lunch breaks and breaks between classes were measured separately. On both break occasions a single-item measure ('I distance myself mentally from my work during lunch breaks/breaks between classes'; 'I use the time to relax during lunch breaks/breaks between classes') was used. The items were from the Recovery Experience Questionnaire (Sonnentag and Fritz, 2007), which has been validated in Finland (Kinnunen, Feldt, Siltaloppi, and Sonnentag, 2011) and modified to apply to breaks. The rating scale ranged from 1 (seldom) to 5 (very often). We computed a sum score for break detachment and relaxation covering both lunchbreaks and breaks between classes, for which the respective Cronbach's alphas were 0.68 and 0.64.

Recovery outcomes

Need for recovery was measured on the shortened scale constructed by van Veldhoven, Prins, Van der Laken and Dijkstra (2015) based on the longer version of the scale (van Veldhoven and Broersen, 2003). The shortened scale consists of six items (e.g., 'When I get home from work, I need to be left in peace for a while'), which were rated on a scale from 1 (totally disagree) to 5 (totally agree). The Cronbach's alpha of the scale was 0.86. *Job burnout* was assessed by the Bergen Burnout Indicator-9 (Salmela-Aro, Rantanen, Hyvönen, Tilleman, and Feldt, 2011; Feldt et al., 2014), which measures exhaustion (e.g., 'I am snowed under with work'), cynicism (e.g., 'I feel that I'm gradually losing interest in my pupils') and sense of inadequacy (e.g., 'I feel that I have gradually less to give') each with three items. The rating scale ranged from 1 (totally disagree) to 6 (totally agree). The Cronbach's alphas were as follows: 0.71, 0.81 and 0.81. It has been shown (Näätänen, Aro, Matthesien, and Salmela-Aro, 2003) that the subscales of exhaustion and cynicism correspond well with the corresponding subscales of the Maslach Burnout Inventory—General Survey (Maslach, Jackson, and Leiter, 1996). However, the correspondence is less clear between sense of inadequacy and lack of professional efficacy. The reason for this may lie in the wording of the sense

of inadequacy items; they are negative contrary to the positive items of (lack of) professional efficacy (Näätänen et al., 2003).

Moderator

Chronological *age* was measured as a continuous variable eliciting the year of birth. Age was calculated by performing a transformation (2017–year of birth) ($M = 49.8$ years, $SD = 10.2$ years, range 20–65).

Controls

In the analyses we controlled for *workload*, as job demands may set in motion a process of deteriorating health leading to poor well-being and health (Bakker, Demerouti, and Sanz-Vergel, 2014). Workload has been shown to be the main antecedent of burnout, especially of exhaustion (Alarcon, 2011; Lee and Ashforth, 1996). In addition, workload is a crucial factor that makes psychological detachment from work and relaxation more difficult (Bennett et al., 2018; Wendsche and Lohmann-Haislah, 2017). Workload was measured with three items (e.g., ‘How often does your job require you to work under time pressure?’) from the Quantitative Workload Inventory (Spector and Jex, 1998). The items were rated on a five-point scale from 1 (very seldom or never) to 5 (very often or always). The Cronbach’s alpha of the scale was 0.86.

Results

Descriptive results

For descriptive purposes we examined teacher and age group differences in the study variables, which are shown in **Table 1**. The results of the two-way analyses of variance revealed that teacher group differences were more pronounced than were age group differences. Class teachers had less break detachment and relaxation experiences and higher exhaustion level than subject teachers ($p < 0.001$). Due to these essential differences between the teacher groups in recovery opportunities, we continued by examining the two teacher groups separately. There were also age differences in break detachment ($p < 0.01$), in relaxation ($p < 0.05$) and in inadequacy ($p < 0.001$). The oldest group of teachers (over 55 years old) reported higher break detachment and relaxation than teachers aged 45–55 years. The youngest group (under 45 years old) had fewer feelings of inadequacy than the older age groups.

Table 2 shows the correlations of the study variables separately for class teachers and subject teachers. In both teacher groups, break detachment and relaxation related to less need for recovery and fewer burnout symptoms. Age correlated with higher sense of inadequacy in both teacher groups and with higher break detachment among subject teachers. Break detachment and relaxation were strongly linked with each other in both teacher groups. Also, recovery outcomes correlated strongly with each other, especially the two burnout symptoms of cynicism and sense of inadequacy. Workload was negatively associated with break recovery experiences and positively with recovery outcomes.

Hypotheses testing

We tested the hypotheses (H1–H3) with moderated regression analysis (Aiken and West, 1991) separately among class teachers and subject teachers. To avoid multicollinearity, we calculated separate models for break detachment and relaxation (correlations ranged $r = 0.66$ – 0.68 , $p < 0.001$). We performed hierarchical multiple regression analyses for each dependent variable using the following procedure: workload was entered at step 1 to control for its effect; break detachment and relaxation were entered at step 2 and age at step 3. At step 4 we entered the interaction terms (age \times break detachment, age \times break relaxation). All variables were standardized to avoid multicollinearity.

Results for break detachment

The results for the relationships between break detachment and recovery outcomes are shown in **Table 3** separately for class teachers and subject teachers. At step 1, workload as a control variable explained 6–29% of the variance in various outcomes. The explanation rate was highest for exhaustion and lowest for cynicism in both teacher groups. At step 2 break detachment contributed to all outcomes except for inadequacy among class teachers, explaining 1–8% of the variance in the outcomes. Again, the highest variance explained concerned exhaustion in both teacher groups. At step 3 age did not play a major role as it was positively related only to inadequacy in both teacher groups.

All significant moderator effects at step 4 were found in subject teachers: age moderated the relationship between break detachment and need for recovery, exhaustion and inadequacy. These moderator effects are shown graphically in **Figure 1 (a–c)**. The graphical presentations of the interactions were derived using standardized regression coefficients of the regression lines for teachers high (1 *SD* above the mean age, that is, over 60 years) and low (1 *SD* below the mean age, that is, under 40 years) on the moderator variable of age. We also performed simple slope analyses to test the significance of the relationships in younger and older age groups.

As **Figure 1 (a–c)** shows, under conditions of high break detachment older subject teachers reported less (or equally great) need for recovery, exhaustion and inadequacy at work than younger teachers. However, under conditions of low break detachment, older subject teachers’ well-being was poorer than that of their younger counterparts. Thus the results suggest that older subject teachers benefitted more from high workday break detachment than did their younger counterparts. Simple slope analyses provided support for this interpretation: the negative relationship between detachment and need for recovery was significant in both younger ($B = -0.23$, $p < 0.01$) and older teachers ($B = -0.45$, $p < 0.001$) but the relationship was stronger among older teachers. This seemed also to be the case concerning the relationship between detachment and exhaustion although the difference in strength was not confirmed by the level of statistical significance: $B = -0.28$, $p < 0.001$ in younger and $B = -0.52$, $p < 0.001$ in older

Table 1: Age and teacher group differences (*M* and *SD*) in study variables: Results of 2-way analyses of variance.

Variable	Under 45-year-olds (1)		45–55-year-olds (2)		Over 55-year-olds (3)		Age effect <i>F</i>	Teacher group effect <i>F</i>	Age × teacher group <i>F</i>
	Class teachers (n = 95)	Subject teachers (n = 94)	Class teachers (n = 185)	Subject teachers (n = 114)	Class teachers (n = 168)	Subject teachers (n = 113)			
Workload	4.10 0.74	3.93 0.86	4.06 0.70	3.94 0.79	3.91 0.73	3.86 0.69	2.24, ns	4.10*	0.36, ns
Break detachment	1.54 0.67	1.75 0.72	1.54 0.76	1.77 0.85	1.60 0.74	2.09 0.93	5.35** 2 < 3	28.77***	2.57, ns
Break relaxation	1.76 0.72	2.15 0.86	1.73 0.80	2.10 0.88	1.86 0.86	2.39 0.89	5.01** 2 < 3	46.33***	0.78, ns
Need for recovery	3.40 0.95	3.26 1.04	3.42 0.87	3.27 1.01	3.34 0.97	3.20 1.03	0.46, ns	3.65, ns	.01, ns
Exhaustion	3.68 1.26	3.33 1.14	3.68 1.12	3.44 1.16	3.60 1.18	3.34 1.22	0.42, ns	10.51***	0.12, ns
Cynicism	2.49 1.09	2.52 1.14	2.65 1.22	2.66 1.26	2.64 1.23	2.64 1.16	0.99, ns	0.18, ns	.01, ns
Inadequacy	2.86 1.15	2.83 1.19	3.66 1.37	3.23 1.33	3.55 1.40	3.21 1.29	10.23*** 1 > 2–3	3.10, ns	0.88, ns

****p* < 0.001, ***p* < 0.01, **p* < 0.05, ns = non-significant; pairwise mean comparisons with Bonferroni correction (*p* < 0.05).

Table 2: Correlations of study variables among subject teachers (*n* = 321, above the diagonal) and class teachers (*n* = 448, under the diagonal).

Variable	Class teachers <i>M</i> (<i>SD</i>)	Subject teachers <i>M</i> (<i>SD</i>)	1	2	3	4	5	6	7	8
1 Workload	4.01 (0.72)	3.91 (0.77)	–	–0.05	–0.24***	–0.35***	0.43***	0.54***	0.30***	0.31***
2 Age	50.82 (9.28)	48.73 (11.20)	–0.09	–	0.13*	0.09	–0.01	0.01	0.06	0.12*
3 Break detachment	1.56 (0.73)	1.88 (0.86)	–0.34**	0.03	–	0.68***	–0.32***	–0.39**	–0.23***	–0.23***
4 Break relaxation	1.79 (0.81)	2.22 (0.89)	–0.27**	0.02	0.66**	–	–0.39***	–0.42**	–0.25***	–0.27***
5 Need for recovery	3.39 (0.93)	3.25 (1.02)	0.41***	–0.03	–0.30***	–0.28***	–	0.66***	0.52***	0.55***
6 Exhaustion	3.65 (1.17)	3.37 (1.17)	0.52***	–0.04	–0.33***	–0.31***	0.67***	–	0.57***	0.57***
7 Cynicism	2.61 (1.20)	2.61 (1.19)	0.24***	0.02	–0.18**	–0.17**	0.48***	0.59**	–	0.79***
8 Sense of inadequacy	3.27 (1.36)	3.10 (1.28)	0.26***	0.16**	–0.16**	–0.16**	0.46***	0.54***	0.81***	–

****p* < 0.001, ***p* < 0.01, **p* < 0.05.

Table 3: Results of hierarchical regression analyses for recovery outcomes; break detachment as a recovery experience.

	Class teachers (n = 448)				Subject teachers (n = 321)			
	Need for recovery		Exhaustion		Cynicism		Inadequacy	
	β	β	β	β	β	β	β	β
Step 1. Workload	0.35***	0.46***	0.21***	0.25***	0.37***	0.47***	0.26***	0.27***
ΔR^2	0.17***	0.27***	0.06***	0.07***	0.18***	0.29***	0.09***	0.10***
R^2	0.17***	0.27***	0.06***	0.07***	0.18***	0.29***	0.09***	0.10***
Step 2. Break detachment	-0.18***	-0.18***	-0.11*	-0.08	-0.24***	-0.29***	-0.18**	-0.18***
ΔR^2	0.03	0.03***	0.01*	0.01	0.05***	0.08***	0.03**	0.03**
R^2	0.20***	0.29***	0.07***	0.07***	0.23***	0.36***	0.12***	0.12***
Step 3. Age	0.01	0.00	0.04	0.18***	0.05	0.07	0.10	0.16**
ΔR^2	0.00	0.00	0.00	0.04***	0.00	0.00	0.01	0.02**
R^2	0.20***	0.29***	0.07***	0.11***	0.23***	0.36***	0.13***	0.15***
Step 4. Age \times break detachment	-0.02	0.03	0.05	0.04	-0.10*	-0.11*	-0.06	-0.13*
ΔR^2	0.00	0.00	0.00	0.00	0.01*	0.01*	0.00	0.02**
R^2	0.20***	0.30***	0.07***	0.11***	0.24***	0.38***	0.13***	0.16***

Note: β = standardized beta-coefficient from the final step. ΔR^2 = change in explanation rate in each step. R^2 = explanation rate. *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$.

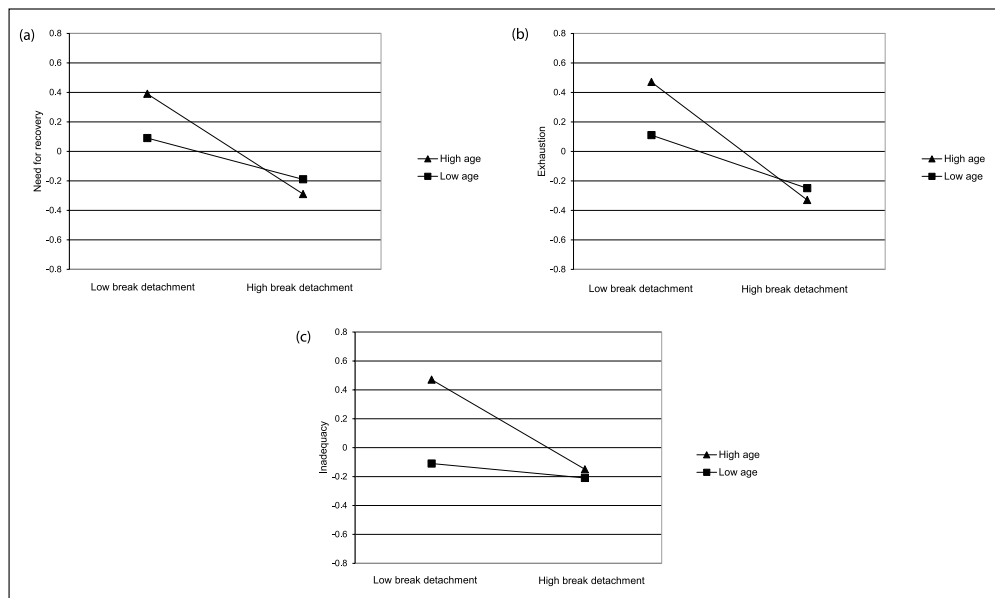


Figure 1: Significant interaction effects between break detachment and need for recovery (a), exhaustion (b), and sense of inadequacy (c) among subject teachers.

teachers. The negative relationship between detachment and feelings of inadequacy was only significant among older teachers ($B = -0.48$, $p < 0.001$ vs. $B = -0.15$, ns). The full models explained between 7% (cynicism in class teachers) and 38% (exhaustion in subject teachers) of the variance in various outcomes.

Results for break relaxation

The results for the relationships between break relaxation and recovery outcomes shown in **Table 4** separately for class teachers and subject teachers are quite similar to the results for break detachment. Break relaxation contributed to all recovery outcomes, explaining 1–6% of the variance in the outcomes. Age did not play a role except for feelings of inadequacy. Again, the moderator effects were only found among subject teachers and they were similar to those for detachment (graphical presentations therefore not shown). Simple slope analyses confirmed that the negative relationship between break relaxation and feelings of inadequacy ($B = -0.40$, $p < 0.001$ in older vs. $B = -0.17$, $p < 0.01$ in younger teachers) was stronger among older than among younger teachers. The relationship between break relaxation and exhaustion ($B = -0.53$, $p < 0.001$ in older vs. $B = -0.32$, $p < 0.001$ in younger teachers) pointed in the same direction, although it was statistically equally significant in both teacher groups. Thus, both younger and older subject teachers benefitted from high break relaxation, but the benefit was greater for older teachers. The total variance explained by the model ranged from 7% to 36%.

Discussion

The main aim of the present study was to shed new light on the role of age in the relationships between recovery

experiences (detachment from work and relaxation) at work breaks and recovery outcomes (need for recovery and job burnout). Besides these possible moderator effects, we examined the direct relationships between recovery experiences and age with need for recovery and job burnout. The target group of our study was teachers, who are known to have highly stressful jobs and therefore recovery experiences should be particularly helpful for them (Sonnentag, 2018).

Main findings and their theoretical implications

Experiencing detachment from work and relaxation during workday breaks was negatively associated with need for recovery and burnout, as expected on the basis of the E-R model (Meijman and Mulder, 1998). H1 thus received support. Our study demonstrates, in line with earlier studies concerning lunchbreaks (e.g., Bosch et al., 2018; Sianoja et al., 2016, 2018; von Dreden and Binnewies, 2017), that these recovery experiences are also significant during work breaks and not only during off-job time. The associations as regards greater need for recovery and exhaustion appear stronger than for cynicism and sense of inadequacy. This may relate to the fact that need for recovery and exhaustion are symptoms occurring at an early phase of the burnout process and may therefore be easier to influence than cynicism and inadequacy (Maricuțoiu, Sava, and Butta, 2016; Maslach et al., 2001).

It is noteworthy that detachment and relaxation were experienced quite seldom during work breaks and their explanation rates remained low (0–8%). Moreover, teacher group had a more marked effect on both recovery experiences than did age. Both recovery experiences were more common among subject teachers than class

Table 4: Results of hierarchical regression analyses for recovery outcomes; break relaxation as a recovery experience.

	Class teachers (n = 448)			Subject teachers (n = 321)				
	Need for recovery β	Exhaustion β	Cynicism β	Inadequacy β	Need for recovery β	Exhaustion β	Cynicism β	Inadequacy β
Step 1. Workload	0.36***	0.47***	0.21***	0.24***	0.33***	0.44***	0.24***	0.25***
ΔR^2	0.17***	0.27***	0.06***	0.07***	0.18***	0.29***	0.09***	0.10***
R ²	0.17***	0.27***	0.06***	0.07***	0.18***	0.29***	0.09***	0.10***
Step 2. Break relaxation	-0.17***	-0.18***	-0.11*	-0.10*	-0.28***	-0.28***	-0.18**	-0.21***
ΔR^2	0.03***	0.03***	0.01*	0.01*	0.06***	0.06**	0.02**	0.03**
R ²	0.20***	0.30***	0.07***	0.07***	0.25***	0.35***	0.12***	0.13***
Step 3. Age	-0.00	0.00	0.05	0.19***	0.04	0.08	0.12*	0.19**
ΔR^2	0.00	0.00	0.00	0.03***	0.00	0.00	0.01	0.02**
R ²	0.20***	0.30***	0.07***	0.11***	0.25***	0.35***	0.12***	0.15***
Step 4. Age x break relaxation	-0.08	-0.00	0.06	0.02	-0.03	-0.11*	-0.09	-0.14*
ΔR^2	0.01	0.00	0.00	0.00	0.00	0.01*	0.01	0.02*
R ²	0.21***	0.30***	0.07***	0.11***	0.25***	0.36***	0.13***	0.17***

Note: β = standardized beta-coefficient from the final step, ΔR^2 = change in explanation rate in each step, R^2 = explanation rate.
 *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$.

teachers and an increase in their occurrence was observed especially among subject teachers belonging to the oldest (over 55-year-old) age group. These findings suggest that experiencing detachment from work and relaxation during work breaks depends more on recovery opportunities offered by working conditions than age, although age has a minor role. The observed role of age is in line with the theoretical considerations on age differences in emotion regulation: the use of strategies representing attentional deployment—such as detachment and relaxation—in which one distracts attention from the stressful situation increases with advancing age (Scheibe and Zacher, 2013). This likely relates to older adults' emotion-regulation competence, which helps them to select appropriate (often less cognitively demanding) strategies (Heckhausen et al., 2010). Such avoidance strategies are helpful in recovery as they make it possible to avoid work-related cognitions maintaining negative activation (Sonnentag and Fritz, 2015).

Of burnout symptoms, age played a role in relation to sense of inadequacy. Older teachers had more sense of inadequacy at work. This concerned both class teachers and subject teachers. Therefore H2, which expected fewer symptoms with age, did not gain support. In the meta-analysis by Ng and Feldman (2010) older employees experienced fewer burnout symptoms, which may relate to the selection bias known as the healthy worker effect. However, there are also some studies showing that burnout increases somewhat with age. For example, Ahola and co-workers (2006) showed that as a three-dimensional syndrome, burnout was positively related to age in a population-based Finnish sample. In our study the age effect was seen only in relation to sense of inadequacy. This may relate to the growing demands for lifelong learning with the rapid digitalization of Finnish society, including teaching work. It challenges the existing teaching methods and practices and requires teachers to work more effectively and flexibly. This demand may become a burden for older teachers, whose digital skills are very likely poorer than those of their younger colleagues, causing them to feel inadequate at their work. It is also possible that a general distrust in older employees' competence and motivation to learn may be behind the result (Ng and Feldman, 2012): older teachers may have internalized this stereotype over the years and therefore feel inadequate.

Age moderated the relationships between break detachment and relaxation and recovery outcomes, but these moderator effects were found only in subject teachers. Thus, older subject teachers benefitted more than their younger counterparts from break detachment and relaxation in terms of well-being. H3 expecting moderator effects gained partial support. The result that moderator effects were only found among subject teachers may relate to the perception that they had more recovery opportunities during work breaks. Consequently, their breaks fulfilled the criterion for a break better, that is, during a break attention is distracted from work tasks (Hunter and Wu, 2016). Class teachers seem to perform work tasks and oversee their pupils during work breaks

more often than subject teachers, which reduces their recovery opportunities (Virtanen, Perko, Törnroos, de Bloom, and Kinnunen, 2019). This can be seen in the form of poorer detachment and relaxation during breaks. We may conclude that only when a certain threshold of recovery opportunities is achieved do the moderator effects emerge.

Among subject teachers age played a role in helping to benefit more from both break detachment and relaxation in terms of well-being. Although the beneficial effects of high break detachment on need for recovery, high break detachment and relaxation on exhaustion and high break relaxation on inadequacy were also seen in the younger age group, the effects were more marked among older subject teachers. The positive effect of break detachment on less feeling of inadequacy at work was seen only in the older age group. Thus, not only did work conditions afford better recovery opportunities during breaks for subject teachers, but our results suggest that age also gave these teachers more competence and experience to use detachment and relaxation during work breaks and benefit from these experiences (see Scheibe and Zacher, 2013). It is possible that this tendency of detaching and relaxing during breaks may develop gradually into a habit and become a more usual way of spending breaks (Sonnentag and Fritz, 2015). In our case, greater work experience achieved through increasing age (e.g., less need to prepare for classes) likely helps to make the habit possible. However, working conditions also have to support the experience of break detachment and relaxation.

Limitations and suggestions for future studies

A few noteworthy limitations are obvious in our study. First of all, the study design was cross-sectional, making it impossible to draw conclusions about the direction of causality. Our hypotheses stated that recovery experiences during breaks determine well-being outcomes, but the relationships might equally well be the opposite. It has been argued that employees higher in burnout may have a harder time detaching from work. The reason for this may relate to reduced self-regulatory capacity that would be needed to refrain from thinking about work-related matters when it is not necessary (Sonnentag and Fritz, 2015). This reverse relationship has been shown in longitudinal studies lasting from four weeks (Sonnentag, Arbeus, Mahn, and Fritz, 2014) to two years (Kinnunen, Feldt, and de Bloom, 2019). In the future, either short-term diary studies or long-term longitudinal studies are needed to better reveal causal relationships between break recovery and various recovery outcomes. Such studies would also be relevant from the viewpoint of aging, as individuals age differently. Studying within-individual changes is therefore more useful than age group comparisons (e.g., Truxillo et al., 2015).

Second, our data were based on self-reports, which may inflate the relationships found between the phenomena examined due to common method variance. However, it has been shown that interaction effects, which were the principal focus of our study, are unlikely to be produced

by common method variance (Siemsen, Roth, and Oliveira, 2010). The moderator effects found in our study were small, which is typical of non-experimental field studies (e.g., McClelland and Judd, 1993). Evans (1985) concluded that even those moderator effects explaining 1–2% of the total variance should be considered important. In addition, common method variance should have inflated all the relations and not just some of them. In fact, it has been argued that common method variance does not automatically inflate associations measured with self-report measures (Spector, 2006). However, in the future break detachment and relaxation could be observed by colleagues (e.g., where colleagues spend their breaks, whether they work or speak about work during breaks) in addition to self-evaluations.

Third, we focused on teachers because they have structured breaks at work. Although this was a good starting point, a one-sample design naturally limits the generalizability of our findings; they can be generalized only to teachers. In addition, the response rate was rather low and certain self-selection was apparent as women and subject teachers were overrepresented in the sample compared to teachers in the register of the Trade Union of Education, from which the sample was drawn. Our sample was also older but that is due to the age-stratified way the sample was drawn. Nevertheless, we had enough power to obtain significant results due to a large sample, which also adds to the generalizability of our results. In the future, other occupations, in which breaks may be more spontaneously scheduled, would be worth examining.

Fourth, we used two-item scales to measure break detachment and relaxation in order to keep the length of the questionnaire reasonable because this study was part of a larger project. The reliability (internal consistency) of these two-item measures remained slightly under 0.70, likely due to the fact that of the two items, one concerned lunch breaks and another breaks between classes, that is, they had a different focus. In addition to using more items, the focus could be expanded to cover other recovery experiences (e.g., control, affiliation), in order to better answer the question as to which recovery experiences are most beneficial during work breaks.

All in all, as our results are the first to show the moderating role of age in the relationships between break detachment and relaxation and recovery outcomes, we recommend that future studies examine age effects in other occupations.

Practical implications

Our results showed that class teachers' opportunities to detach from work and relax at work breaks were poorer than those of subject teachers. Therefore, class teachers in particular would need better breaks, that is, better opportunities to shift their attention away from work tasks. Our ongoing larger study among Finnish teachers revealed that class teachers prepare their classes and oversee their pupils more often during work breaks than do subject teachers (Virtanen et al., 2019). Instead of working, class teachers should spend their breaks more often with other teachers in a staffroom, which turned

out to be a good way to experience both detachment and relaxation during breaks in our larger study. Consequently, both changes in organizing work tasks and changes in the awareness of the role of recovery in maintaining well-being may be needed. Perhaps it would be possible to leave the classroom and decrease preparations for next classes more often by being more aware of the beneficial effects of recovery, that is, to strive more consciously for recovery experiences during breaks. This is important as these experiences promote well-being, i.e., are conducive to needing less recovery at the end of working day and also having less exhaustion.

Earlier studies have also shown that relaxation exercises or park walks during breaks are helpful in relaxing and detaching and beneficial to afternoon well-being (de Bloom et al., 2017; Krajewski et al., 2010; Sianoja et al., 2018; Verbeek et al., 2018). Advancing age may also help to develop a habitual tendency of detaching and relaxing during breaks if working conditions make room for this development. This tendency probably also develops with the help of conscious attention towards beneficial recovery experiences throughout the working career. In addition, we know that job demands, like high workload and job resources, like control and support, are connected to both recovery experiences and well-being (Bennett et al., 2018; Kinnunen et al., 2011; Sonnentag et al., 2017). Therefore, it is important that teaching work should have a healthy job design, that is, job demands remain at a reasonable level and job resources are high.

Funding Information

This study was supported by the Finnish Work Environment Fund (grant no. 116773).

Competing Interests

The authors have no competing interests to declare.

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How to cite this article: Kinnunen, U., de Bloom, J., and Virtanen, A. (2019). Do Older Teachers Benefit More From Workday Break Recovery Than Younger Ones? *Scandinavian Journal of Work and Organizational Psychology*, 4(1): 7, 1–15. DOI: <https://doi.org/10.16993/sjwop.87>

Submitted: 05 April 2019 **Accepted:** 29 August 2019 **Published:** 04 October 2019

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Scandinavian Journal of Work and Organizational Psychology is a peer-reviewed open access journal published by Stockholm University Press.

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**PUBLICATION
III**

Drammatic breaks: Break recovery experiences as mediators between job demands and affect in the afternoon and evening

Virtanen, A., Van Laethem, M., de Bloom, J., & Kinnunen, U.

Stress and Health, 37(4), 801-818.
doi: 10.1002/smi.3041P

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Drammatic breaks: Break recovery experiences as mediators between job demands and affect in the afternoon and evening

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Abstract

The present study focused on within-workday recovery, which has received less scholarly attention than has recovery outside work. We examined six break recovery experiences (detachment, relaxation, autonomy, mastery, meaning and affiliation) as possible mediators between daily emotional job demands, positive and negative affect both in the afternoon and in the evening. We conducted a one-work week diary study ($N = 107$) among Finnish schoolteachers with three daily measurements per workday. Most participants (88%) were women, and the average age was 50 years. The data were analysed with multilevel path modelling. Regarding daily afternoon affect, both low break detachment and low break meaning mediated the relationship between high daily emotional demands and low afternoon positive affect and high afternoon negative affect. Regarding daily evening affect, only low break meaning mediated the relationship between high daily emotional demands and low evening positive affect. In addition, afternoon positive and negative affect did mediate the relationships between break detachment and meaning and positive and negative evening affect. Our findings offer new insights into the interplay of daily job demands, break recovery experiences and affective well-being. Despite detachment, meaning, which has received limited research attention as a recovery experience, seems to play an important role in within-workday recovery. Our study also suggests that successful break recovery can benefit employees' affective well-being in the evening.

KEYWORDS

affective well-being, breaks, diary study, recovery from work, recovery experiences

1 | INTRODUCTION

Recovery from work protects against the harmful effects of high job demands on employee well-being (Geurts & Sonnentag, 2006; Sonnentag et al., 2017). It refers to the process of alleviating strain symptoms caused by job demands (Sonnentag & Fritz, 2015) and

restoring employees' energetic and mental resources (Zijlstra & Sonnentag, 2006). Although most people spend a third to a half of their waking hours at work, within-working day recovery, also called *internal recovery*, has been studied less extensively than external recovery occurring outside working hours (see Sonnentag et al., 2017, for a review). However, internal recovery has received increasing

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research attention during the recent years. Breaks are defined as an episode of the working day during which employees shift their attention away from work tasks (Hunter & Wu, 2016). The available evidence on breaks and employee well-being has been summarized in the following points (Sianoja et al., 2015; Sonnentag et al., 2017). First, breaks at work benefit employees' health and well-being. Second, breaks are especially beneficial when they can be taken at a point of heightened fatigue. Third, positive affect and engagement in relaxing or social activities increase the recovery potential of breaks, while engagement in compulsory chores diminishes it (see also; Kim et al., 2017; Trougakos et al., 2008). However, psychological recovery experiences during breaks have received limited attention in research so far.

Besides simply taking a break, break activities and psychological experiences (e.g., relaxation) can increase the recovery potential of a break. Previous research has shown that successful recovery during breaks can prevent the accumulation of stress and thus help maintain positive mood, energy and productivity throughout working day (e.g., Kühnel et al., 2017; Trougakos et al., 2008; Von Dreden & Binnewies, 2017). Recent findings also imply that recovery during the working day is related to well-being thereafter. There is some evidence suggesting that a favourable recovery state at the end of the working day has a positive effect on employees' recovery processes in the evening (Van Hooff & de Pater, 2017; Van Hooff & Geurts, 2014). This is important, given that successful recovery from work during off-job hours is consistently related to higher well-being (e.g., Sonnentag et al., 2017). A longitudinal study by Sianoja and colleagues (2016) suggests that successful lunch-time recovery may even have long-term consequences such as higher energy levels one year later. In addition, if employees end their working day without feeling completely exhausted, it is possible that they have more energy left to enjoy their leisure time and engage in recovery-promoting activities in the evening. Even though successful recovery replenishes resources (Hobfoll, 1989), some resources may also be needed in order to engage in recovery-promoting activities such as physical exercise (Sonnentag & Jelden, 2009).

In the present study, we focused on schoolteachers. Teachers' work offers a fruitful starting point to examine internal recovery as, in addition to lunch breaks, Finnish schoolteachers have structured breaks between classes, which, at least in principle, should provide them with opportunities to recover. Therefore, in this study, we focused on all within-workday breaks lasting at least five minutes (i.e., excluding the shortest micro-breaks) to extend earlier research which has focused on either only one break type, typically lunch breaks (e.g., Krajewski et al., 2010; Sianoja et al., 2016; Sianoja et al., 2018; Trougakos et al., 2008; Trougakos et al., 2014) or very short micro-breaks (e.g., de Bloom, Kinnunen, & Korpela, 2015; Hunter & Wu, 2016; Kim et al., 2017; Kühnel et al., 2017). We focused specifically on psychological recovery experiences during these breaks, as these experiences expedite recovery (Sonnentag & Fritz, 2007, 2015).

Teaching is a stressful occupation with high job demands and burnout rates (e.g., Arvidsson et al., 2016; Kyriacou, 2001; Skaalvik &

Skaalvik, 2015; 2017) and is especially emotionally demanding: Teachers frequently face stressors related to interactions with pupils, colleagues or parents (e.g., Bauer, 2007; Skaalvik & Skaalvik, 2017; Unterbrink et al., 2008). Emotional demands related to social interactions tend to be negatively related to occupational well-being (e.g., Hülshager & Schewe, 2011; Scheibe, Stamoov-Roßnagel, & Zacher, 2015) and are likely to be a challenge in terms of recovery from work during breaks. It is therefore possible that break recovery experiences act as underlying mechanisms in the relationship between high job demands and lower well-being as shown in earlier research on off-job recovery (Bennett et al., 2018; Kinnunen et al., 2011).

Using a one-work week diary design in a sample of Finnish schoolteachers, the aim of this study is to contribute to recovery research in three ways. Firstly, we examine six recovery experiences suggested by the recently developed Detachment, Relaxation, Autonomy, Mastery, Meaning, and Affiliation (DRAMMA) model (Newman et al., 2014) in the context of teachers' breaks during the working day. Accordingly, we extend existing research, which has not examined these break experiences together. Secondly, we investigate how recovery experiences during breaks relate to positive and negative affect both in the afternoon and in the evening as it is important to know whether successful working day recovery promotes well-being after work and in the evening. Affects have frequently been studied in the context of recovery from work, also during breaks, as negative or positive affect is a common short-term reaction to daily work demands (see, e.g., Kim et al., 2017; Rhee & Kim, 2016; Trougakos et al., 2014). Affects are also related to longer-term well-being outcomes such as job satisfaction (e.g., Judge & Ilies, 2004; Moè et al., 2010) and life satisfaction (e.g., Extremera & Rey, 2016; Kuppens et al., 2008). Nevertheless, none of these studies has focused on the relations of all six DRAMMA experiences with negative and positive affect. Thirdly, we focus on the role of recovery experiences as mediators between daily emotional demands and affect in the afternoon and in the evening. Our study therefore provides novel insights into teachers' daily recovery processes, which are mostly unexamined. Long-term negative consequences of insufficient recovery result from incomplete day-to-day recovery (e.g., Geurts & Sonnentag, 2006), which is why it is important to study recovery from a short-term perspective, such as in the form of a daily diary study like ours.

1.1 | The DRAMMA model and the theoretical background of recovery experiences

In the present study, we approached recovery by focussing on the processes aiding recovery, that is, on recovery experiences (Sonnentag & Fritz, 2007, 2015). These are psychological recovery-promoting experiences which underlie different recovery activities. The main theoretical framework of this study is the DRAMMA model, which aims to explain how and in what circumstances leisure enhances subjective well-being (Newman et al., 2014). Drawing on a

meta-analysis of 363 studies within psychology and leisure sciences, Newman and colleagues integrated various theories on subjective well-being in order to establish a conceptual model concerning psychological experiences which promote well-being.

The DRAMMA model suggests six recovery experiences: detachment from work, relaxation, autonomy, mastery, meaning, and affiliation. In an earlier, widely used framework Sonnentag and Fritz (2007) suggested four recovery experiences: detachment, relaxation, control, and mastery. *Detachment from work* refers to disengagement from work-related thoughts. *Relaxation* implies low levels of mental or physical activation and little physical or intellectual effort. These experiences have their main theoretical basis on the Effort-Recovery Model, which suggests that recovery occurs when employees stop working and rest, which allows their psychobiological systems to return to pre-stressor levels (Meijman & Mulder, 1998). Both these experiences fulfil this condition. Detachment and relaxation help to reduce activation, which is important because prolonged activation of a person's psychobiological systems due to inadequate recovery is detrimental to well-being in the long term (Brosschot et al., 2006; McEwen, 1998; Ursin & Eriksen, 2004). *Autonomy (control)* refers to being able to decide on one's schedule and activities outside work. Having autonomy over one's life can be seen as a basic psychological need in Self-Determination Theory (SDT, Ryan & Deci, 2000). *Mastery* encompasses learning opportunities and challenges resulting in feelings of achievement and competence outside the work domain. Engaging in challenging but also rewarding activities allows employees to replenish their depleted or lost personal resources (Hobfoll, 1989), experience flow (Csikszentmihalyi, 1990) and self-efficacy (Bandura, 1997). These four recovery experiences during free time have been shown to promote well-being (see the meta-analysis by Bennett et al., 2018), although detachment has received most research attention (Sonnentag et al., 2017; Wendsche & Lohmann-Haislah, 2017) and has been labelled the most powerful recovery experience (Sonnentag, 2018).

The DRAMMA model also contains two new elements compared to Sonnentag and Fritz's recovery experiences: meaning and affiliation. *Meaningful* leisure activities are a means by which people gain something important or valuable in their life (Iwasaki, 2008). Particularly in leisure sciences, searching for and finding meaning are seen as key elements of leisure and quality of life in general (e.g., Iwasaki et al., 2018; Loveday et al., 2018). Meaningful leisure activities help individuals gain a sense of purpose in their lives (e.g., Iwasaki, 2008), which is beneficial for well-being (e.g., Machell et al., 2015; Thrash et al., 2010). Also, on daily level, searching for meaning is related to higher well-being (Newman et al., 2018). *Affiliation* refers to feelings of relatedness with other people, which is considered an innate psychological need following SDT theory (Ryan & Deci, 2000) and fosters social support, which helps people to cope with stressful events (Lakey & Orehek, 2011).

All in all, the DRAMMA model combines the perspectives of recovery from work and satisfaction of more general psychological needs. Some recovery experiences—autonomy, mastery, and

affiliation—largely correspond to the basic needs suggested by SDT theory (Ryan & Deci, 2000), which implies that the fulfilment of three basic psychological needs (i.e., autonomy, competence and relatedness) is essential for our well-being. Also, a few recent studies show that basic needs satisfaction contributes to recovery from work (Mojza et al., 2011; Van Hooff et al., 2018; Van Hooff & Geurts, 2014). According to Van Hooff et al. (2018), there are several reasons why need satisfaction and recovery are closely related. Firstly, SDT theory suggests that need satisfaction results in energy maintenance and enhancement (Ryan & Deci, 2008), which facilitates the recovery process. Secondly, need satisfaction tends to be accompanied by positive emotions (Reis et al., 2000; Sheldon, Ryan, & Reis, 1996), which help to downregulate stress (Esch & Stefano, 2004). Thirdly, according to the Broaden-and-Build Theory, positive emotions linked to affiliation broaden our thought-action repertoires (Fredrickson, 2001), which helps people to increase their resources, for instance by engaging in behaviours that promote recovery.

Until now, most earlier studies have examined recovery experiences during time outside work. Only few recent studies have also investigated recovery experiences in the context of within-workday breaks. Several longitudinal, diary and cross-sectional studies suggest that detachment from work during breaks is related to favourable recovery outcomes, such as positive affect, vigour, lower exhaustion and lower need for recovery (e.g., Coffeng et al., 2015; Kinnunen et al., 2019; Rhee & Kim, 2016; Sianoja et al., 2016; Von Dreden & Binnewies, 2017). In addition, earlier diary studies and intervention studies show that relaxation during breaks can contribute to improved well-being (e.g., Bosch et al., 2018; de Bloom et al., 2017; Krajewski et al., 2011; Sianoja et al., 2018). There is also evidence concerning the beneficial role of autonomy (or control) during breaks (Bosch et al., 2018; Sianoja et al., 2016; Trougakos et al., 2014). Affiliation has not been studied much in the context of breaks. Bosch et al. (2018) found that relatedness during lunch breaks predicted lower exhaustion and higher work engagement in the afternoon. Also, positive humour with colleagues during breaks, which is likely to foster social support and affiliation, has been shown to buffer against the effect of high job demands on affective outcomes (Scheel, Putz, & Kursawa, 2017). By contrast, as far as we know, no evidence on the role of experiences of mastery and meaning during breaks has so far been presented.

In this study, we therefore extend the knowledge available by investigating all six break recovery experiences together as mediators in the relationship between emotional job demands and affective well-being, which is a new approach to recovery during the working day.

1.2 | Recovery experiences as mediators between emotional job demands and affective well-being

It is especially important to recover from work when job demands are high (e.g., Sonnentag, 2018). The negative relationship between high

demands and well-being can be explained by means of the health impairment process in the Job Demands-Resources (JD-R) model (e.g., Bakker & Demerouti, 2017). In this process, high or long-lasting job demands may over time lead to the depletion of energy and result in fatigue and burnout. The JD-R model has also been applied in the context of recovery (e.g., Bennett et al., 2018; Kinnunen et al., 2011). Studies have shown, for example, that high job demands inhibit recovery experiences (Bennett et al., 2018). In the present study, we focus on daily emotional job demands, which are a prominent source of job stress among teachers (e.g., Bauer, 2007; Skaalvik & Skaalvik, 2017; Unterbrink et al., 2008). The most frequently reported emotionally charged stressors in their jobs include managing pupils' behavioural problems, verbal insults, and interpersonal conflicts. Thus, these situations arouse emotions which have to be dealt with, needing effort.

We can expect that when teachers have encountered emotionally challenging demands in their work, they may have difficulties in detaching from work or feeling relaxed during breaks as they may ruminate and continue thinking about these demanding situations. It is also quite probable that due to depleted energy levels they may lack the energy for mastery experiences during breaks. Also, engaging in activities that produce experiences of meaning can take some effort and focus. For example, a study by Waterman (2005) showed that preferred high-effort activities were associated with higher self-realization and importance (among several variables related to well-being and meaning) than preferred low-effort activities. Therefore, it is possible that when teachers' energy levels and cognitive resources have been depleted by emotional demands, they find it more difficult to focus on meaning-promoting activities during breaks. Emotional demands may also impair experiences of autonomy during breaks, for example, by decreasing break time or by cognitive preoccupation with work demands during breaks. Due to emotional demands teachers may also feel in need for recovery which is actualized with social withdrawal during breaks (van Veldhoven & Broersen, 2003). As a consequence, they may feel less affiliation. There are a few earlier diary studies showing that daily emotional stress is related to lower levels of detachment and relaxation (Schraub et al., 2013). Based on this reasoning, and the JD-R theory, our first hypothesis is:

Hypothesis 1 *Higher daily emotional job demands are related to lower levels of recovery experiences (i.e., detachment, relaxation, autonomy, mastery, meaning, and affiliation) during breaks.*

Second, we were interested in the direct relationship between emotional demands and affective well-being in the afternoon and in the evening. From earlier studies we know that emotional demands or emotional labour are related to poorer well-being among teachers (Kinman et al., 2011; Philipp & Schupbach, 2010), but to the best of our knowledge, no studies have so far examined the effects of day-level emotional demands specifically among teachers. However, a link between daily emotional demands and emotional well-being has been found among other occupational groups, such as service

workers (see, e.g., Biron & Van Veldhoven, 2012). We expand the existing research by investigating daily emotional job demands and their relationship to affective well-being, concerning people's feelings, more formally described as affect (Warr, 2012). We predict that:

Hypothesis 2 *Higher daily emotional job demands are related to lower positive affect and higher negative affect in the afternoon (H2a) and in the evening (H2b).*

Third, we examined the direct relationships between break recovery experiences and affective well-being in the afternoon and in the evening. Several earlier findings suggest that detachment (e.g., Coffeng et al., 2015; Kinnunen et al., 2019; Rhee & Kim, 2016; Sianoja et al., 2016; Von Dreden & Binnewies, 2017), relaxation (e.g., Bosch et al., 2018; de Bloom et al., 2017; Krajewski et al., 2011; Sianoja et al., 2018), and autonomy (or control) (Bosch et al., 2018; Sianoja et al., 2016; Trougakos et al., 2014) during breaks are related to improved well-being. Also, at least one study (Bosch et al., 2018) found a link between affiliation during breaks and better well-being in the afternoon. Although no evidence on the role of experiences of mastery and meaning during breaks has so far been presented, they can be presumed to replenish threatened resources, which is related to favourable outcomes (e.g., Hobfoll, 1989; Newman et al., 2014; Sonnentag & Fritz, 2007). For example, a recent experience-sampling study by Chawla and colleagues highlights the role of leisure-time mastery in predicting positive work behaviours, such as productivity, the next day (Chawla et al., 2020). Although affective well-being has often been examined as an outcome of internal recovery (see, e.g., Kim et al., 2017; Rhee & Kim, 2016; Trougakos et al., 2014), these studies have not focused on all six DRAMMA experiences. Therefore, we hypothesize that:

Hypothesis 3 *Break recovery experiences (i.e., detachment, relaxation, autonomy, mastery, meaning, and affiliation) are related to higher positive affect and lower negative affect in the afternoon (H3a) and in the evening (H3b).*

Theoretically, recovery experiences are considered mediators between job demands and well-being (Bennett et al., 2018; Demerouti et al., 2009; Kinnunen et al., 2011). This is especially evident when one considers how the recovery process unfolds on a daily basis. In addition to theoretical perspectives, empirical studies suggest that leisure-time recovery experiences mediate the relationship between job demands and well-being (see, e.g., for a meta-analysis, Bennett et al., 2018; Kinnunen et al., 2011). Of recovery experiences, detachment has been most often studied as a mediator (Chen et al., 2017; Germeys & De-Gieter, 2016; Chen & Li, 2019; Kinnunen et al., 2011). Also, relaxation has been found to mediate the relationship between emotional stress and affective well-being (Schraub et al., 2013). A meta-analysis by Bennett et al. (2018) showed that in addition to detachment and relaxation, also control, and mastery mediate the relationship between job demands and well-being. However, these studies focused on recovery experiences

after working hours. To the best of our knowledge, no earlier studies have investigated break recovery experiences as mediators between daily job demands and well-being outcomes. In addition, the role of meaning and affiliation in this mediation process still remains to be investigated.

We expect that all six recovery experiences during breaks can function as mediators in the relationship between emotional job demands and afternoon and evening affect. High emotional demands at work can prevent these experiences during breaks (see Hypothesis 1), which in turn may result in less positive affect and more negative affect in the afternoon and in the evening (see Hypothesis 3). Therefore, we hypothesize that:

Hypothesis 4 *Recovery experiences (i.e., detachment, relaxation, autonomy, mastery, meaning, and affiliation) mediate the relationship between daily emotional demands and positive and negative affect in the afternoon (H4a) and in the evening (H4b).*

We assumed that all hypothesized relations (Hypothesis 2–Hypothesis 4) are more probable in relation to afternoon affect than evening affect, because the afternoon is closer in time to the occurrence of emotional job demands and break recovery experiences.

2 | METHODS

2.1 | Participants

The majority of the participants were recruited from the sample of a cross-sectional questionnaire study among Finnish schoolteachers, which was conducted in May 2017. Participants of the cross-sectional study were asked whether they would be willing to take part in the diary study during autumn 2017. Of the whole sample of 909 teachers, 208 (22.9%) agreed. To ensure participation in the diary study, we approached these 208 teachers via email in autumn 2017. We asked for their postal addresses to send the diary questionnaires, and also asked their permission to combine their background information from the cross-sectional questionnaire in order to avoid asking the same questions again. In addition, we recruited more participants from one municipality with the help of their school administration. All in all, 114 teachers provided their contact information, 108 were participants of the earlier study and six were newly recruited participants.

The final number of participants returning the diary questionnaires was 107. The average age of the participants was 50 years ($SD = 8.9$), and only 20% were under 45 years old. The relatively high mean age was due to the sample selection: the cross-sectional questionnaire study focused on the role of ageing in recovery, hence the sample included a greater share of older teachers than the general working population of Finnish teachers. Half (52%) of the participants were class teachers (teaching pupils aged 7 to 12 years) or special education teachers, 37% were specialized subject teachers,

and 10% were school head teachers. Almost all the participants (93%) worked in comprehensive schools (teaching pupils aged 7 to 16), and the rest worked in upper secondary schools (teaching pupils aged 17 to 19). Most of the participants (88%) were women. The mean number of working hours per week was 37.2 ($SD = 8.0$). When comparing the participants with those of the cross-sectional questionnaire study, they seemed to be similar in terms of their background factors.

2.2 | Study design

Before the actual diary study, participants answered an electronic background questionnaire. Informed consent was included at the beginning of the background questionnaire. We also informed the participants about the study objectives, assured them that their responses would be treated confidentially, and that participation was voluntary. The diary study was conducted in November 2017 during three different weeks (according participants' preferences). The study period lasted five days, from Monday to Friday during a regular working week. On these days, participants filled in three daily paper-and-pencil diary questionnaires: one in the morning before going to work, the second around 16 in the afternoon (regardless of whether their workday had ended), and the third in the evening before going to sleep. The average time for completing the daily questionnaires in the morning ranged between 6:57 and 7:15, in the afternoon between 16:17 and 16:37 and in the evening/night between 19:25–1:28. We also sent the participants text message reminders to fill in the questionnaires on each measurement day at 7:30, at 16:00 and at 21:30.

3 | MEASURES

3.1 | Daily emotional job demands

Daily *emotional job demands* were measured in the afternoon questionnaire with three items from the COPSOQ II (Pejtersen et al., 2010) adapted to the current working day (e.g., 'Today my work was emotionally demanding', Cronbach's $\alpha = 0.81$ – 0.90). The items were rated on a scale from 1 to 5 (1 = totally disagree, 5 = totally agree).

3.2 | Break recovery experiences

Recovery experiences during breaks were measured in the afternoon questionnaire with eight items referring to all breaks during the working day with a minimum duration of five minutes. The measures of detachment, relaxation, autonomy, and mastery were from the state version of the Recovery Experience Questionnaire (Bakker et al., 2015). *Detachment* from work (e.g., 'I distanced myself from work'; $\alpha = 0.83$ – 0.90) and *relaxation* (e.g., 'I did relaxing things'; $\alpha = 0.81$ – 0.87) were assessed with two items each. *Autonomy* was

measured with one item: 'I determined for myself how I spent my time'. Although strictly speaking this is originally a measure of control, we consider control and autonomy so similar in the context of breaks but we adhere to the concept of autonomy, which is in line with the DRAMMA framework. *Mastery* was also assessed with one item: 'I did something to broaden my horizons'. *Meaning* was measured with one item ('I did something which was important to me personally'; adapted from Butler & Kern, 2016; Schulenberg et al., 2011). Finally, *affiliation* was measured with one item ('I felt connected [belonging] with other people') adapted from the work-related basic needs satisfaction scale (van den Broeck et al., 2010). The rating scale for all recovery experience items was from 1 to 5 (1 = totally disagree, 5 = totally agree). The choice of one-item measures was based on their factor loadings in earlier studies (for the Recovery Experience Questionnaire (developed by Sonnentag & Fritz, 2007) items, see Bakker et al., 2015; Kinnunen et al., 2011; Sonnentag & Fritz, 2007; for meaning, see Butler & Kern, 2016; for affiliation, see van den Broeck et al., 2010) and the content of the item, so that the item would depict the concept (i.e., recovery experience) as clearly and unequivocally as possible.

3.3 | Affective well-being: positive and negative affect

Affect was assessed in all daily questionnaires: in the morning (used as a control in the analyses), in the afternoon, and in the evening. Affect was measured with seven adjectives (or pairs of adjectives, e.g., calm/relaxed) always referring to right now: calm/relaxed, fatigued/tired, enthusiastic, irritable, energetic/vigorous, tense, and gloomy. These items were based on Warr's (1990) framework and rated on a scale from 1 to 7 with three verbal anchors 1 = not at all, 4 = to some extent, 7 = very much. For the analyses these items were combined into averaged variables of *positive affect* (calm/relaxed, enthusiastic, energetic/vigorous; $\alpha = 0.56-0.90$) and *negative affect* (fatigued/tired, irritable, tense, gloomy; $\alpha = 0.75-0.90$) concerning morning, afternoon and evening.

3.4 | Workload

We used workload as a control variable as it is known to be related to affect (e.g., Ilies et al., 2010; Ilies et al., 2007). Workload was assessed with three items adapted to daily level from Spector and Jex (1998) (e.g., 'Today there was a great deal to be done' $\alpha = 0.79-0.89$). The items were rated on a scale from 1 to 5 (1 = totally disagree, 5 = totally agree).

3.5 | Statistical approach

Daily measurements were nested within individuals. Multi-level path modelling with ML estimation in Mplus 7.4 (Muthén & Muthén, 2015)

was used to test all hypotheses and account for the nested structure of the data. Intra-class correlations confirmed that 37% to 65% of the variance in the study variables was on the day-level (within individuals). Thus, intra-class correlations justified using a multi-level approach to analyse the data.

All variables included in the analyses contained variance at Level 1 (i.e., within-person: $N = 514-532$ daily measurements) and Level 2 (i.e., between-person: $N = 107$ participants). Associations between variables were modelled on the within-level and thus the predictor in our model (i.e., emotional demands) and our control variables, daily workload and morning positive and negative affect, were person-mean centered (see also Ohly et al., 2010). All other variables were either outcome variables or mediators and were thus not centred (cf. Aguinis et al., 2013).

Hypotheses 1-3 were tested in one multi-level model and all predictors were added as fixed effects. In the first model, pathways from emotional job demands to the six break recovery experiences were modelled in addition to pathways from break recovery experiences to positive and negative affect in the afternoon. Next, pathways from the six break recovery experiences to positive and negative affect in the evening were added to the model as well as pathways from positive affect in the afternoon to positive affect in the evening and from negative affect in the afternoon to negative affect in the evening. Lastly, pathways from the control variable workload to all afternoon and evening affect outcomes were modelled, likewise pathways from morning positive and negative affect to all afternoon affect outcomes. As Pindek et al. (2015) argue, it is important to consider both the within level and between level. So, we modelled the pathways from afternoon positive and negative affect to evening affect on the between level. If the requirements for mediation were fulfilled (c.f. Hayes, 2009; 2013), we tested Hypothesis 4 by calculating the indirect effects and their 95% confidence intervals (CI) with Bayesian estimation in Mplus 7.4 (using default starting values and iterations). If the CI excludes zero, then the indirect effect is considered statistically significant at the 0.05 level. We assessed model fit with the root mean square error of approximation (RMSEA) comparative fit index (CFI), and standardized the root mean square residual (SRMR). RMSEA values below 0.07, CFI values above 0.95 and SRMR values below 0.08 indicate acceptable model fit (Hu & Bentler, 1999; Steiger, 2007).

4 | RESULTS

4.1 | Descriptive statistics

Means, standard deviations, and intra-class correlations are presented in Table 1. As can be seen in Table 1, of the break recovery experiences, affiliation was rated on average highest, whereas detachment was rated lowest. As expected, daily emotional job demands and workload appeared to be high in teachers. The average duration of lunch break among participants was 17.55 min ($SD = 6.22$) and on 68% of the days teachers spent lunchtime with

TABLE 1 Within-and between-level means, standard deviations and intra-class correlations of study variables

	M_{between}	SD_{between}	ICC_{between}	M_{within}	SD_{within}	ICC_{within}
Age (in years)	50.20	8.85				
Workload (1–5)	3.44	0.81	0.50	3.44	1.03	0.50
Morning PA (1–7)	3.71	1.00	0.54	3.70	1.25	0.46
Morning NA (1–7)	2.57	1.00	0.47	2.58	1.20	0.53
Emotional demands (1–5)	2.94	0.83	0.43	2.94	1.12	0.57
(D) Break detachment (1–5)	1.64	0.68	0.44	1.64	0.89	0.56
(R) Break relaxation (1–5)	2.30	0.81	0.41	2.31	1.07	0.59
(A) Break autonomy (1–5)	2.68	1.02	0.43	2.69	1.35	0.57
(M) Break mastery (1–5)	1.97	0.82	0.35	1.99	1.16	0.65
(M) Break meaning (1–5)	2.83	0.95	0.44	2.86	1.25	0.56
(A) Break affiliation (1–5)	3.43	0.82	0.38	3.44	1.11	0.62
Afternoon PA (1–7)	3.48	0.83	0.36	3.52	1.17	0.64
Afternoon NA (1–7)	2.90	0.95	0.47	2.90	1.24	0.53
Evening PA (1–7)	3.35	0.71	0.39	3.35	0.99	0.61
Evening NA (1–7)	2.82	0.90	0.63	2.83	1.07	0.37

Abbreviations: ICC, intra-class correlation; M = mean; NA, negative affect; PA, positive affect; SD, standard deviation

their pupils. In addition to the lunch break, teachers had on average 2.07 ($SD = 0.63$) breaks during their working day and the longest break (excluding lunch break) averaged around 10.46 min ($SD = 8.11$). Finally, a repeated measures ANOVA showed that positive affect ($F [1.79, 189.35] = 12.62, p < 0.001$) and negative affect ($F [1.25, 132.14] = 20.54, p < 0.001$) changed significantly during the day. Post hoc tests using the Bonferroni correction showed that positive affect decreased from morning ($M = 3.71, SD = 1.00$) to afternoon ($M = 3.48, SD = 0.83$), but positive afternoon and evening affect ($M = 3.35, SD = 0.71$) did not statistically differ ($p = 0.081$). Negative affect did increase significantly from morning ($M = 2.57, SD = 1.00$) to afternoon ($M = 2.90, SD = 0.95$), whereas it decreased again from afternoon to evening ($M = 2.82, SD = 0.90$).

Within-level and between-level correlations of the study variables are presented in Table 2. On the within level, all break recovery experiences correlated positively with positive affect and negatively with negative affect in the afternoon. However, meaning was the only recovery experience which also correlated negatively with negative affect in the evening. Both detachment and meaning correlated positively with positive affect in the evening. Daily emotional demands correlated negatively with all break recovery experiences except affiliation or mastery. Daily emotional demands correlated negatively with positive affect in the afternoon and in the evening and positively with negative affect in the afternoon and in the evening. Mostly correlations were similar on the between level, with three exceptions: break mastery did not correlate significantly with affective outcomes, break meaning did not correlate with evening negative affect, and emotional demands did not correlate with break relaxation between individuals.

In describing our results, we report standardized estimates whenever possible. The multi-level model fitted the data well ($\chi^2 [32] = 37.069, CFI = 0.997, RMSEA = 0.017, SRMR_{\text{within}} = 0.034, SRMR_{\text{between}} = 0.034$). A visualization of all significant within-level results is presented in Figure 1.

4.2 | Daily emotional job demands in relation to break recovery experiences

First, we examined whether daily emotional job demands were associated with break recovery experiences during the same day. All direct effects between study variables in multi-level models are presented in Table 3. The results showed that daily emotional job demands were indeed related to low levels of break detachment ($\gamma = -0.10, SE = 0.04, p < 0.05$), relaxation ($\gamma = -0.11, SE = 0.04, p < 0.05$), and meaning ($\gamma = -0.10, SE = 0.04, p < 0.05$). Emotional job demands were not associated with break autonomy ($\gamma = -0.08, SE = 0.04, p = 0.060$), mastery ($\gamma = -0.06, SE = 0.05, p = 0.155$) or affiliation ($\gamma = -0.07, SE = 0.04, p = 0.103$). These results lent partial support to Hypothesis 1.

4.3 | Daily emotional job demands, break recovery experiences and afternoon affect

We expected daily emotional job demands to predict subsequent afternoon positive and negative affect. The results (see Figure 1, Table 3) revealed that emotional job demands were negatively related to positive affect in the afternoon ($\gamma = -0.20, SE = 0.04,$

TABLE 2 Within- and between-level correlations of the study variables

	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Gender	-0.17	-0.06	-0.01	0.10	0.02	0.35**	0.36**	0.21*	0.04	0.22*	0.01	0.08	-0.01	-0.05	0.20*
2. Age	0.11	0.07	0.07	0.07	0.07	-0.24*	-0.36**	-0.35**	-0.10	-0.23*	-0.17	0.02	0.11	0.08	0.03
3. Workload	-0.03	0.58**	-0.39**	0.58**	0.60**	-0.40**	-0.38**	-0.34**	0.11	-0.14	-0.14	-0.60**	0.67**	-0.57**	0.59**
4. Morning PA	0.04	-0.03	-0.64**	-0.77**	-0.42**	0.33**	0.32**	0.28*	0.20	0.50**	0.47**	0.81**	-0.61**	0.71**	-0.51**
5. Morning NA	0.04	0.04	-0.64**	-0.77**	0.64**	-0.35**	-0.29**	-0.28*	-0.08	-0.36**	-0.49**	-0.68**	0.93**	-0.65**	0.90**
6. Emotional demands	0.37**	0.37**	-0.05	0.06	-0.24*	-0.24*	-0.06	-0.24*	0.05	-0.11	-0.26*	-0.53**	0.74**	-0.48**	0.63**
7. (D)Break detachment	-0.26**	-0.26**	-0.01	-0.01	-0.16**	0.69**	0.64**	0.64**	0.44**	0.41**	0.35**	0.45**	-0.39**	0.32*	-0.24*
8. (R)Break relaxation	-0.29**	-0.29**	0.03	-0.06	-0.17**	0.44**	0.63**	0.63**	0.35**	0.76**	0.37**	0.35**	-0.34**	0.30*	-0.23*
9. (A)Break autonomy	-0.27**	-0.27**	-0.01	0.01	-0.14**	0.34**	0.54**	0.39**	0.39**	0.55**	0.26*	0.36**	-0.33**	0.26*	-0.22*
10. (M)Break mastery	-0.19**	-0.19**	0.04	-0.02	-0.09	0.18**	0.32**	0.21**	0.35**	0.35**	0.24	0.23	-0.07	0.11	0.08
11. (M)Break meaning	-0.20**	-0.20**	0.01	0.01	-0.14**	0.18**	0.36**	0.27**	0.26**	0.44**	0.44**	0.48**	-0.29*	0.41**	-0.21
12. (A)Break affiliation	-0.09	-0.09	-0.01	-0.01	-0.09	0.07	0.26**	0.11*	0.33**	0.36**	0.36**	0.32**	-0.39**	0.35**	-0.38**
13. Afternoon PA	-0.23**	-0.23**	0.17**	-0.15**	-0.32**	0.18**	0.17**	0.10*	0.12*	0.18**	0.19**	-0.72**	0.86**	0.86**	-0.57**
14. Afternoon NA	0.22**	0.22**	-0.12*	0.18**	0.35**	-0.17**	-0.17**	-0.12*	-0.15*	-0.22**	-0.19**	-0.68**	-0.66**	0.93**	0.93**
15. Evening PA	-0.04	-0.04	0.05	0.01	-0.10*	0.11*	0.05	0.04	0.05	0.15**	0.09	0.25**	-0.20**	-0.20**	-0.65**
16. Evening NA	0.08	0.08	0.01	0.05	0.18**	-0.08	-0.01	-0.05	-0.05	-0.10*	-0.01	-0.20**	0.28**	-0.50**	-0.50**

Note: Within-level correlations are presented under the diagonal, and between-level correlations above the diagonal.

* $p < 0.05$, ** $p < 0.01$.

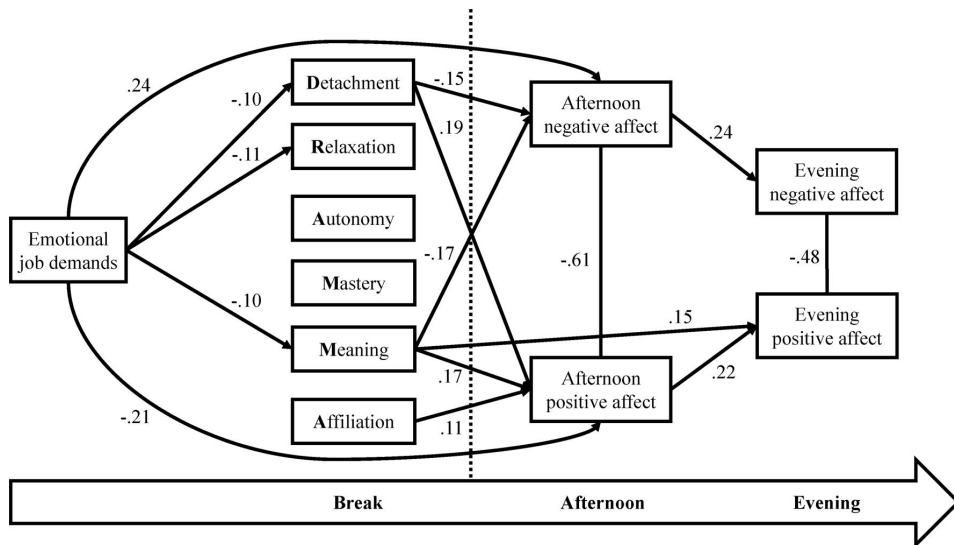


FIGURE 1 Within-level results of the significant relationships between emotional demands, break DRAMMA experiences and afternoon and evening affect. Note: For clarity, pathways from the control variable workload to afternoon and evening affect are not depicted as well as the pathways from morning affect to afternoon affect. All pathways from workload to the affect outcomes were non-significant (afternoon positive affect: $\gamma = -0.05$, $SE = 0.04$, $p = 0.294$; afternoon negative affect: $\gamma = 0.03$, $SE = 0.04$, $p = 0.507$; evening positive affect: $\gamma = 0.04$, $SE = 0.05$, $p = 0.421$; evening negative affect: $\gamma = -0.01$, $SE = 0.05$, $p = 0.793$). The pathways from morning positive affect to afternoon positive affect ($\gamma = 0.13$, $SE = 0.03$, $p < 0.001$) and from morning negative affect to afternoon negative affect ($\gamma = 0.13$, $SE = 0.03$, $p < 0.001$) were statistically significant. In addition, correlations between break DRAMMA experiences and correlations between morning positive and morning negative affect are not visualized. All break DRAMMA experiences and morning affect measures were correlated

$p < 0.001$) and positively related to negative afternoon affect ($\gamma = 0.24$, $SE = 0.04$, $p < 0.001$), thereby supporting Hypothesis 2a.

Next, we examined whether break recovery experiences were related to increased afternoon positive affect and decreased afternoon negative affect. Our results showed that only break detachment ($\gamma = 0.19$, $SE = 0.06$, $p < 0.01$), meaning ($\gamma = 0.17$, $SE = 0.06$, $p < 0.01$), and affiliation ($\gamma = 0.11$, $SE = 0.05$, $p < 0.05$) were related to higher positive affect during the same afternoon. Break relaxation ($\gamma = -0.02$, $SE = 0.07$, $p = 0.633$), autonomy ($\gamma = -0.02$, $SE = 0.06$, $p = 0.723$), and mastery ($\gamma = 0.03$, $SE = 0.05$, $p = 0.512$) were not related to subsequent positive affect. Regarding negative afternoon affect, daily detachment ($\gamma = -0.15$, $SE = 0.06$, $p < 0.01$) and meaning ($\gamma = -0.17$, $SE = 0.06$, $p < 0.01$) predicted lower negative affect in the afternoon, whereas break relaxation ($\gamma = 0.03$, $SE = 0.07$, $p = 0.680$), autonomy ($\gamma = -0.01$, $SE = 0.06$, $p = 0.816$), mastery ($\gamma = -0.06$, $SE = 0.05$, $p = 0.279$), and affiliation ($\gamma = -0.10$, $SE = 0.05$, $p = 0.056$) did not. These results partly supported Hypothesis 3a.

Requirements for mediation include significant relations between independent variable and mediator, in addition to significant relations between mediator and dependent variables (cf. Hayes, 2009; 2013; see 'Statistical approach' in the Methods section for a description of mediation requirements and a description of how indirect effects were estimated). These requirements were fulfilled for the relationship between emotional job demands and afternoon positive and negative affect through detachment and meaning.

Overview of these indirect effects is included in Table 4. Results show that detachment did indeed mediate the relationship between emotional job demands and positive afternoon affect (unstandardized estimate = -0.024 , 95% CI [-0.055 , -0.003], $p < 0.05$) and between emotional job demands and negative afternoon affect (unstandardized estimate = 0.018 , 95% CI [0.001 , 0.046], $p < 0.05$). On days when participants reported high emotional job demands, they were less able to detach from work during their breaks and subsequently reported less positive and more negative affect in the afternoon. Regarding emotional job demands, break meaning, and afternoon affect, the results supported break meaning as a mediator in the relationship between emotional job demands and positive affect in the afternoon (unstandardized estimate = -0.020 , 95% CI [-0.051 , -0.001], $p < 0.05$) as well as negative affect in the afternoon (unstandardized estimate = 0.019 , 95% CI [0.001 , 0.049], $p < 0.05$). On days when participants reported high emotional job demands, they experienced less meaning during their breaks and consequently experienced less positive affect and more negative affect in the afternoon. Hypothesis 4a gained partial support.

4.4 | Daily emotional job demands, break recovery experiences and evening affect

We expected daily emotional job demands to predict evening positive and negative affect. The results in Figure 1 and Table 3 show that

TABLE 3 Results of the multi-level path analysis: Direct effects between variables

Predictor	Outcome																			
	Detachment		Relaxation		Autonomy		Mastery		Meaning		Affiliation		Afternoon PA		Afternoon NA		Evening PA		Evening NA	
	γ	<i>p</i>	γ	<i>p</i>	γ	<i>p</i>	γ	<i>p</i>	γ	<i>p</i>	γ	<i>p</i>	γ	<i>p</i>	γ	<i>p</i>	γ	<i>p</i>	γ	<i>p</i>
Emotional demands	-0.10	0.018	-0.11	0.012	-0.08	0.060	-0.06	0.018	-0.10	0.023	-0.07	0.103	-0.20	0.000	0.24	0.000	-0.02	0.638	0.08	0.068
Detachment													0.19	0.001	-0.15	0.007	0.10	0.107	-0.05	0.434
Relaxation													-0.03	0.633	0.03	0.680	-0.06	0.384	0.04	0.565
Autonomy													-0.02	0.723	-0.01	0.816	-0.01	0.887	-0.02	0.748
Mastery													0.03	0.512	-0.06	0.279	-0.02	0.792	0.04	0.500
Meaning													0.17	0.003	-0.17	0.003	0.15	0.011	-0.08	0.184
Affiliation													0.11	0.030	-0.10	0.056	0.05	0.401	0.01	0.871
Afternoon PA																	0.22	0.000		
Afternoon NA																			0.24	0.000

Note: Standard errors are not noted as they only varied between 0.03 and 0.07. γ = standardized estimate.

emotional job demands were not directly related to positive ($\gamma = -0.02$, $SE = 0.05$, $p = 0.638$) or negative affect ($\gamma = 0.08$, $SE = 0.05$, $p = 0.068$) in the evening. Accordingly, these results did not support Hypothesis 2b.

In the next step, we investigated whether break recovery experiences were directly related to increased positive affect in the evening and decreased negative affect in the evening. Our results revealed that break meaning was positively related to positive affect during the following evening ($\gamma = 0.15$, $SE = 0.06$, $p < 0.05$). Other break recovery experiences (detachment: $\gamma = 0.10$, $SE = 0.06$, $p = 0.107$; relaxation: $\gamma = -0.06$, $SE = 0.07$, $p = 0.384$; autonomy: $\gamma = -0.01$, $SE = 0.06$, $p = 0.887$; mastery: $\gamma = -0.02$, $SE = 0.06$, $p = 0.792$; affiliation: $\gamma = 0.05$, $SE = 0.06$, $p = 0.401$) were not related to positive affect in the evening. None of the daily break recovery experiences predicted negative evening affect: detachment: $\gamma = -0.05$, $SE = 0.06$, $p = 0.434$; relaxation: $\gamma = 0.04$, $SE = 0.07$, $p = 0.565$; autonomy: $\gamma = -0.02$, $SE = 0.07$, $p = 0.748$; mastery: $\gamma = 0.04$, $SE = 0.06$, $p = 0.500$; meaning: $\gamma = -0.08$, $SE = 0.06$, $p = 0.184$; affiliation: $\gamma = 0.01$, $SE = 0.06$, $p = 0.871$. These results only partially supported Hypothesis 3b.

The requirements for mediation were fulfilled for the relationship between emotional job demands and evening positive affect through break meaning. The multi-level mediation analyses revealed that break meaning did mediate the relationship between emotional job demands and evening positive affect (unstandardized estimate = -0.014 , 95% CI $[-0.039, -0.001]$, $p < 0.05$). On days when participants reported higher emotional job demands, they felt less meaning during their breaks, which in turn was related to less positive affect in the evening. Hypothesis 4b gained partial support.

4.5 | Exploratory analyses

Although not explicitly hypothesized, we assumed afternoon affect to predict evening affect. Our results confirmed this assumption and showed that afternoon positive affect was related to evening positive affect ($\gamma = 0.22$, $SE = 0.05$, $p < 0.001$) and that afternoon negative affect was associated with evening negative affect ($\gamma = 0.24$, $SE = 0.05$, $p < 0.001$). We found identical results for the between-level (afternoon positive affect \rightarrow evening positive affect: $\gamma = 0.83$, $SE = 0.06$, $p < 0.001$; afternoon negative affect \rightarrow evening negative affect: $\gamma = 0.93$, $SE = 0.03$, $p < 0.001$).

As some daily break recovery experiences (i.e., break detachment, meaning, and affiliation) were related to subsequent afternoon affect and afternoon affect was related to evening affect, we performed five exploratory multi-level mediation analyses. The results showed that afternoon positive affect did mediate the relationship between break detachment (unstandardized estimate = 0.035 , 95% CI $[0.013, 0.067]$, $p < 0.001$) and meaning (unstandardized estimate = 0.023 , 95% CI $[0.007, 0.045]$, $p < 0.01$) on the one hand and positive evening affect on the other. The same was true for break affiliation (unstandardized estimate = 0.018 , 95% CI $[0.002, 0.039]$, $p < 0.05$). On days when participants reported better detachment,

TABLE 4 Overview of indirect effects, for which requirements for mediation were fulfilled

Direction of effect	Unstandardized estimate	95% CI	p
Emotional demands → detachment → afternoon PA	-0.024	-0.055–-0.003	0.011
Emotional demands → meaning → afternoon PA	-0.020	-0.051–-0.001	0.015
Emotional demands → detachment → afternoon NA	0.018	0.001–0.046	0.016
Emotional demands → meaning → afternoon NA	0.019	0.001–0.049	0.016
Emotional demands → meaning → evening PA	-0.014	-0.039–0.001	0.020
Exploratory results			
Detachment → afternoon PA → evening PA	0.035	0.013–0.067	0.000
Meaning → afternoon PA → evening PA	0.023	0.007–0.045	0.002
Affiliation → afternoon PA → evening PA	0.018	0.002–0.039	0.015
Detachment → afternoon NA → evening NA	-0.026	-0.053–-0.006	0.005
Meaning → afternoon NA → evening NA	-0.021	-0.041–-0.006	0.002
Reversed mediation results			
Detachment → emotional demands → afternoon PA	0.063	0.023–0.112	0.001
Autonomy → emotional demands → afternoon PA	0.032	0.005–0.064	0.010
Affiliation → emotional demands → afternoon PA	0.043	0.014–0.078	0.002
Detachment → emotional demands → afternoon NA	-0.079	-0.135–-0.029	0.001
Autonomy → emotional demands → afternoon NA	-0.040	-0.078–-0.006	0.010
Affiliation → emotional demands → afternoon NA	-0.054	-0.095–-0.018	0.002
Detachment → emotional demands → evening NA	-0.025	-0.052–-0.007	0.001
Autonomy → emotional demands → evening NA	-0.013	-0.029–-0.002	0.010
Affiliation → emotional demands → evening NA	-0.054	-0.036–-0.004	0.002

more meaning and affiliation during their breaks, they reported more positive affect the following afternoon, which in turn was favourable for positive evening affect. In addition, afternoon negative affect acted as a mediator between break detachment (unstandardized estimate = -0.026, 95% CI [-0.053, -0.006], $p < 0.01$) and meaning (unstandardized estimate = -0.021, 95% CI [-0.041, -0.006], $p < 0.01$) and negative affect the following evening. On days when participants reported better detachment and more meaning during their breaks, they reported less negative affect the following afternoon and in turn less negative evening affect.

In addition, we performed several robustness analyses to check whether background variables such as gender, age, years of work experience, work hours per week, experiencing a negative or positive event during the workday, and number of breaks change the results. Adding these as control variables did not change the results of the analyses.

4.6 | Reversed pathways from daily break experiences to emotional demands and affect

Given our chosen design and the fact that we measured emotional demands and break recovery experiences at the same time, it could also be that break recovery experiences predict emotional demands

that day and not the other way around. To explore this further, we performed another multi-level path analysis and multi-level mediation analyses, in which we estimated reversed pathways from the six break recovery experiences to emotional demands and to all affect outcomes. The fit of this reversed model was worse than the fit of our initial model ($\chi^2(57) = 129.673$, CFI = 0.963, RMSEA = 0.049, SRMR_{within} = 0.088, SRMR_{between} = 0.062).¹ The reversed model with the multi-level mediation analyses indicated that on days when participants reported better detachment, more autonomy, and more affiliation during their breaks, they reported fewer emotional demands and, in turn, less negative affect and more positive affect in the afternoon, and less negative affect the following evening. These results indicate that emotional demands could also be an underlying mechanism linking break detachment, autonomy, and affiliation to afternoon positive and negative affect, as well as evening negative affect. The detailed results are not shown but upon request they are available from the first author.

5 | DISCUSSION

The main aim of this diary study was to investigate whether the six recovery experiences based on the DRAMMA model (Newman et al., 2014) during workday breaks acted as underlying mechanisms

in the relationship between daily emotional job demands and affective well-being both in the afternoon and in the evening.

5.1 | Main results

Our findings extend existing research by showing that, of the break recovery experiences, detachment and meaning functioned as underlying mechanisms between daily emotional job demands and affective outcomes. Thus, on the days when teachers reported high emotional demands, they experienced less detachment during their breaks and consequently experienced less positive affect and more negative affect in the afternoon. On the days when teachers experienced less break meaning due to high emotional job demands, they also experienced more negative affect in the afternoon and less positive affect in the evening. Emotional demands were also directly related to higher negative affect and to lower positive affect in the afternoon (meaning that the mediation effects were partial). However, they were not directly related to evening affects. Consequently, of the six recovery experiences, only detachment and meaning turned out to be significant underlying mechanisms in the daily emotional job demands–affect relationship.

The result concerning the important role of *detachment* is not surprising (Sonnentag, 2018). Interestingly, however, in our study detachment was the least often reported break recovery experience. This is likely related to the fact that most (68%) of our participants spent their longest lunchtime break with pupils, which means that among teachers not all breaks fulfil the criterion of break, that is, a break from job demands. Still, our findings imply that even a small amount of detachment during breaks may suffice to achieve well-being benefits. It was probably also difficult to detach from emotional job demands during breaks due to negative activation related to these demands, which was reflected in increased negative affect and decreased positive affect in the afternoon. Detachment during off-job time has been reported in several studies to function as a mediator (Bennett et al., 2018; Schraub et al., 2013). Our study showed that poor detachment during breaks also impedes internal recovery and is related to less positive affect and more negative affect during the afternoon, thereby corroborating earlier studies on within-workday recovery (Rhee & Kim, 2016; Sianoja et al., 2018; Von Dreden & Binnewies, 2017). In addition, via afternoon affect break detachment did have effects on both positive and negative evening affect, also suggesting longer-lasting indirect effects.

Meaning has not received much attention as a recovery experience so far, although experiencing meaning in one's activities is related to better well-being (Newman et al., 2014). Our study suggests that doing something meaningful during breaks when experiencing high emotional demands at work is crucial as its positive well-being effects lasted even until the evening. In fact, meaning was the only break recovery experience having such direct lasting effects, thereby also lending support to our anticipation that the positive effects of break recovery experiences are mostly seen in the afternoon. Nevertheless, break meaningfulness also had an indirect effect

on evening positive affect via afternoon positive affect. Spending one's breaks during the working day in a meaningful way may be a small step to increase the presence of meaning in one's life and to cope with work-related stressors.

In addition to detachment and meaning, *affiliation* was related to (positive) afternoon affect despite the fact that affiliation was not associated with emotional demands. Furthermore, break affiliation had an indirect effect on evening positive affect via positive afternoon affect. Affiliation was the most frequently reported recovery experience. At least in a good workplace atmosphere affiliation can be achieved during breaks because most teachers have opportunities to spend their breaks with colleagues. Earlier diary studies have also found that experiencing relatedness during breaks as well as social break activities are beneficial for recovery (Bosch et al., 2018; Kim et al., 2017; Von Dreden & Binnewies, 2017).

Daily high emotional demands also challenged break *relaxation*, although their links to afternoon or evening affect were non-significant, contrary to several diary studies suggesting that break relaxation (Bosch et al., 2018; Kim et al., 2017) is important for internal recovery. One explanation for the absent links might lie in high mutual correlations between detachment, relaxation and autonomy. When taking all these factors simultaneously into account, the direct links from relaxation and autonomy to affect (seen at a correlational level) disappeared. In addition, our sample consisted of school-teachers only in contrast to earlier studies including participants from different occupational groups. Also, we investigated all breaks during the working day, whereas diary studies have previously focused exclusively on lunch breaks (Bosch et al., 2018; Sianoja et al., 2018) or micro-breaks (Kim et al., 2017).

Mastery turned out to be the only break recovery experience which was related to neither emotional demands nor to afternoon or evening affect. Our study therefore suggests that break mastery does not function as a recovery experience promoting recovery. This may relate to the fact that it is difficult to have mastery experiences (the second least frequently reported recovery experience in our sample) during short breaks. Activities producing mastery experiences are also energy consuming, that is, internal resources are needed and depleted for new challenges and learning during breaks.

5.2 | Theoretical contributions

Our study makes three contributions to the literature. *First*, this is the first study so far to investigate all six recovery experiences presented in the DRAMMA model (Newman et al., 2014) in the context of within-workday breaks. Our results lend support to the DRAMMA model: in addition to detachment, meaning and affiliation during breaks also seem to be beneficial for affective well-being. This extends the findings from earlier break recovery studies, which have mostly focused on the four recovery experiences proposed by Sonnentag and Fritz (2007). Although meaning and affiliation have received little attention as recovery experiences, several theoretical perspectives highlight their importance for people's well-being (for

an overview, see Newman et al., 2014). *Second*, break detachment and meaning functioned as underlying mechanisms in the daily relationship between emotional demands and affect. Thus, our study revealed new paths through which emotional demands are detrimental to well-being at the day-level. Although research has shown that detachment during off-job time may function as such a mediating mechanism (Bennett et al., 2018; Kinnunen et al., 2011) our study is the first to show that break detachment also plays a mediating role. *Third*, our findings also offer new insights concerning the relationship between within-workday recovery and well-being after the working day. The positive effects of break meaning were still visible before going to sleep in the evening, suggesting that the impact of successful break recovery lasts more than just a few hours during the working day. In addition, break detachment, meaning, and affiliation had effects on evening affect via afternoon affect.

All in all, our findings suggest that breaks which are important and personally meaningful for employees support their recovery. This is in line with the idea of a person-break fit, which is the balance between a person's break-related needs and their actual breaks (Venz et al., 2019), and the findings regarding the well-being benefits of experiencing meaning in life (e.g., Machell et al., 2015; Thrash et al., 2010). Also, to the best of our knowledge, no studies to date have focused on breaks during the working day in the context of the teaching profession, although schoolteachers often have high job demands and stress levels (e.g., Arvidsson et al., 2016; Kyriacou, 2001; Skaalvik & Skaalvik, 2015; 2017). Compared to many other knowledge workers, teachers have limited autonomy concerning break timing and break activities. These specific demands of a teaching job are major challenges for break recovery, and therefore it is important to study this issue specifically in a teaching context.

5.3 | Practical implications

Our findings highlight the benefits of detachment, meaning and affiliation during breaks in terms of affective well-being. Accordingly, we encourage schoolteachers to pursue break activities that could help them to have these experiences. Avoiding performing work tasks during breaks whenever possible is essential for break recovery: Recovery is not possible in the presence of immediate job demands. In addition, positive social interactions with colleagues are likely to produce experiences of affiliation. Therefore, it would likely be useful for teachers to spend their breaks with colleagues as often as possible. This might also afford them social support, which helps them to deal with problems they encounter at work and can also be related to higher work engagement, job satisfaction and better mental health (Simbula, 2010). Social support could be particularly useful in dealing with emotional stressors, which are highly prevalent in teachers' work both according to earlier studies (e.g., Bauer, 2007; Skaalvik & Skaalvik, 2017; Unterbrink et al., 2008) and also in our sample. However, if the atmosphere at work is not good, spending time with colleagues is unlikely to promote recovery.

According to our findings, when teachers can spend their breaks doing something which is personally important and meaningful for them, they recover more successfully. What these meaningful activities are likely varies between individuals. They may, for example, include engaging in relaxing, physical, or social activities during breaks. Research has shown that enjoyment of breaks (Hunter & Wu, 2016; Sianoja et al., 2018) and a good person-break fit (Venz et al., 2019) are linked to better recovery during breaks. This means that employees can enhance their break recovery by taking time for something they like and feel meaningful. This requires sufficient levels of autonomy and is not always possible in busy and restricted working environments like schools.

Although individual employees can proactively make changes that support their break recovery, employers should also pay more attention to ensuring working conditions which enable within-workday recovery. For example, recruiting assistants to oversee pupils during lunch breaks and breaks between classes would allow teachers more opportunities to spend their breaks in a preferred way. Naturally, this is an economic issue which, however, could pay off financially if teachers were able to recover better, need fewer sick leaves and be able to work effectively. It is also good to remember that teachers' well-being is of interest not only for their own sake but also for their pupils' sake: teacher stress relates to pupils' stress (e.g., Oberle & Schonert-Reichl, 2016) and may impair academic outcomes and lower motivation (e.g., Zhang & Sapp, 2008).

The findings of this study, combined with those from other intervention studies, could also be applied in designing interventions to promote break recovery such as nature walks and relaxation exercises (e.g., Sianoja et al., 2018; Steidle et al., 2017). Additionally, interventions outside working hours suggest that recovery training can help increase recovery experiences (for a review, see Verbeek et al., 2018). Future interventions could focus more specifically on strategies targeted at increasing detachment, meaning and affiliation during breaks in the working day. In addition, in designing interventions it is important to take account of the demands of a specific occupation. For example, taking a walk during a lunch break may not be possible for teachers due to time or location constraints.

5.4 | Limitations and suggestions for future research

There are a few limitations to be considered. *First*, the timing of the measurements: Break recovery experiences were assessed at the same time as afternoon affect. Although we asked participants to rate their recovery experiences during all breaks during that day and affect at the exact time when filling in the questionnaire, it is possible that current mood also played a role in the retrospective ratings of break experiences. Daily emotional job demands were also measured in the afternoon questionnaire. Therefore, it is possible that teachers who did not manage to recover well during breaks perceived their emotional demands during the day to be particularly high. We investigated this issue further by conducting a reverse mediation

analysis with emotional demands as a mediator between break recovery experiences and affective outcomes. Even though the model fit was worse than the fit of our original model, it is noteworthy that break detachment, autonomy, and affiliation also seem to predict emotional demands and via these demands predict subsequent afternoon and evening affect. Future diary studies could consider including measurements in the middle of the working day as well, although this may not be convenient for participants—burdening them with very frequent measurements might even increase their stress. For example, measurements after each break might be difficult to implement among teachers, who already have a tight and structured schedule.

Second, we were interested in within-workday breaks in general and did not differentiate between different types of breaks. Therefore, we were not able to compare lunch breaks and shorter breaks between classes. Future studies could pay more attention to comparing different break types (including very short micro-breaks) and recovery experiences and activities during those different types of breaks. Also, assessing 'averaged' breaks (i.e., participants were asked to evaluate all their breaks during the workday at the same time) means that breaks which were longer or later in the day may have weighted more in participants' evaluations. Findings from earlier studies show that break timing may matter for well-being outcomes: for example, Kühnel et al. (2017) found that taking a short break in the afternoon was related to better daily work engagement measured at the end of the working day, whereas a break in the morning was not. On the other hand, they also found that it is better to take short breaks *both* in the morning and in the afternoon than to take a break either in the morning or in the afternoon. In future studies, event-based designs might be useful to further investigate the effects of break timing and duration. Concerning the number of breaks, when we conducted the analyses using the number of breaks as a control variable, we found that it did not play a role in predicting the outcomes.

Third, the use of paper-and-pencil questionnaires also has its limitations. Despite instructions and text message reminders, it was impossible to fully control the time the participants filled in the questionnaires. For this reason, we always asked them to report the time of answering in the booklet. Adherence to the protocol was generally good in terms of reported response times. Future studies could avoid these problems, for example by using short questionnaires provided in a smartphone application or via text messages. *Fourth*, we used one-item measures for some break recovery experiences. Although one-item measures have been demonstrated to be often valid (Fisher et al., 2016) and reduce the burden on participants in diary studies including several measurements per day, future studies may benefit from multiple item measures. *Fifth*, although we tested mediation in a longitudinal study, we cannot draw definite conclusions in causality, because our study did not include manipulation of variables (such as an intervention study). *Sixth*, the reliability of our positive affect measure was quite low. This may be due to the combination of positive affect characterized by both high and low activity level. *Finally*, our sample was quite old

(mean age around 50 years), which may have affected the results. It is possible that older teachers have better recovery self-efficacy, that is, they have learnt which strategies are the most effective for them in promoting recovery. Ageing is related to effectiveness in implementing emotion regulation strategies (e.g., Scheibe & Zacher, 2013), which are closely related to recovery processes (Sonnentag & Fritz, 2007).

The findings of this study suggest five directions for future research. *First*, our theoretical framework, the DRAMMA model (Newman et al., 2014) needs to be studied further in the context of breaks. Future studies could, for example, focus more on examining which break characteristics (i.e., spending the break at the workplace or outside, timing and duration of the break) or activities predict recovery experiences during breaks. This would likely generate ideas for designing effective interventions to promote break recovery among different occupational groups. *Second*, combining self-report measurements of recovery experiences with physiological measurements would offer an interesting perspective on break recovery. Some intervention studies aiming to support break recovery have utilized physiological measurements such as heart rate, heart rate variability (Brown et al., 2012), or cortisol levels (Krajewski et al., 2011), but these studies did not investigate psychological recovery experiences. *Third*, along with well-being outcomes, future studies could also investigate how break recovery is related to performance-related outcomes, such as concentration capacity and creativity at work. For example, it is possible that very high detachment—especially during breaks—may be detrimental to performance. After successfully detaching from work, reattachment (i.e., rebuilding a mental connection to work) is needed when continuing to work and may take some effort (Sonntag et al., 2019; Sonntag & Kühnel, 2016). So far, reattachment has been studied in the context of starting the working day, but the same idea could also be applied to within-workday breaks such as lunch breaks. *Fourth*, future studies could investigate how employees can proactively support their recovery during the working day with the help of crafting behaviours (see e.g., Petrou & Bakker, 2016; Petrou et al., 2017). *Fifth*, future studies could pay attention to which events and experiences after the working day (such as negative events or high demands at home) possibly moderate the relationship between internal recovery and well-being outcomes later in the day. *Sixth*, comparing the effects on recovery experiences and well-being outcomes of emotional demands with other demands, such as workload, would yield more information about their mutual effects. Concerning the association between break recovery and well-being after the working day, it would be worth examining whether break recovery experiences are associated with recovery experiences and activities in the evening.

6 | CONCLUSIONS

Our findings offer new insights into the interplay of daily job demands, recovery during breaks and affective well-being. The results

of this diary study suggest that experiences of detachment, meaning and affiliation during within-workday breaks promote teachers' well-being. This lends further support to the DRAMMA model, suggesting that meaning and affiliation are also important recovery experiences. Break detachment and meaning acted as mediators between daily emotional job demands and affective well-being. Possible practical implications include break recovery training and interventions targeting teachers. Also, employers should pay attention to teachers' working conditions in order to support their opportunities to recover from work during breaks.

ACKNOWLEDGMENTS

This study was supported by the Finnish Work Environment Fund (grant no. 116373).

CONFLICTS OF INTERESTS

The authors report no conflicts of interest.

DATA AVAILABILITY STATEMENT

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

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How to cite this article: Virtanen A, Van Laethem M, de Bloom J, Kinnunen U. Drammatic breaks: Break recovery experiences as mediators between job demands and affect in the afternoon and evening. *Stress and Health*. 2021;1–18. <https://doi.org/10.1002/smi.3041>

PUBLICATION IV

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

Virtanen, A., de Bloom, J., Reins, J. A., Syrek, C., Lehr, D., & Kinnunen, U.

Gedrag & Organisatie, 32(4), 250-278.
doi: 10.5117/2019.032.004.003

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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 wegebben 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). Existing studies indicate that vacations promote employees' recovery, well-being, and job performance (Chen & 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 form an especially stressed occupational group among knowledge workers (e.g., Kyriacou, 2001; Skaalvik & Skaalvik, 2015; 2017). Teachers typically face job demands such as heavy workload, students' behavioral problems, lack of autonomy, conflicts with colleagues or parents, and the increasing use of technology in teaching (e.g., Fernet et al., 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 cease to work 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. Summing up, recovery does not only entail 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 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 appear at all (de Bloom et al., 2009). For example, negative incidents, engagement in passive activities (de Bloom et al., 2011), and lack of detachment from work (Kühnel & Sonnentag, 2011) during a vacation may limit positive vacation effects on well-being. It is also possible that although 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 is theoretically 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 techniques, 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 et al. (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, 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. Thiar and colleagues (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 *Holiday* 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.. Summing up, 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 eHealth 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 mentioned 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.

Summing up, 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 registrations). All in all, 100 teachers

from all over Finland registered to participate. However, only 79 of them responded to the first weekly questionnaire in February 2018 and actually took part in the study. 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” (“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 to which extent 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 registration codes for the app. The study started on the Wednesday 1½ weeks before the scheduled beginning of the vacation and ended on the Wednesday 1½ weeks 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.

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%-42%. At T1, there were least missing values (up to 5%), whereas the amount 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.

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 1–4 “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 between-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 between-subject variable and time as a repeated measure. In addition to group and time effects, we paid special attention to group \times 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.

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 similar vein positive affect ($p < .001$) and sleep quality ($p < .001$) were rated significantly higher and negative affect lower ($p < .001$) during the vacation (T3) than at all other time points. In addition, 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 one and a half weeks 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 \times 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 affect 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 (5/9, 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 (6/9, 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 1.5 weeks 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 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 between-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 it might be possible that 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 0–411, $SD = 67.35$, $Mdn = 6$), 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 amount 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 also have 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 targeted 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 which automatically shows 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 by 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 10-29% 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, Mäkinie, Syrjä, Heikkilä-Tammi, & Viteli, 2016), and it is possible that at worst, smartphone-based interventions could be another source of technostress. 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 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 to recover 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 under 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 of 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.

Table 1. Participants' background information in three app use groups

	Non-users (<i>n</i> = 51)	Passive users (<i>n</i> = 18)	Active users (<i>n</i> = 10)
	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)
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
	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)
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)

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 $\alpha = 0.77$ –0.87		“I forgot about work”	Sonnentag & Fritz, 2007
Relaxation		4 $\alpha = 0.83$ –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”) Sonnentag & Fritz, 2007 Chen et al., 2015
Autonomy		4 $\alpha = 0.74$ –0.87		“I determined for myself how I would spend my time”	van den Broeck et al., 2010
Mastery		5 $\alpha = 0.79$ –0.84		“I did something to broaden my horizons”	Sonntag & Fritz, 2007
Meaning		3 $\alpha = 0.65$ –0.88		“I spent my time in a meaningful way”	adapted from Butler & Kern, 2016 Schulenberg, Schnetzer, & Buchanan, 2010
Affiliation		3 $\alpha = 0.74$ –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 $\alpha = 0.80$ –0.93	1–5	calm/relaxed	Warr, 1990
Negative affect	1 (not at all) –7 (very much)	4 $\alpha = 0.78$ –0.86	1–5	fatigued/tired	Watson & Clark, 1994 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 $\alpha = 0.71$ –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, & Dijkstram, 2015
Job performance					
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 $\alpha = 0.88$ –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

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

Recovery experiences	1) Non-users ($n = 51$)					2) Passive users ($n = 18$)					3) Active users ($n = 10$)					Group \times time effect	
	T1	T2	T3	T4	T5	T1	T2	T3	T4	T5	T1	T2	T3	T4	T5		Group effect
	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)		
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	<i>F</i> , <i>p</i> , (η^2) 26.70, <i>p</i> 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	<i>F</i> , <i>p</i> , (η^2) 38.20, <i>p</i> < .001
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	<i>F</i> , <i>p</i> , (η^2) 27.75, <i>p</i> < .001
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	<i>F</i> , <i>p</i> , (η^2) 16.00, <i>p</i> < .001
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	<i>F</i> , <i>p</i> , (η^2) 7.75, <i>p</i> < .001
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	<i>F</i> , <i>p</i> , (η^2) (0.27) 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 (<i>n</i> = 51)					2) Passive users (<i>n</i> = 18)					3) Active users (<i>n</i> = 10)					Group effect × time effect	Group × time effect	
	T1	T2	T3	T4	T5	T1	T2	T3	T4	T5	T1	T2	T3	T4	T5			
	<i>M</i>	<i>M</i>	<i>M</i>	<i>M</i>	<i>M</i>	<i>M</i>	<i>M</i>	<i>M</i>	<i>M</i>	<i>M</i>	<i>M</i>	<i>M</i>	<i>M</i>	<i>M</i>	<i>M</i>	<i>F, p, (np²)</i>	<i>F, p, (np²)</i>	
	(<i>SD</i>)	(<i>SD</i>)	(<i>SD</i>)	(<i>SD</i>)	(<i>SD</i>)	(<i>SD</i>)	(<i>SD</i>)	(<i>SD</i>)	(<i>SD</i>)	(<i>SD</i>)	(<i>SD</i>)	(<i>SD</i>)	(<i>SD</i>)	(<i>SD</i>)	(<i>SD</i>)	(<i>np²</i>)	(<i>np²</i>)	
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, <i>p</i> < .001	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, <i>p</i> < .001	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, <i>p</i> < .001	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, <i>p</i> < .001	ns
																(0.17)	(0.10)	

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.

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

Job performance	1) Non-users ($n = 51$)					2) Passive users ($n = 18$)					3) Active users ($n = 10$)					Group effect \times time effect	
	T1	T2	T4	T5	T1	T2	T4	T5	T1	T2	T4	T5	T1	T2	T4		T5
	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)		<i>M</i> (<i>SD</i>)
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)	7.75 (0.92)	7.49 (0.86)	7.49 (0.86)	7.73 (0.92)	<i>F</i> , <i>p</i> , (η^2) 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)	5.25 (1.28)	5.24 (1.03)	5.24 (1.03)	5.25 (1.28)	<i>F</i> , <i>p</i> , (η^2) 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)	4.88 (0.92)	4.91 (1.00)	4.91 (1.00)	4.88 (0.92)	<i>F</i> , <i>p</i> , (η^2) ns
																	<i>F</i> , <i>p</i> , (η^2) 2.79, <i>p</i> = .041 (0.04)
																	<i>F</i> , <i>p</i> , (η^2) 2.84, <i>p</i> = .011 (0.07)

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

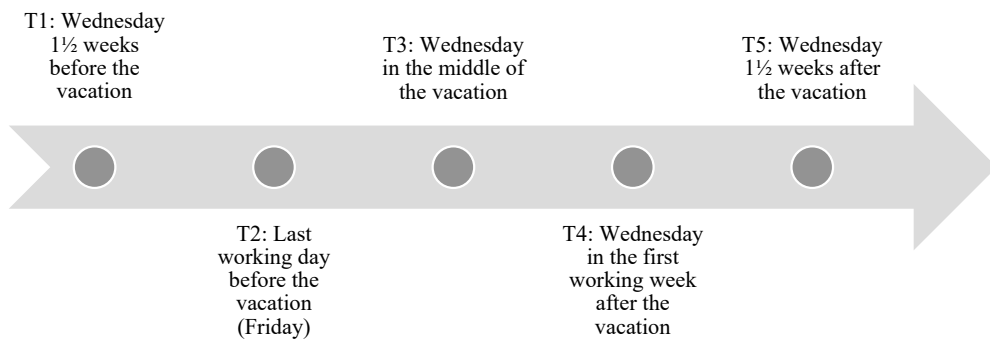


Figure 1. Study design: Measurement points

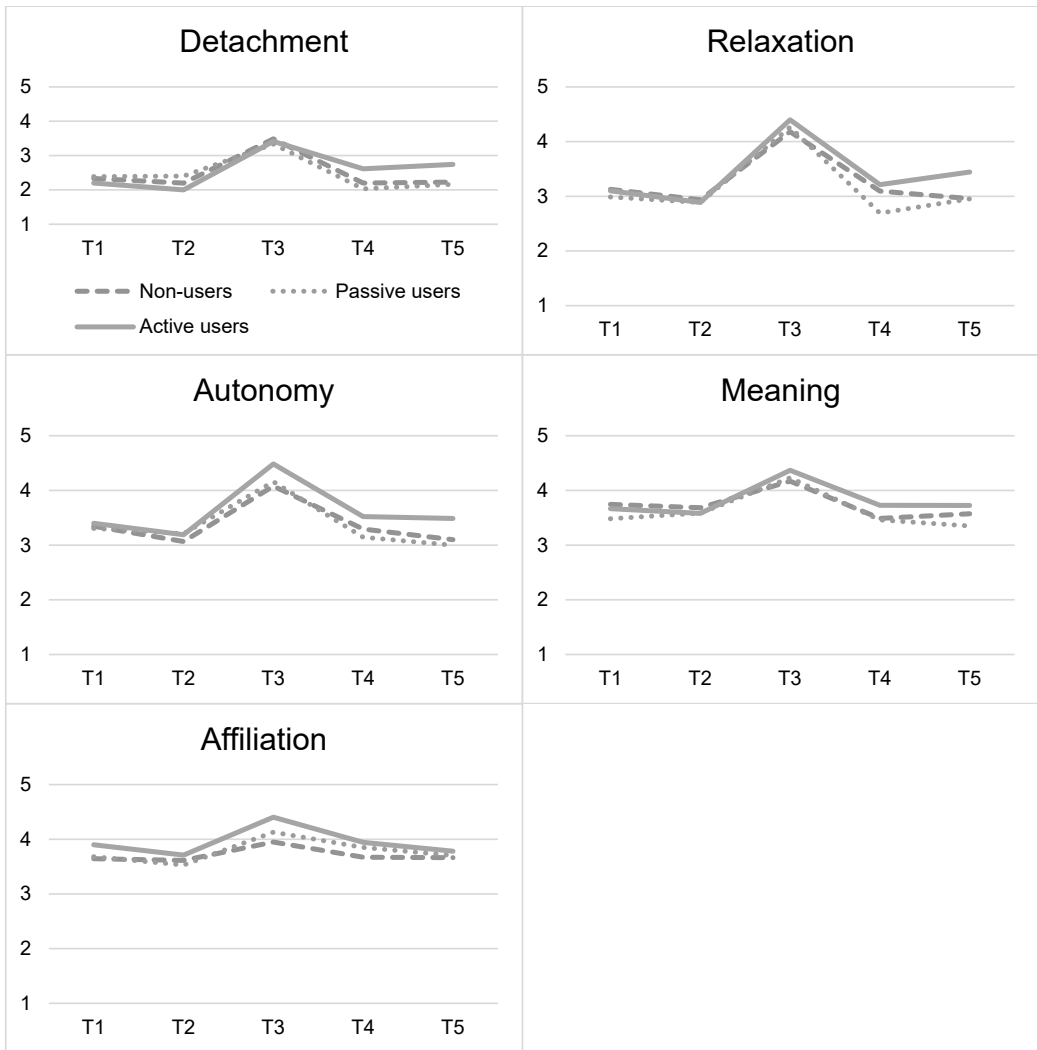


Figure 2. Changes in recovery experiences among non-users ($n = 51$), passive app users ($n = 18$), and active app users ($n = 10$) across the study period (T1–T5).

Note: T1: Wednesday 1.5 weeks 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 1.5 weeks after the vacation

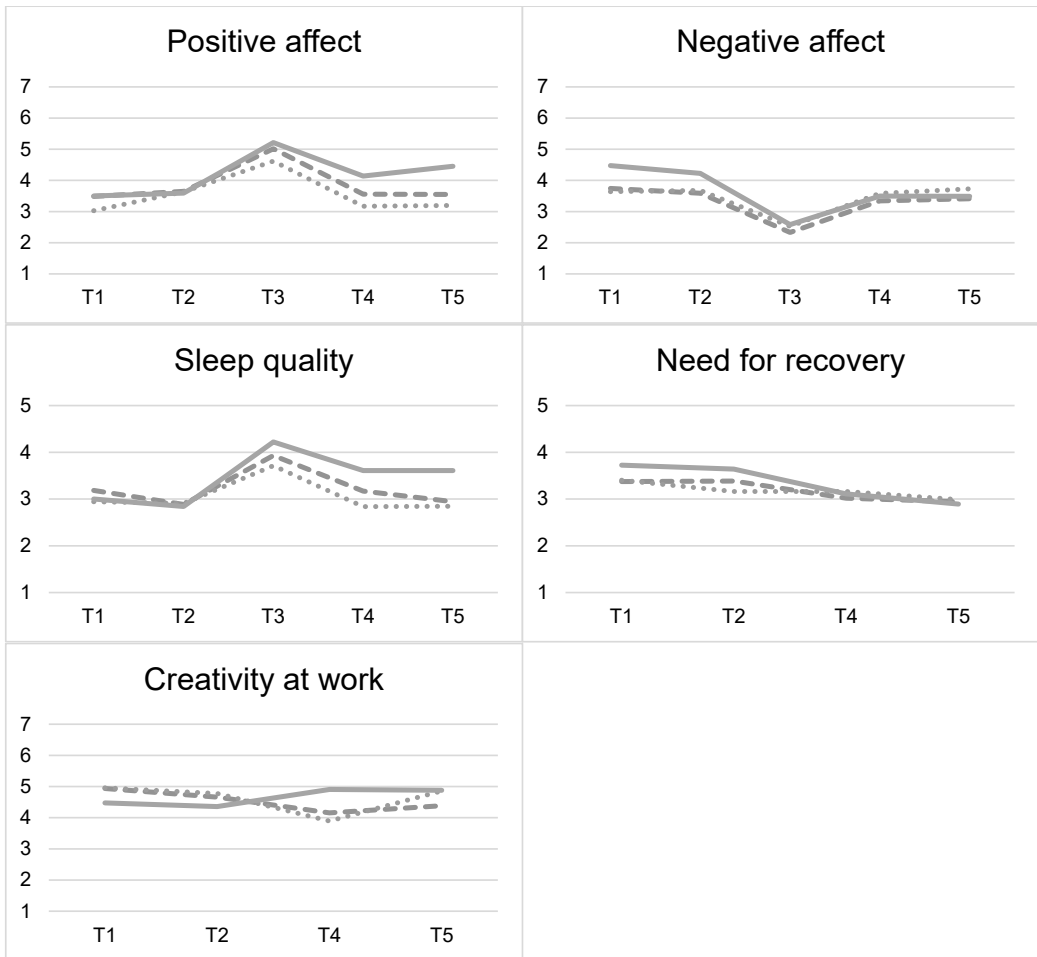


Figure 3. Changes in well-being and job performance among non-users ($n = 51$), passive app users ($n = 18$), and active app users ($n = 10$) across the study period (T1–T5).

Note: T1: Wednesday 1.5 weeks 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 1.5 weeks after the vacation.

Implications for practice

- 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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English Summary

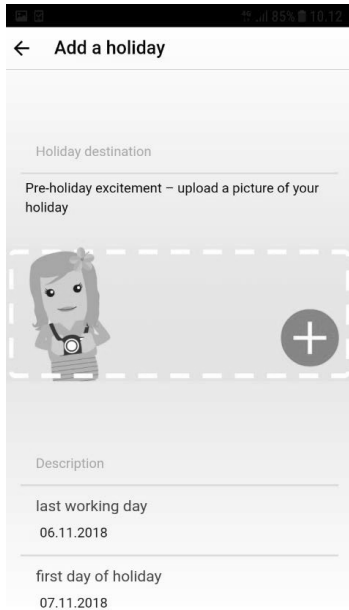
The aim of this study was to investigate whether beneficial vacation effects can be strengthened and prolonged with a smartphone-based intervention. In a four-week longitudinal study among 79 Finnish teachers, we investigated the development of recovery, well-being, and job performance before, during, 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 make active use of 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

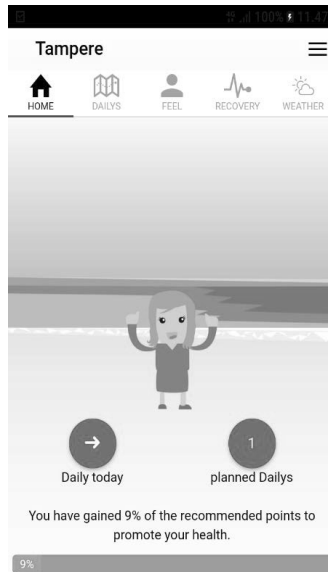
recovery from work, vacations, occupational e-mental health, recovery intervention, smartphone-based intervention

Appendix 1: Screenshots of main functionalities in the Holiday app

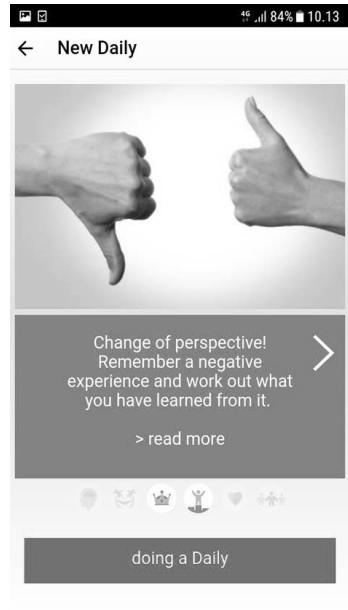
a) Adding a holiday in the app



b) Home screen after adding a holiday



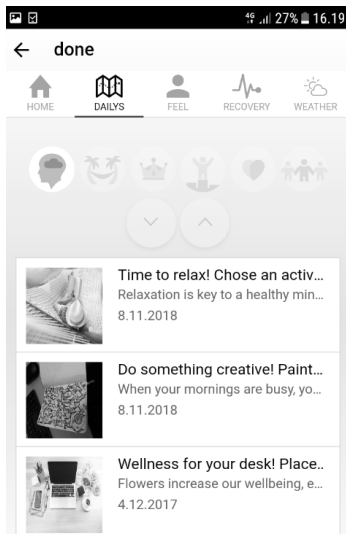
c) Daily example 1



d) Daily example 2



e) View of a completed Daily



f) Well-being ratings

