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ARTICLE

Examining the training design and training transfer of a boundary management training: A randomized controlled intervention study

Kathrin Reinke[1] | **Sandra Ohly**[2]

[1]Department of Business Psychology, University of Applied Sciences Fresenius, Wiesbaden, Germany

[2]Department of Business Psychology, University of Kassel, Kassel, Germany

Correspondence
Sandra Ohly, Department of Business Psychology, University of Kassel, Pfannkuchstraße 1, 34121 Kassel, Germany.
Email: ohly@uni-kassel.de

Abstract

In our mobile working world, boundaries between work and non-work domains are more and more blurred, which can impair professionals' recovery and well-being. Consequently, managing work–non-work boundaries represents an important challenge for professionals. Research suggests that boundary work tactics conveyed in boundary management interventions may promote recovery and well-being. However, the efficacy of boundary work tactics is largely unknown, as well as theoretical mechanisms that may explain the effectiveness of boundary management interventions in regard of both training design and training transfer. Building on the social cognitive theory of self-regulation, we develop a web-based boundary management training. Based on the integrated training transfer and effectiveness model, we evaluate its effects on the three levels of training effectiveness: (1) perceived learning, (2) cognitions and behaviours, with boundary control and boundary creation as indicators, and (3) recovery and well-being. Results of our randomized controlled intervention study show several expected changes in boundary creation, suggesting that drawing on the social cognitive theory of self-regulation for training design can result in effective behaviour change. Intervention effects on recovery and well-being are more ambiguous, hinting at the power but likewise potential limitations of boundary creation.

KEYWORDS

boundary creation, boundary management, intervention study, recovery, training design, training transfer, well-being

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Practitioner Points

- Managing work–non-work boundaries represents an important challenge for employees in our mobile working world. To help employees dealing with this challenge, organizations could offer boundary management trainings based on principles of the social cognitive theory of self-regulation, as these trainings can enable employees to increase boundary creation.
- Learning how to promote boundary creation in boundary management trainings may further help employees to improve their satisfaction with work-life balance and to reduce negative affect.
- Yet, to consistently promote employees' recovery might require not only addressing the individual level – that is the employees' boundary creation in trainings – but additionally addressing work-related contextual factors such as work demands or supervisor support for recovery and well-being.

Many professionals use information and communication technologies (ICTs) to stay connected to work without any temporal or spatial boundaries (Kossek, 2016), which has even increased with the rise of mobile work during the pandemic. Consequently, boundaries between work and non-work are increasingly blurred (Rudolph et al., 2021). In the past decades, numerous studies have examined the effects of boundary blurring on individual recovery and well-being: On the one hand, research showed that boundary blurring brings greater flexibilities, facilitates managing the work–non-work interface and increases work satisfaction (Diaz et al., 2012; Sayah, 2013). On the other hand, studies found that boundary blurring – particularly of the non-work boundary, that is, integration of work into non-work – may impair recovery and well-being. For example, boundary blurring was linked to impaired work-life balance (Wepfer et al., 2018), reduced psychological detachment (Park et al., 2011; van Laethem et al., 2018) and impaired sleep (Barber & Jenkins, 2014). In contrast, boundary creation was linked to increased work-life balance (Reinke & Gerlach, 2022), reduced psychological work–non-work interference (Park & Jex, 2011) and increased psychological detachment (Barber & Jenkins, 2014). Hence, 'one of the most important challenges that many professionals […] currently face is managing their work-life boundaries' (Kossek, 2016, p. 269). To maintain employee well-being, and in turn, performance (Wright & Huang, 2012), both employees and employers should be concerned with finding ways to effectively deal with the challenge of boundary management.

Prior research suggests that well-being interventions represent promising ways to foster employee well-being (e.g. Karabinski et al., 2021; Richardson, 2017). Yet, research on interventions addressing boundary management is still scarce: To our knowledge, there are 11 (including unpublished) studies that included the topic of boundary management in their interventions (see Karabinski et al., 2021 for an overview; Althammer et al., 2021; Rexroth et al., 2017). Further, while these studies offer valuable insights into intervention effects for well-being, the theoretical mechanisms underlying the effectiveness of these interventions remain largely unknown. This limitation represents a general deficiency in intervention research on well-being (Daniels, 2016; Nielsen & Shepherd, 2022) and yields two central implications for intervention research. First, it is critical to ground the intervention itself on theoretical mechanisms to be able to 'provide a strong test of a theory' (Daniels, 2016, p. 333) and to shed light on potential learning processes underlying the intervention (Daniels, 2016). While most intervention studies on boundary management used theories such as boundary theory (Ashforth et al., 2000; Clark, 2000) as the conceptual basis of the training content, only Schlachter (2018) and Hahn et al. (2011) further provided some assumptions on theoretical processes for learning during the intervention. Hence, current research largely omits to build the intervention design on such theoretical mechanisms, neglecting to examine not only content ingredients but also process ingredients for an effective intervention design (Daniels, 2016).

Second, intervention research needs to gain knowledge on how interventions are transferred to the participants' daily life. Put more drastically, so far, 'training transfer is an unknown phenomenon in mental health and well-being training' (Nielsen & Shepherd, 2022, p. 3). According to the integrated training transfer and effectiveness model (ITTEM, Nielsen & Shepherd, 2022), which integrates previous models of training transfer and applies them to well-being interventions, research needs to consider three levels of training effectiveness to understand the process of training transfer: First, participants need to experience changes in their learnings, that is acquire new skills and knowledge. Second, individuals need to transfer these learnings into actual and sustained changes in their emotions, cognitions and behaviours. Ultimately, these changes can translate into the desired changes in individuals' well-being (Nielsen & Shepherd, 2022). However, the majority of intervention studies on boundary management only examines the third level, changes in well-being outcomes such as psychological detachment, exhaustion or satisfaction with work-life balance (e.g. Ebert et al., 2015; Hoppe et al., 2018; Michel et al., 2014), disregarding to integrate the two preceding levels of training effectiveness. Thus, rarely, learnings (Hahn et al., 2011) or cognitions and behaviours (Rexroth et al., 2016, 2017; Schlachter, 2018) are investigated.

Together, there is a considerable need for research on the effectiveness of boundary management interventions and its underlying theoretical mechanisms – in regard of both training design and training transfer (Daniels, 2016; Nielsen & Shepherd, 2022; Richardson, 2017). Addressing these limitations and proposed directions for intervention research, this study develops a theory-based boundary management training and investigates how and why this training is transferred to individuals' daily life. To do so, we conducted a randomized controlled intervention study with three measurement points (prior to, directly after and 1 month after the training).

Our study contributes to research by (1) identifying important content ingredients as well as (2) process ingredients of effective boundary management interventions and by (3) examining training transfer on different levels of training effectiveness. In more detail, first, this study expands our knowledge about the usefulness of boundary work tactics in promoting boundary creation (refer to Table 1 for definitions), and in turn, sheds light on the relevance of boundary creation for changes in recovery and well-being. Because boundary work tactics represent crucial means to create stronger boundaries between work and non-work (Allen et al., 2021; Kreiner et al., 2009), they are regarded as key content ingredients in our training. As many findings on boundary work tactics stem from qualitative studies (e.g. Allen et al., 2021; Lirio, 2017; Sayah, 2013), our intervention study addresses recent calls to examine the usefulness of boundary work tactics (Allen & French, 2023; Rudolph et al., 2021). Thus, our study provides insights into *what* content ingredients should be included in the training design.

Second, we answer recent calls to provide a theoretical basis for the mechanisms of a training design (Daniels, 2016). Particularly, we build the mechanism of our training design on principles of social cognitive theory of self-regulation (SCT, Bandura, 1991, 1998), and include ingredients in each training module that address the theoretical process of behaviour change. Thereby, we extend knowledge on potential learning processes underlying the intervention itself and provide insights into *how* the training content should be conveyed (Daniels, 2016), illuminating important process ingredients of the training design.

Third, we aim to extend our understanding of the process of training transfer by considering that 'intervention outcomes are the result of people's reasonings and behaviors' (Nielsen & Shepherd, 2022, p. 3). Thus, we acknowledge that research needs to consider distinct levels of training effectiveness to draw conclusions about the relations between them and to shed light on the underlying processes of training transfer. Accordingly, our study draws on principles from the ITTEM (Nielsen & Shepherd, 2022) and captures indicators of all three levels of training effectiveness. Specifically, we examine how the training contributes to changes in (1) perceived learnings on boundary management, (2) cognitions and behaviours about boundary management and, in turn, (3) recovery and well-being outcomes. To the best of our knowledge, this study is the first in the context of boundary management that integrates all three levels of training effectiveness from a theoretical

TABLE 1 Definition and operationalization of the study's key boundary management concepts.

Concept	Definition in current study	Operationalization in current study
Boundary management	Umbrella term representing 'the process by which individuals create, maintain, or change boundaries to navigate the world around them, including their work and family roles' (Allen & French, 2023, p. 440; Cobb et al., 2022)	Overarching concept, rooted in the theoretical framework of boundary theory (Ashforth et al., 2000; Clark, 2000)
Boundary control	Individuals' beliefs about their capability to control their own boundary management (Kossek et al., 2012)	Indicator of cognitive outcome of training effectiveness: Measured by boundary control scale from Kossek et al. (2012)
Boundary creation	The degree to which boundaries between work and non-work are created as strong (impermeable and inflexible, indicating segmented roles; see Ashforth et al., 2000; Clark, 2000) versus weak (more permeable and flexible, indicating integrated roles; see Ashforth et al., 2000; Clark, 2000) Conceptualized as an outcome; focus on 'how much'	Indicator of behavioural outcome of training effectiveness: 1. Boundary enactment (positive indicator), measured by three items from the boundary strength at home scale (Hecht & Allen, 2009) combined with the work-interrupting non-work behaviours scale (Kossek et al., 2012) 2. Extent of work-related ICT use after hours (negative indicator), measured with one item
Boundary work tactics	Specific actions and strategies that individuals actively use to help create and maintain their preferred boundaries between work and non-work (Allen et al., 2021; Kreiner et al., 2009) Conceptualized as a tool; focus on '"how" and less on "how much"' (MacDermid, 2005, p. 36 in Kreiner et al., 2009)	Central content ingredient in the intervention as a tool for boundary creation

perspective. Hence, we go beyond prior research that has largely focused on improving well-being without examining theoretical mechanisms of training transfer.

Together, building on previous findings on boundary management, the SCT and the ITTEM, allows us to shed light on the effectiveness of the training design – in regard of both content ingredients, that is boundary work tactics, and process ingredients, that is learning mechanisms – for successful training transfer. Table 1 provides a summary of key terms and Figure 1 summarizes our conceptual framework.

MECHANISMS FOR TRAINING DESIGN: SOCIAL COGNITIVE THEORY OF SELF-REGULATION

For the theoretical grounding of our training's process ingredients, we draw on social cognitive theory of self-regulation (Bandura, 1991). SCT is applicable to health promotion (Bandura, 1998, 2004) and proposes that individuals regulate and change their behaviour based on three sub-functions: self-monitoring, self-assessment and self-reaction. Self-monitoring refers to observing and becoming aware of one's own behaviour and setting individual goals. Individuals then evaluate their goal attainment, comparing their behaviour to individual standards and preferences (self-assessment). Finally, according to SCT, individuals anticipate positive or negative self-reactions that stem from engaging in a certain behaviour, and accordingly adapt their behaviour to pursue positive self-reactions and avoid negative self-reactions (Bandura, 1991).

Further, SCT posits that individuals' self-efficacy plays a central role in successfully changing their behaviour. Self-efficacy refers to one's belief of being able to successfully control and perform certain behaviours (Bandura, 1991, 1998). Transferred to our study context, SCT suggests that if individuals

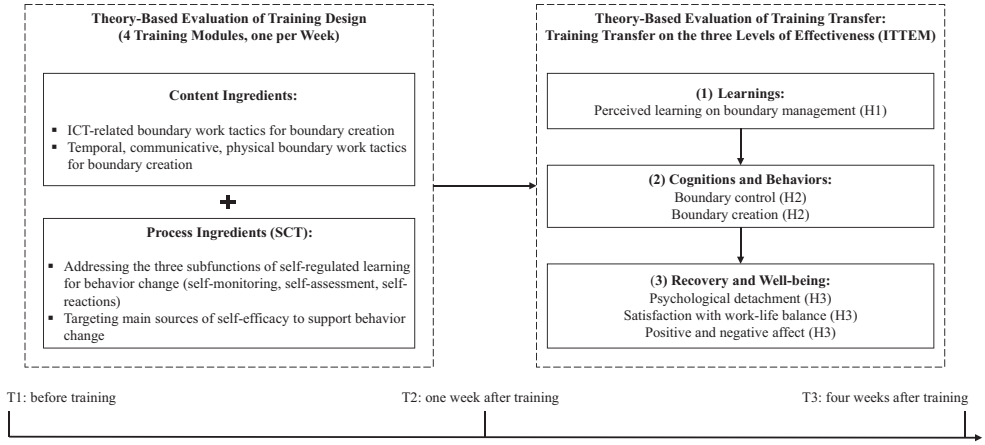

FIGURE 1 Conceptual framework of our study approach.

have higher beliefs in being capable of controlling their boundary management, they will have higher motivation to actively change their boundary management behaviour. Besides, Bandura (1991) proposes that self-efficacy influences the three sub-functions of behaviour change: For example, when individuals assess themselves as being able to control their boundary management, they will commit more strongly to goals for this behaviour (Bandura, 1991). Hence, when an intervention successfully increases self-efficacy, the individual will more likely initiate behaviour change. According to Bandura (1991, 1998), self-efficacy can be increased by addressing its main sources (mastery experiences, vicarious experiences by social models, social persuasion and somatic and emotional states).

In line with these notions, a few intervention studies specifically included exercises to increase self-efficacy in their training (i.e. recovery-related self-efficacy in Hahn et al., 2011; ICT-related self-control and boundary self-efficacy in Schlachter, 2018). To complement these approaches and capture the entire process of self-regulated learning, we include process ingredients in our training that explicitly address (1) the three sub-functions of behaviour change and (2) main sources to increase self-efficacy for boundary management (see Table 2 for details). To examine whether self-efficacy for boundary management was successfully increased, we include boundary control as a criterion in our training evaluation (see Hypothesis 2).

MANAGING WORK–NON-WORK BOUNDARIES AFTER HOURS

Linking boundary management, recovery and well-being

Boundary theory (Ashforth et al., 2000; Clark, 2000) posits that individuals differ in how they manage their work–non-work boundaries on a continuum from segmentation to integration. Segmentation refers to keeping boundaries between work and non-work rather strong, that is more impermeable and inflexible. In contrast, integration implies to have more permeable and flexible boundaries, increasing boundary blurring (Ashforth et al., 2000, Clark, 2000). Prior research has shown that integration – particularly of work into non-work – can have detrimental consequences for individuals' recovery, and consequently, for their well-being (e.g. Kühner et al., 2023; Park et al., 2011; Wepfer et al., 2018).

As an indicator of recovery, we focus on psychological detachment, 'the sense of being away from the work situation' (Etzion et al., 1998, p. 579) because it is considered a core aspect of individuals' recovery process (Sonnentag & Fritz, 2007) and a relevant outcome in research on boundary management (e.g. see the meta-analyses by Karabinski et al., 2021; Thörel et al., 2022). As indicators of well-being,

TABLE 2 Aim, content ingredients and process ingredients in the four training modules.

	Module 1	Module 2	Module 3	Module 4
Aim	Initiating intentions for behavior change	Providing knowledge about boundary work tactics as a tool to foster recovery and well-being and testing to implement them in daily lives		Encouraging long-term transfer of the participants' learnings into their daily lives
Content ingredients	Importance of recovery and well-being Activities to relax and unwind	Effects of boundary creation for recovery and well-being Boundary work tactics I: Tactics to create boundaries for work-related ICT use and availability after hours	Boundary work tactics II: Communicative, physical and temporal tactics to create work-nonwork boundaries	Summary of key learnings Boundary management intentions ("boundary management mission")
Process ingredients I: Supporting the three subfunctions of SCT	**Self-monitoring (Modules 1–4):** 1. Exercises to reflect the current status, preferences and goals – for their recovery and well-being (Module 1), – for their boundary management (Modules 2–3), – for their boundary management and well-being in the future (Module 4). *Example for goal setting*: I wish to integrate work and nonwork during the week—but in a moderate way. That means the boundary of my personal life is permeable only for calls from my team. On weekends I wish to segment work and nonwork more without often thinking about work and upcoming To Dos. 2. Exercises for detailed action planning – for trying out recovery activities (Module 1) and boundary work tactics (Modules 2–3) in the following week, which fit their respective goal and preferences, – for regularly implementing their suitable boundary work tactics in the future (Module 4). *Example for action planning*: For the weekend, I introduce a transition ritual: On Friday evening, I write down the most important to-dos for the next week and three things that went particularly well this week. I then consciously store away my laptop and other work materials. **Self-assessment (Modules 2–4):** Exercises for reflecting – on goals, challenges and ways of coping (using mental contrasting with implementation intentions (MCII), Oettingen & Gollwitzer, 2010) during the previous week (Modules 2–3), – on goal progress since Module 1, including obstacles and ways to overcome them using MCII (Module 4). **Positive self-reaction (Modules 2–4):** Exercises to celebrate successes and progress.			
Process ingredients II: Addressing the sources of self-efficacy	**Emotional states:** Exercises to envision one's feelings when reaching the goal (Oettingen & Gollwitzer, 2010). **Enactive mastery experiences (Modules 2–4):** Exercises to think about how and why they made progress towards their goal, or to think about successful experiences in regard of their goal in the past. **Vicarious experiences and social persuasion:** Testimonials on challenges for recovery and experiences with recovery activities (Module 1) as well as on experiences with boundary work tactics and their effects on well-being and recovery (Modules 2–4) from participants of an interview study. Emphasizing throughout the training that everyone can learn to actively create work-nonwork boundaries.			

which refers to 'a broad category of phenomena that includes people's emotional responses, domain satisfactions, and global judgments of life satisfaction' (Diener et al., 1999, p. 277), we examine satisfaction with work-life balance, positive affect and negative affect, capturing different components of well-being. Specifically, we examine satisfaction with work-life balance as an evaluation of cross-domain satisfaction, as it is defined as an overall satisfaction with one's success at meeting the demands of both work and non-work roles (Valcour, 2007). Positive and negative affect represent important affective components of well-being (Daniels, 2000). Specifically, high positive affect and low negative affect refer to individuals' frequent experience of pleasant and their rare experience of unpleasant moods and emotions (Diener et al., 1999).

The detrimental effects of boundary blurring for recovery and well-being can be explained by building on the Effort–Recovery Model (ERM, Meijman & Mulder, 1998). The ERM suggests that work effort relates to an elevated psychophysiological activation. These short-term stress reactions can be reversed by engaging in recovery processes, allowing exhausted functional systems to replenish. Thus, recovery processes from work can only occur when work-related demands are not present anymore (Meijman & Mulder, 1998). If recovery processes are continuously interrupted by work-related demands or continued work, this leads to insufficient recovery, which in turn may result in impaired physiological and psychological well-being in the long term (Meijman & Mulder, 1998). Hence, as indicated by recent meta-analyses, the detrimental effects of boundary blurring are likely due to work demands still being present after hours, regularly interrupting recovery processes (Hu et al., 2021; Thörel et al., 2022) and ultimately leading to impaired well-being (Thörel et al., 2022). Accordingly, integrating boundary theory, the ERM and findings from prior research, it follows that individuals – including those who prefer to integrate work and non-work – should benefit from engaging in a certain degree of boundary creation after hours to be able to provide for phases of recovery and to maintain their well-being. This notion was empirically supported by Althammer et al. (2021), showing that both segmenters and integrators benefitted from a boundary management intervention in regard of their recovery and well-being.

As a means to increase boundary creation, and thus, to prevent boundary blurring, individuals can apply various boundary work tactics (e.g. Allen et al., 2021; Kreiner et al., 2009). Thereby, individuals can use boundary work tactics that create very strong boundaries (e.g. turning off work-related smartphones after hours), as well as tactics that still create boundaries but allow for more permeability (e.g. checking work emails only at certain times after hours; see Reinke et al., 2024 for an overview). Thus, a boundary management training should enable individuals to increase boundary creation, that is to establish stronger boundaries, by applying boundary work tactics that are suitable for them. Ultimately, such training should enable them to engage in recovery processes and to foster their well-being (Barber & Jenkins, 2014; Kreiner et al., 2009). We present our hypotheses and their underlying rationales in the following.

Intervention effects on perceived learning about boundary management

According to the ITTEM, to effectively change individuals' behaviour and well-being in a training, participants need to acquire new skills and knowledge as a first step. That is, they need to gain learnings about the training topic (Nielsen & Shepherd, 2022), in our case, about the relevance of boundary creation and its relationship with recovery and well-being, as well as about various boundary work tactics as tools for boundary creation. In contrast, participants in the control group have no access to this information, which should result in no or lower levels of perceived learning. As empirical support, Hahn et al. (2011) examined learning differences as a manipulation check in their recovery training study and found that training participants reported more learning about recovery than the control group. Thus, we propose that participating in our training will have a positive effect on perceived learning about the training content:

> **Hypothesis 1.** Participants in the intervention group (IG) report higher perceived learning about the training content than participants in the waitlist-control group (CG).

Intervention effects on boundary management cognitions and behaviours

As a second step, the ITTEM posits that training participants will translate their gains in learning into changes in their cognitions and behaviours (Nielsen & Shepherd, 2022). In regard of cognitions, self-efficacy is considered an important cognitive outcome of interventions (Nielsen & Shepherd, 2022), supporting self-regulatory processes towards behaviour change (Bandura, 1991, 1998). According to Skinner (1996), self-efficacy can be regarded as an appraisal of control, referring to individuals' belief that they can intentionally produce a certain outcome. Thus, we regard boundary control as an indicator of self-efficacy related to boundary management, because it matches this definition (Kossek et al., 2012, also see Table 1) as an appraisal of control (Frese et al., 2007; Skinner, 1996). The training targets participants' boundary control by specifically addressing main sources of self-efficacy (Bandura, 1991, 1998) during the training (see Table 2). Further, the training provides participants with the means, that is the knowledge about boundary work tactics, to intentionally manage their work–non-work boundaries, which should likewise increase their appraisal of control (Skinner, 1996). In contrast, individuals in the CG do not encounter this content, depriving them from systematically experiencing sources of self-efficacy, which should result in no changes in this group. In line with these arguments, Hahn et al. (2011) and Schlachter (2018) examined self-efficacy in their training studies. While Hahn et al. (2011) found improvements in recovery-related self-efficacy for training participants, Schlachter (2018) found mixed results, with an increase in ICT-related self-control for training participants but no effects for boundary self-efficacy. Because our training targets main sources of self-efficacy, we suggest that training participants report an increase in their boundary control, whereas participants in the CG should not.

With regard to behaviours, we expect an increase in boundary creation for training participants, because the training encourages individuals to apply various boundary work tactics to create stronger work–non-work boundaries. Addressing the three sub-functions of behaviour change according to the SCT (Bandura, 1991, 1998), participants are advised in multiple training modules to reflect on their current behaviour, and encouraged to set goals as well as action and coping plans on how to change their behaviour towards higher boundary creation (see Table 2). In contrast, individuals in the CG are not encouraged to monitor their boundary creation and set goals on how to change it. Although they might occasionally reflect on their behaviour, they do not receive any guidance on how to create boundaries and deal with obstacles, which should result in little systematic changes in their behaviour. Prior studies showed some support that an intervention can foster more boundary creation, with Rexroth et al. (2016) finding positive intervention effects on boundary creation and Schlachter (2018) finding short-term, negative intervention effects on work-related ICT use during the weekend. Taken together, we hypothesize the following changes in cognitions and behaviours:

> **Hypothesis 2.** Participants in the IG report increases in (a) boundary control and (b) boundary creation, compared to the CG.

Intervention effects on recovery and well-being outcomes

As a third step, the ITTEM suggests that these prior changes in knowledge, cognitions and behaviours can lead to a change in well-being (Nielsen & Shepherd, 2022). According to the ERM (Meijman & Mulder, 1998), work being present in the non-work domain may lead to insufficient recovery, which likely results in impaired psychological and physiological well-being. Building on these propositions, we expect the training to increase participants' recovery and consequently, to improve well-being.

Regarding recovery, many previous studies showed that boundary blurring impedes psychological detachment from work (e.g. see the meta-analyses by Kühner et al., 2023; Thörel et al., 2022). Building on the ERM, creating boundaries enables individuals to engage in uninterrupted phases of recovery (Meijman & Mulder, 1998). Through allowing uninterrupted phases of recovery, individuals can better mentally distance themselves from their work, resulting in increased levels of psychological detachment.

The training encourages participants to apply boundary work tactics that create stronger boundaries by setting goals and planning actions (see Table 2). In contrast, participants in the CG are not systematically encouraged to apply boundary work tactics, and do not learn how to increase uninterrupted phases of recovery. Creating stronger boundaries has been linked to increased psychological detachment in previous research (Barber & Jenkins, 2014; Park et al., 2011), also in prior intervention studies (Hahn et al., 2011; Michel et al., 2014; Rexroth et al., 2016). Hence, we propose that training participants should report an increase in their psychological detachment, whereas participants in the CG should not.

With regard to well-being, previous studies showed that higher segmentation of work from non-work relates to increased work-life balance, while higher work–non-work integration links to reduced work-life balance (Reinke & Gerlach, 2022; Wepfer et al., 2018). Combining propositions from boundary theory and ERM, the negative effect of integration on work-life balance might be due to a higher number of work-related interruptions during non-work: This may not only leave less time to restore functional systems (Meijman & Mulder, 1998) but also to meet demands of the non-work role, creating more work–non-work conflicts (Ashforth et al., 2000). In support of this notion, prior research found that work–non-work integration relates to increased work–non-work conflicts (Fenner & Renn, 2010; Powell & Greenhaus, 2010; Thörel et al., 2022), which in turn relate to reduced satisfaction with work-life balance (e.g. Wayne et al., 2020). In our training, participants learn how to create stronger boundaries and are encouraged to engage in increased boundary creation enabling uninterrupted phases to focus on their non-work life. As a result, they should experience less work–non-work conflicts and hence, higher satisfaction with work-life balance. In contrast, participants in the CG do not learn how to create boundaries, resulting in higher interferences of work and non-work life. Thus, they should not show a change in satisfaction with work-life balance.

Several studies indicate that lower affective well-being, such as lower positive and higher negative affective states, is related to thinking about and experiencing work demands (e.g. Beal & Ghandour, 2011; Daniels, 2000; Hülsheger et al., 2022). According to boundary theory, these affective states are likely to be more present in the non-work domain, too, when boundaries are more permeable (Clark, 2000). Further building on the ERM (Meijman & Mulder, 1998), boundary blurring may lead to interrupted phases of recovery, which, in turn, should also have detrimental effects on the individual's affective well-being. Thus, when individuals can recover from work demands in their leisure time, they will experience higher levels of affective well-being (Sonnentag et al., 2008). In support of this, several studies showed that boundary blurring through work-related ICT use after hours relates to reduced positive affect (Ohly & Latour, 2014) and increased negative affect (Butts et al., 2015; Kühner et al., 2023), while creating stronger boundaries was found to predict increased positive affect and reduced negative affect (Spieler et al., 2017). Accordingly, by learning how to create boundaries, training participants (but not individuals in the CG) should improve their affective well-being. We hypothesize:

> **Hypothesis 3.** Participants in the IG show (a) increased psychological detachment, (b) increased satisfaction with work-life balance, (c) increased positive affect and (d) reduced negative affect, compared to the CG.

METHOD

Study design and sample

The randomized controlled intervention study was conducted between April 2020 and January 2021. The study included a pre- and two post-intervention assessments, comparing an intervention group (IG) participating in the web-based training to a waitlist-control group (CG). Data were collected 1 week before the training (T1, pre-survey), in the week directly after the training (T2, post-survey) and 4 weeks after the training (T3, follow-up).

Participants were recruited using announcements of the training study in a local newspaper, social media of the University of Kassel, on professional email list servers and various social media websites,

as well as through the personal and professional network of the authors. In total, 89 participants registered for the study and received the pre-survey, which was completed by 86 participants, allocated randomly by the survey software Unipark to either the IG ($n = 42$) or the CG ($n = 44$).[1] After the training phase, we excluded 11 participants from the IG who did not participate in the training, resulting in 75 participants who completed the T1 survey ($n = 31$ in the IG; $n = 44$ in the CG). In this remaining IG, 25 participants completed the T2 survey and 23 completed the T3 survey. All three surveys were completed by 22 participants. Participants in the IG completed at least two training modules. In the CG, 34 participants completed the T2 questionnaire and 32 the T3 survey. All questionnaires were filled out by 29 participants in the CG. Subsequently, the CG also received access to the training.

To check for potential selection bias due to dropout, we conducted ANOVAs and chi-square tests for demographic[2] and study variables. Results showed no significant differences between individuals who dropped out and our final sample, that is 59 participants for the analyses of T1–T2 (25 in the IG; 34 in the CG). The majority was female (71.2%) and averaged 37.37 years old ($SD = 11.16$). Most were employed (91.5%) and 8.5% were self-employed, with 22% working in HR, 13.6% in IT, 11.9% in strategy and sales, 10.2% in general management and 30.4% in other occupations. Participants worked on average 41.81 h ($SD = 10.53$) and 70.9% of their working time from home. The majority was in a relationship (76.3%) and 35.6% lived with at least one child in their household. For analyses comparing T1–T3, the sample comprised 51 participants, 22 in the IG and 29 in the CG.

Although this sample size is relatively small, *a priori* power analyses revealed a sample size of 44 participants to detect medium effect sizes with a power of 95%. Our study sample fulfils this minimum sample size. Yet, to account for our relatively small sample size, we added supplemental analyses with all available data ($N = 75$) using full information maximum likelihood (FIML).

Boundary management training 'Switch off and recharge'

The web-based, 4 week training programme consisted of four consecutive modules of 45–60 min duration, which were unlocked week after week on the training platform. Each module included psychoeducational elements with audio clips and written information as well as practical exercises, in which participants were encouraged to follow the instructions of the exercises and to write down their responses in the spaces provided on the training platform (such as their goals or action plans). Thus, the training was conceptualized as a self-training without direct interaction between participants. Regarding the process ingredients, the training was structured based on principles of the SCT (Bandura, 1991, 1998), combined with methods from general training research (e.g. Oettingen & Gollwitzer, 2010; Salas et al., 2012), to support the three sub-functions of self-regulated behaviour change and increase sources of self-efficacy. Detailed information on the respective content and process ingredients are shown in Table 2.

We developed the content ingredients based on prior research on boundary management (e.g. Kreiner et al., 2009; Sayah, 2013). Module 1 focused on initiating intentions for behaviour change, explaining the importance of recovery and well-being. Modules 2 and 3 aimed at learning about various boundary work tactics as a tool to foster boundary creation, recovery and well-being (e.g. Allen et al., 2021; Gravador & Teng-Calleja, 2018; Sayah, 2013). While participants were encouraged to actively create boundaries, it should be noted that they were not encouraged to fully segment work–non-work boundaries. Rather, we provided knowledge about a variety of boundary work tactics, with some building very strong boundaries and others creating boundaries that are more permeable (Reinke et al., 2024), so

[1]To register, participants had to send their consent to participate in the study to the first author. They received detailed information on the study's process and design, the training, data collection and data analysis as well as data privacy before the start of the study. Prior to completing the pre-survey, all participants confirmed their understanding of this information and their consent to participate again.

[2]We compared sex, age, relationship status (1 = single, 2 = in a relationship), number of kids living in the household, weekly working hours, occupation status (1 = employed, 2 = self-employed/freelancer, 3 = other) and job position (1 = employee without managerial responsibility, 2 = employee with managerial responsibility, 3 = executive board/CEO, 4 = other).

participants could choose those tactics suitable to their needs. Module 4 aimed at the long-term transfer of the participants' learnings into their daily lives.

Measures

If not stated differently, items were measured on a 7-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree). For T2 and T3, participants were instructed to refer to the last 4 weeks and the wording of items was adapted accordingly.

Perceived learning

We assessed perceived learning at T2 referring to the training content with three items adapted from Hahn et al. (2011), measured on a 5-point Likert scale from 1 (do not agree) to 5 (fully agree). A sample item is 'In the last four weeks, I learnt how to actively manage the boundaries between my work and personal life'.

Boundary control

We measured boundary control with the three-item scale from Kossek et al. (2012). An example is: 'I control whether I have clear boundaries between my work and personal life'.

Boundary creation

Boundary creation was operationalized by two variables, boundary enactment as a positive indicator and work-related ICT use after hours as a negative indicator. Boundary enactment was assessed with the work-interrupting non-work behaviours scale (Kossek et al., 2012) combined with three items from the boundary strength at home scale (Hecht & Allen, 2009) to cover a wide range of diverse boundary creation behaviours. Factor analyses with varimax rotation showed that all eight items loaded highly onto one factor. Confirmatory factor analyses further showed no differences between the one-factor model and the two-factor model, suggesting that the scales can be combined (see Table S1). A sample item is 'I allow work to interrupt me when I spend time with my family or friends'. Items were reversed for analyses, with higher values indicating higher boundary enactment. Work-related ICT use after hours was measured with the self-developed item 'I use mobile technologies (e.g. smartphone, tablet, laptop) for work-related reasons after hours' on a response scale ranging from 1 (almost never) to 7 (almost always).

Psychological detachment

Psychological detachment was measured with four items developed by Sonnentag and Fritz (2007) on a 5-point Likert scale from 1 (do not agree) to 5 (fully agree). A sample item is 'During time after work, I forget about work'.

Satisfaction with work-life balance

We assessed satisfaction with work-life balance with the five-item scale from Valcour (2007) on a 5-point Likert scale ranging from 1 (very dissatisfied) to 5 (very satisfied). An example is 'How satisfied are you with the way you divide your attention between work and home?'

Positive and negative affect

We used the short scale from MacKinnon et al. (1999) to assess positive and negative affect with five items each on a response scale ranging from 1 (never) to 7 (always). A sample item for positive (negative) affect is 'feeling enthusiastic' ('feeling upset'). For T1, the reference was to how individuals feel in general, and for T2 and T3, they were instructed to refer to the last 4 weeks.

Data analysis

We used IBM SPSS Statistics 27 to analyse the data. First, we checked for outliers as well as for randomization of the IG and CG using multivariate analysis of variance (MANOVA) for socio-demographic and study variables. To test our hypotheses, we then conducted a *t* test for independent samples for perceived learning and mixed ANOVAs for all other study variables. Thereby, we first examined the interaction effect of condition (IG vs. CG) by time (T1–T3) to test whether the study variables developed differently over time for participants in the IG and CG. Next, we ran *post-hoc* analyses for between-group and within-group effects. For between-group effects, we tested for mean differences between the IG and CG with three separate MANOVAs for each point in time. To increase power, these analyses were conducted with all available data at each measurement point. To test for within-group developments of the study variables from T1 to T2 and from T1 to T3, we conducted repeated measures ANOVAs with pairwise comparisons for each group. If sphericity was violated, the Greenhouse–Geisser adjustment was used for correction.

RESULTS

We show correlations and Cronbach's alphas for all study variables in Table 3 and their descriptive statistics and results of the MANOVAs in Table 4. Inter-correlations of study variables across time points were low to medium, with the exception of boundary enactment and ICT use, as well as inter-correlations of the same variables across time points. Results of our randomization check revealed no significant differences between the IG and CG for socio-demographic variables. As shown in Table 4, no significant differences between the IG and CG were found at baseline for our study variables except for satisfaction with work-life balance [$F(1, 57) = 3.14$, $p = .082$], with participants in the IG reporting marginally significant lower levels than the CG. We consider this result when interpreting our findings. Further, there were no outliers detected.

Changes in perceived learning, cognition and behaviour outcomes

Participants in the IG reported higher perceived learning at T2 ($M = 3.68$, $SD = 1.03$) than participants in the CG [$M = 2.29$, $SD = .85$; $t(57) = 5.68$, $p < .001$]. Hypothesis 1 was supported.

For boundary control, results of the mixed ANOVA showed a significant interaction effect of condition and time [$F(1.73, 84.58) = 6.2$, $p = .005$, partial $\eta^2 = .112$]. As shown in Table 4, separate MANOVAs for the three time points revealed a marginally significant difference between IG and CG at T2, suggesting higher boundary control for the IG compared to the CG after the intervention. Repeated measures ANOVAs with pairwise comparisons showed a significant effect of time for the IG [$F(2, 42) = 4.37$, $p = .019$, partial $\eta^2 = .172$]. Pairwise comparisons revealed a marginally significant increase of boundary control in the IG from T1 to T2 (Δ T2–T1 = .86, $p = .051$) but not from T1 to T3 (Δ T3–T1 = .67, $p = .209$). There were no significant time effects in the CG [$F(2, 56) = 1.93$, $p = .155$, partial $\eta^2 = .064$]. Thus, boundary control increased over time in the IG, but only marginally from T1 to T2. Hypothesis 2a was partially supported.

For boundary enactment, results of the mixed ANOVA showed a significant interaction effect for condition by time [$F(2, 98) = 15.49$, $p < .001$, partial $\eta^2 = .240$]. The MANOVAs suggested significant differences between the IG and CG at T2 and at T3 with medium effect sizes (see Table 4). Results of repeated measures

TABLE 3 Correlations of study variables across intervention and control groups.

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1. Learning T2	(.91)																					
2. BControl T1	−.07	(.93)																				
3. BControl T2	.34**	.43**	(.87)																			
4. BControl T3	.30*	.49**	.73**	(.94)																		
5. BEnact T1	−.02	.07	−.01	.06	(.93)																	
6. BEnact T2	.23	.10	.18	.30*	.66**	(.91)																
7. BEnact T3	.27	.06	.12	.26	.64**	.82**	(.92)															
8. ICT use T1	−.03	−.01	.06	−.09	−.83**	−.59**	−.59**	-														
9. ICT use T2	−.13	−.03	−.12	−.21	−.66**	−.80**	−.74**	.65**	-													
10. ICT use T3	−.26	−.05	−.08	−.22	−.59**	−.72**	−.85**	.62**	.79**	-												
11. Detach T1	.19	.27*	.15	.20	.43**	.31*	.34*	−.38**	−.33*	−.35*	(.92)											
12. Detach T2	.44**	.20	.42**	.49**	.32*	.53**	.50**	−.39**	−.49**	−.49**	.50**	(.88)										
13. Detach T3	.24	.01	.20	.34*	.30*	.46**	.62**	−.43**	−.43**	−.65**	.55**	.67**	(.90)									
14. SWLB T1	.04	.34**	.23	.25	.29*	.15	.05	−.22	−.16	−.15	.47**	.23	.11	(.89)								
15. SWLB T2	.45**	.18	.59**	.51**	.34**	.47**	.48**	−.29*	−.37**	−.40**	.34**	.60**	.36**	.51**	(.88)							
16. SWLB T3	.23	.09	.35*	.40**	.13	.21	.34*	−.10	.02	−.21	.13	.19	.23	.28*	.63**	(.91)						
17. PA T1	.01	.05	.17	.11	−.21	−.21	−.28	.27*	.10	.18	.13	.04	−.08	.35**	.14	.09	(.70)					
18. PA T2	.25	.07	.41**	.33*	.14	.10	.07	−.08	−.05	.08	.10	.21	.08	.24	.43**	.43**	.53**	(.79)				
19. PA T3	.40**	−.01	.43**	.36**	.01	.06	.11	−.09	.07	−.02	.12	.37**	.28*	.11	.52**	.53**	.42**	.72**	(.80)			
20. NA T1	−.07	−.11	−.27*	−.27	.07	−.14	−.01	−.05	.10	−.02	−.12	−.29*	−.09	−.38**	−.38**	−.35*	−.55**	−.49**	−.29*	(.81)		
21. NA T2	−.32*	−.06	−.46**	−.37**	.03	−.21	−.16	.01	.12	.15	−.11	−.29*	−.15	−.23	−.49**	−.49**	−.36**	−.55**	−.48**	.68**	(.86)	
22. NA T3	−.34*	.02	−.35*	−.28*	.12	−.09	−.17	−.03	−.07	.16	−.05	−.29*	−.30*	−.16	−.32*	−.47**	−.33*	−.43**	−.41**	.63**	.80**	(.79)

Note: $N = 59$ at T1 and T2 with $n = 25$ for the IG and $n = 34$; $N = 51$ at T3 with $n = 22$ for the IG and $n = 29$ for the CG. Cronbach's alphas are shown in parentheses on the diagonal.

Abbreviations: BControl, boundary control; BEnact, boundary enactment; Detach, psychological detachment; Learning, perceived learning; NA, negative affect; PA, positive affect; SWLB, satisfaction with work-life balance.

*$p < .05$. **$p < .01$.

TABLE 4 Descriptive statistics and results of MANOVAs comparing intervention and control groups at pre, post and follow-up.

		M *(SE)*			MANOVA univariate tests		
					Pre (T1)	Post (T2)	Follow-up (T3)
					F(1, 57)	*F*(1, 57)	*F*(1, 53)
					p-value	*p-value*	*p-value*
Variable	**Group**	**Pre (T1)**	**Post (T2)**	**Follow-up (T3)**	**Partial η^2**	**Partial η^2**	**Partial η^2**
Boundary control	Intervention	4.84 *(1.56)*	5.72 *(0.96)*	5.53 *(1.19)*	1.65	2.91†	2.41
	Control	5.47 *(1.22)*	5.32 *(1.28)*	5.14 *(1.25)*	*.205*	*.094*	*.127*
					.028	.049	.043
Boundary enactment	Intervention	3.74 *(1.67)*	4.90 *(1.25)*	4.91 *(1.37)*	0.37	8.62**	4.74*
	Control	4.31 *(1.40)*	4.03 *(1.50)*	4.12 *(1.48)*	*.548*	*.005*	*.034*
					.006	.131	.082
Work-related ICT use after hours	Intervention	4.05 *(2.04)*	3.23 *(1.85)*	2.73 *(1.75)*	0.01	1.35	3.25†
	Control	3.86 *(1.90)*	3.59 *(1.74)*	3.59 *(1.94)*	*.970*	*.250*	*.077*
					.01	.023	.058
Psychological detachment	Intervention	2.72 *(0.82)*	3.25 *(0.91)*	3.13 *(0.88)*	0.17	3.39†	1.26
	Control	3.03 *(0.94)*	2.94 *(0.94)*	2.88 *(1.08)*	*.686*	*.071*	*.268*
					.003	.056	.023
Satisfaction with work-life balance	Intervention	2.98 *(0.80)*	3.66 *(0.81)*	3.57 *(0.76)*	3.14†	2.21	0.64
	Control	3.64 *(0.81)*	3.53 *(0.81)*	3.41 *(0.94)*	*.082*	*.143*	*.428*
					.052	.037	.012
Positive affect	Intervention	4.68 *(0.72)*	4.79 *(0.75)*	4.82 *(0.74)*	0.42	0.81	0.86
	Control	4.82 *(0.79)*	4.65 *(0.93)*	4.56 *(0.88)*	*.518*	*.373*	*.359*
					.007	.014	.016
Negative affect	Intervention	3.05 *(1.13)*	2.42 *(0.84)*	2.36 *(0.71)*	0.40	14.21***	8.96**
	Control	3.0 *(0.97)*	3.19 *(1.05)*	3.14 *(1.02)*	*.530*	*<.001*	*.004*
					.007	.20	.145

Note: Descriptive statistics are based on mixed ANOVAs with $N = 51$ with $n = 22$ for the IG and $n = 29$ for the CG. MANOVAs were conducted with all available data from the final sample at each measurement point with $N = 59$ with $n = 25$ for the IG and $n = 34$ for the CG at T1 and T2; $N = 55$ with $n = 23$ for the IG and $n = 32$ for the CG at T3.

*$p < .05$. **$p < .01$. ***$p < .001$.

†$p < .10$.

ANOVAs showed a significant, large effect of time for the IG [$F(2, 42) = 17.41$, $p < .001$, partial $\eta^2 = .453$] but not for the CG [$F(2, 56) = 1.19$, $p = .312$, partial $\eta^2 = .041$]. Pairwise comparisons revealed a significant increase of boundary enactment over time in the IG from T1 to T2 (ΔT2–T1 = 1.17, $p < .001$) and from T1 to T3 (ΔT3–T1 = 1.18, $p < .001$). Thus, boundary enactment increased in the IG but not in the CG over time.

For work-related ICT use after hours, results of the mixed ANOVA showed a marginally significant interaction effect for condition by time [$F(1.76, 86) = 3.09$, $p = .057$, partial $\eta^2 = .059$]. Results of the MANOVAs suggested a marginally significant difference between IG and CG at T3 with a small effect size. Further, results of the repeated measures ANOVAs showed a significant, large effect of time for the IG with $F(2, 42) = 10.62$, $p < .001$, partial $\eta^2 = .336$, but not for the CG with $F(1.66, 46.44) = .595$, $p = .525$, partial $\eta^2 = .021$. Specifically, pairwise comparisons showed a significant decrease of ICT use in the IG over time from T1 to T2 (ΔT2–T1 = −.82, $p = .022$) and from T1 to T3 (ΔT3–T1 = −1.32, $p = .002$). Hence, only the IG but not the CG showed a decrease in work-related ICT use after hours over time. Hypothesis 2b was supported.

Changes in recovery and well-being outcomes

For psychological detachment, results of the mixed ANOVA showed a significant interaction effect for condition by time with $F(2, 98) = 3.95$, $p = .022$, partial $\eta^2 = .075$. Results of the MANOVAs revealed a marginally significant difference between IG and CG at T2 with a small effect size, suggesting higher psychological detachment for the IG compared to the CG immediately after the intervention. Besides, results of repeated measures ANOVAs showed a marginally significant effect of time for the IG with a medium effect size with $F(2, 42) = 3.17$, $p = .052$, partial $\eta^2 = .131$, but not for the CG with $F(2, 56) = .66$, $p = .522$, partial $\eta^2 = .023$. Yet, pairwise comparisons revealed no significant increase of psychological detachment in the IG (ΔT2–T1 = .53, $p = .123$; ΔT3–T1 = .41, $p = .342$). Together, psychological detachment significantly increased over time in the IG compared to the CG, but these changes seem to be too small to be detected from T1 to T2 and T1 to T3 respectively. Hypothesis 3a was only partially supported.

For satisfaction with work-life balance, results of the mixed ANOVA revealed a significant interaction effect for condition by time with $F(2, 98) = 7.76$, $p = .001$, partial $\eta^2 = .137$. Results of the MANOVAs revealed no significant differences between IG and CG at T2 and T3 (see Table 4).[3] Yet, the results of repeated measures ANOVAs showed a significant effect of time for the IG with a large effect size [$F(1.57, 33.06) = 6.72$, $p = .006$, partial $\eta^2 = .242$], but not for the CG [$F(1.64, 45.99) = 1.37$, $p = .262$, partial $\eta^2 = .047$]. Pairwise comparisons showed a significant increase of satisfaction with work-life balance in the IG from T1 to T2 (ΔT2–T1 = .68, $p = .018$) and a marginally significant increase from T1 to T3 (ΔT3–T1 = .59, $p = .055$). Hence, satisfaction with work-life balance significantly increased in the IG but not in the CG over time. Hypothesis 3b was supported.

For positive affect, results of the mixed ANOVA showed no significant interaction effect for condition by time with $F(2, 98) = 1.77$, $p = .175$, partial $\eta^2 = .035$. *Post-hoc* analyses for between-group differences at T1–T3 and within-group differences over time with pairwise comparisons revealed no significant effects. Hypothesis 3c was not supported.

For negative affect, results of the mixed ANOVA showed a significant interaction effect for condition by time with $F(2, 98) = 10.67$, $p < .001$, partial $\eta^2 = .179$. Results of the MANOVAs showed a significant difference between IG and CG at T2 and at T3 with large effect sizes (see Table 4), suggesting lower levels of negative affect for the IG compared to the CG. Results of repeated measures ANOVAs revealed a significant effect of time for the IG with a large effect size [$F(2, 42) = 13.74$, $p < .001$, partial

[3]These unexpected non-significant between-group effects for T2 and T3 may be explained when considering the baseline mean: As reported in Table 4, the IG showed marginally significant, lower means than the CG at T1. At T2 and T3, means in the IG substantially increased, now being higher than in the CG. Yet, due to the low baseline in the IG at T1, these mean differences of the IG and CG at T2 and T3 might be too small to be significant.

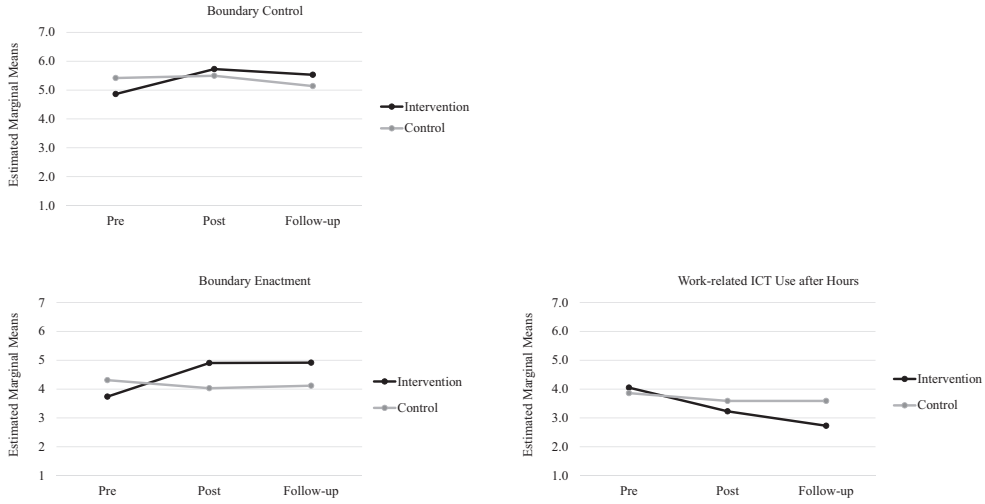

FIGURE 2 Means of boundary management cognitions and behaviour variables at T1–T3.

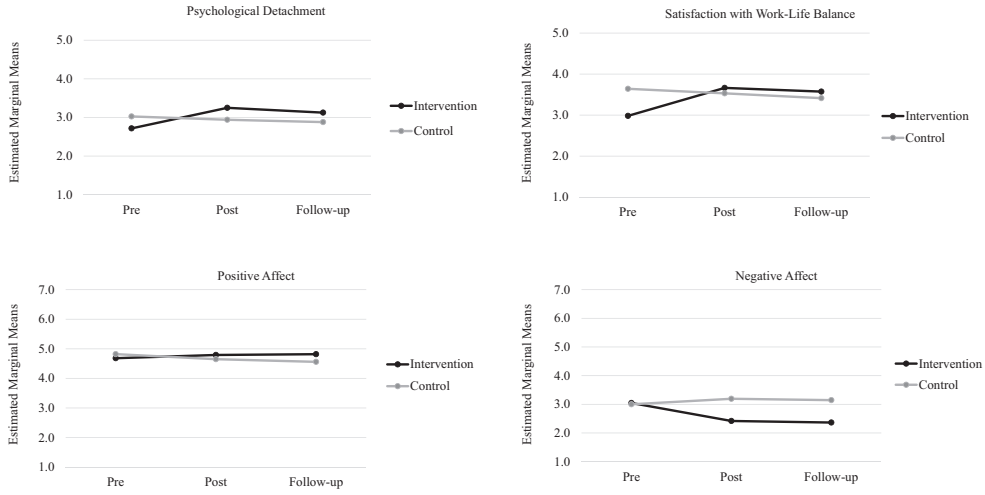

FIGURE 3 Means of recovery and well-being variables at T1–T3.

$\eta^2 = .395$], but not for the CG [$F(2, 56) = 1.01$, $p = .373$, partial $\eta^2 = .035$]. Pairwise comparisons showed a significant decrease of negative affect in the IG from T1 to T2 (ΔT2–T1 = −.63, $p = .001$) as well as from T1 to T3 (ΔT3–T1 = −.68, $p = .002$). Thus, negative affect was reduced in the IG but not in the CG over time. Hypothesis 3d was supported. Figures 2 and 3 show the means of the study variables in the IG and CG over time.

Supplemental analyses

To make full use of the available data, we further conducted Wald tests comparing the changes in estimated means for each study variable at T1–T2 and T1–T3 for the IG and CG, respectively, using full information maximum likelihood (FIML) in Mplus (Muthén & Muthén, 1998–2017). FIML enables to estimate means by using the available data from the sample, without replacing or imputing missing

TABLE 5 Changes over time based on estimated means using FIML.

Variable	Group	Estimated means			Wald test	
		Pre (T1)	Post (T2)	Follow-up (T3)	T_1–T_2	T_1–T_3
Boundary control	Intervention	4.97	5.76	5.59	7.79*	4.14*
	Control	5.38	5.25	5.05	.54	4.02*
Boundary enactment	Intervention	3.88	4.95	4.97	24.70*	21.99*
	Control	4.30	3.86	4.14	4.53*	.54
Work-related ICT use after hours	Intervention	4.29	3.28	2.74	11.99*	24.43*
	Control	3.82	3.85	3.66	<1	<1
Psychological detachment	Intervention	2.72	3.35	3.15	9.20*	3.89*
	Control	2.92	2.90	2.85	<1	<1
Satisfaction with work-life balance	Intervention	3.03	3.74	3.63	14.77*	8.91*
	Control	3.37	3.41	3.44	<1	<1
Positive affect	Intervention	4.66	4.73	4.82	.15	.80
	Control	4.84	4.51	4.61	6.71**	2.89
Negative affect	Intervention	3.08	2.38	2.36	26.24*	23.60*
	Control	3.18	3.37	3.14	1.59	2.14

Note: We conducted the analyses using FIML based on all available data at T1 ($N = 75$ with $n = 31$ for the IG and $n = 44$ for the CG).
*$p < .05$. **$p < .01$.

values (see McAuley et al., 2005; Rioux & Little, 2021), and has been used in previous intervention research (e.g. Motl et al., 2005). For these analyses, the sample is markedly larger ($N = 75$ with $n = 31$ for the IG and $n = 44$ for the CG).

Overall, as shown in Table 5, the results strongly corroborate our findings for the IG, suggesting significant increases in boundary creation, satisfaction with work-life balance and a significant decrease in negative affect from T1 to T2 and T1 to T3, as well as no changes in positive affect. Extending our previous results, the estimated means further showed significant increases for the IG in boundary control and psychological detachment from T1 to T2 and T1 to T3. Results for the CG suggested no changes in work-related ICT use after hours, psychological detachment, satisfaction with work-life balance and negative affect. Yet, the results showed significant decreases in boundary control from T1 to T3, as well as in boundary enactment and positive affect from T1 to T2 for the CG.

DISCUSSION

The aim of our study was to contribute to understanding the underlying theoretical mechanisms of both training design (Daniels, 2016) and training transfer (Nielsen & Shepherd, 2022) in the context of boundary management. Thereby, we answered recent calls to evaluate interventions addressing the role of blurred boundaries (Kossek, 2016; Richardson, 2017). Regarding training design, we integrated prior research on boundary management with SCT (Bandura, 1991) to identify relevant content and process ingredients. Results of our randomized controlled intervention study suggest that the training successfully addressed participants' self-regulated process of learning and motivated behaviour change towards creating stronger boundaries. To examine training transfer, we drew on the ITTEM (Nielsen & Shepherd, 2022) and showed that our training led to changes at all three levels of training effectiveness, with increases in learning about boundary management, short-term increases in boundary control and sustained increases in boundary creation, as well as mixed changes in recovery and well-being. Together, these findings provide important implications for research on boundary management and related interventions, hinting at the potential power as well as limitations of boundary creation.

Implications for theory and research

In the following, we will explain how this study advances our understanding of (1) theory-based content and process ingredients for effective behaviour change, (2) the role of boundary creation for recovery and well-being and (3) the underlying theoretical mechanisms of successful training transfer.

First, our study enhances our understanding of theoretical mechanisms of training design (Daniels, 2016) by identifying important content and process ingredients to initiate behaviour change for boundary creation. Specifically, our findings indicate that by addressing the sources of self-efficacy (Bandura, 1998) in a boundary management training, boundary control can be enhanced at least short term. This finding adds to our understanding of effective process ingredients for training design in the context of boundary management because similar intervention studies, which did not report to actively address these sources of self-efficacy as training ingredients, did not find any intervention effects on related constructs, that is segmentation competency (Rexroth et al., 2016) and boundary self-efficacy (Schlachter, 2018). Interestingly, the immediate increase in boundary control for training participants did not endure, as their boundary control slightly decreased again at T3. An explanation for this decrease could be that over time, participants experienced more obstacles for boundary creation, resulting in failures to achieve their goals (Bandura, 1998; Rexroth et al., 2016). In the absence of supporting training modules between T2 and T3, this might have reduced perceptions of boundary control again. Future research could examine whether subsequent follow-up training sessions addressing the sources of self-efficacy lead to more robust changes in boundary control.

In addition, our findings suggest that building on SCT and addressing the three sub-functions of self-regulated behaviour change with exercises for self-monitoring, self-assessment and (positive) self-reactions (Bandura, 1991) represent effective process ingredients to initiate – and maintain – a desired behaviour change, because training participation resulted in immediate as well as sustained increases in boundary creation. Likewise, these results indicate that using boundary work tactics as a central content ingredient in a boundary management training effectively fosters boundary creation, addressing recent calls to examine the usefulness of boundary work tactics (Rudolph et al., 2021) and complementing previous findings (Rexroth et al., 2016; Schlachter, 2018).

Second, as we build on the theoretical framework of the ITTEM and assess both boundary creation as well as recovery and well-being (Nielsen & Shepherd, 2022), our study contributes to a better understanding of their links. Hence, we can derive several insights into the potential power and limitations of promoting boundary creation. Our findings suggest that increasing boundary creation particularly helps to promote satisfaction with work-life balance and to decrease negative affect. In contrast, we did not find a consistent intervention effect on psychological detachment over time across our analyses, despite participants successfully increasing their boundary creation. These inconclusive results for psychological detachment raise the question whether the beneficial effect of boundary creation on recovery – that is suggested by literature (e.g. Barber & Jenkins, 2014; Kühner et al., 2023; Park et al., 2011) – is bound to several determinants. We will elaborate this notion in the following.

Integrating our findings with the results of a recent meta-analysis (Karabinski et al., 2021) suggests that one important determinant are the content ingredients of the training, namely, the type of boundary work tactics. More specifically, Karabinski et al. (2021) found that interventions including contents on boundary management were more effective in increasing psychological detachment than interventions without these contents. While this appears in contrast to our findings at first glance, a closer look at the effective boundary management intervention studies (Karabinski et al., 2021) suggests that these also included cognitive boundary work tactics as content ingredients, such as thought-stopping (Rexroth et al., 2016) or mindfulness exercises (Ebert et al., 2015; Michel et al., 2014). Our training did not include cognitive tactics but focused on boundary work tactics as defined by Kreiner et al. (2009), which primarily address behaviour. This indicates that for a boundary management training to be effective for detachment, cognitive and behavioural elements need to be combined. This also corresponds with boundary theory (Ashforth et al., 2000; Clark, 2000), suggesting that boundary creation includes

to build 'mental fences' (Ashforth et al., 2000, p. 476) – which appears to require 'mental' tactics. Future studies could compare boundary management trainings with and without cognitive tactics to test this proposition.

Moreover, our inconclusive findings for psychological detachment point at the importance to consider contextual factors as determinants of the training effectiveness, as suggested by the ITTEM (Nielsen & Shepherd, 2022). Underpinning previous notions from scholars, our results indicate that boundary creation and thus, preventing boundary blurring, might not be the only decisive factor to promote recovery. Instead, potential underlying job demands causing boundary blurring might be more critical for recovery, such as experiencing too many unfinished work tasks or feeling overloaded (Heissler et al., 2022; Reinke & Ohly, 2021). Likewise, organizational factors such as supervisor support for recovery (Bennett et al., 2016) might determine whether increased boundary creation can successfully translate into increased psychological detachment (Nielsen & Shepherd, 2022). Hence, our finding indicates that increasing boundary creation without addressing work-related contextual factors might be insufficient to promote recovery. We suggest that future research should investigate their role as potential moderators for the effectiveness of boundary management interventions.

In regard of well-being, we found that the training successfully promoted satisfaction with work-life balance both at T2 and T3. Previous intervention studies yielded inconsistent results with some studies finding no effects (Hoppe et al., 2018; Schlachter, 2018) and others suggesting positive effects on satisfaction with work-life balance (Althammer et al., 2021; Michel et al., 2014). Integrating our findings with the theoretical framework of the ITTEM (Nielsen & Shepherd, 2022), we propose that changes in boundary creation might be crucial for increasing satisfaction with work-life balance. Moreover, our results suggest that the training did not influence training participants' positive affect but successfully reduced their negative affect both at T2 and T3. This finding indicates that boundary creation, and hence, the prevention of boundary blurring, might be more strongly related to negative affect than to positive affect. This notion is in line with several previous studies, as a recent meta-analysis found boundary blurring in the form of ICT-assisted supplemental work after hours to be positively related to negative affect but not to positive affect (Kühner et al., 2023). Yet, it contrasts a different meta-analysis showing that boundary blurring in the form of availability after hours is positively linked to positive affect but unrelated to negative affect (Thörel et al., 2022). An explanation for our study's results might be that boundary creation prevented negative affect built at work to spill over into non-work life (Beal & Ghandour, 2011; Maertz & Boyar, 2011), resulting into overall reduced levels of negative affect for training participants. For positive affect, there might occur two opposing mechanisms: While a boundary management training might help to increase the participants' levels of positive affect by improving their recovery (Sonnentag et al., 2008), it may likewise reduce their positive affect by preventing positive work experiences after hours, such as 'being active or […] the satisfaction of getting a job done' (Thörel et al., 2022, p. 406). Thus, these effects might cancel each other out, resulting in unchanged levels of positive affect. It might be fruitful for future studies to unravel these underlying mechanisms for effects of boundary creation on affective well-being.

Third, combining all results, our study approach adds to our understanding of the theoretical mechanisms of training transfer, underpinning basic propositions of the ITTEM (Nielsen & Shepherd, 2022). Specifically, our findings indicate that our boundary management training led to changes at all three levels of training effectiveness, promoting (1) perceived learning, (2) boundary management cognitions and behaviours and (3) several indicators of recovery and well-being. Thereby, our study points to the relevance of changes in learnings, cognitions and behaviours as preceding steps of a successful training transfer for well-being outcomes. Likewise, this approach allowed us to draw inferences on the relevance of changes in boundary creation for changes in recovery and well-being.

Interestingly, we further found significant changes on two levels of training effectiveness for the control group in our supplemental analyses, namely significant decreases in boundary control, boundary

enactment and positive affect. This might indicate that becoming aware of one's status quo of boundary management and well-being by completing the surveys – without concurrently learning about efficient means to change them – can result in reduced boundary control, boundary enactment and positive affect.

Practical implications

Managing work–non-work boundaries represents a critical challenge for employees (Kossek, 2016) and has gained even more importance due to the pandemic (Rudolph et al., 2021). Organizations should be highly concerned with supporting their employees in their boundary management, since boundary blurring can lead to impaired well-being (Kühner et al., 2023; Wepfer et al., 2018), which in turn also affects performance and retention (Wright & Huang, 2012). Our study results show that using boundary work tactics can be an effective tool to foster boundary creation and ultimately to improve satisfaction with work-life balance and reduce negative affect. Thus, we recommend organizations to offer boundary management trainings as part of their health management programmes, possibly with a training design that contains process ingredients addressing self-monitoring, self-assessment and positive self-reactions, as well as the main sources of self-efficacy (Bandura, 1991, 1998) to support behaviour change. Web-based trainings might represent a feasible, alternative tool to face-to-face trainings, since they offer more flexibility and can reach more employees (Ebert et al., 2015). Yet, changing boundary creation behaviour only on an individual level might not be sufficient to promote employee recovery. To enhance training transfer, we recommend that supervisors and colleagues should likewise be sensitized for the importance of boundary management, recovery and well-being and supervisors should support their employees' participation in such trainings (Nielsen & Shepherd, 2022). Besides, organizations need to create a culture that acknowledges the relevance of boundary management, recovery and well-being and facilitates their realization (Bell et al., 2023; Heissler et al., 2023), for example by regularly monitoring and changing work demands and norms, if necessary.

Limitations and directions for future research

Our study has several strengths, such as using a randomized controlled study design as well as a theoretical foundation for both training design and training transfer. Yet, it also comes with limitations. Due to our relatively small sample size, it can be argued that the generalizability of our findings might be limited. However, *a priori* power analyses for our ANOVAs revealed a sample size of 44 participants to detect medium effect sizes with a power of 95%, which was fulfilled with our sample. Further, we were able to corroborate our findings in a larger sample using FIML. Still, future research should validate our findings with different samples, particularly since the data were collected during the COVID-19 pandemic, with participants largely working from home. This might likewise have impeded their success to promote their psychological detachment and well-being. Future studies should include participants with varying levels of remote work to compare the training's effectiveness for different working models. Further, the validity of the measure of boundary creation needs to be investigated in larger samples, as we observed high inter-correlations of work-related ICT use after hours and boundary enactment, and less optimal CFA results for boundary enactment.

Moreover, our sample showed high rates of dropout. While we found no significant differences for demographic or study variables between the dropout and the final sample, an explanation could be that study participation added to the participants' demands, because the training was completed during leisure time. To avoid this, it might be beneficial to conduct the study with an organization during work hours. Besides, future research might benefit from assessing several contextual factors that might explain dropouts as well as (the lack of) training effects, such as the participants' motivation for changing their boundary creation. Further, as participants might encounter barriers when applying what was learned into their daily lives, future studies could ask training participants about their application of learnings as a more tangible indicator of training transfer (Nielsen & Shepherd, 2022).

As aforementioned, our study showed mixed results for changes in psychological detachment despite sustained changes in boundary creation, pointing to the relevance of including cognitive boundary work tactics beyond behavioural tactics as content ingredients to improve the participants' psychological detachment. Further, it should be noted that the first module of our training included information on the importance of recovery and recovery activities, as these are highly intertwined with boundary management strategies (e.g. Hahn et al., 2011; Karabinski et al., 2021). Thus, changes in recovery and well-being might also be related to these contents. Together, it might be fruitful for future studies to compare boundary management trainings with and without cognitive tactics as well as with and without content on recovery, to thoroughly examine the effects of specific content ingredients for different outcomes.

While drawing on ITTEM allowed us to examine changes on all three levels of training effectiveness and to draw inferences on their relations, we did not test the causal process of training transfer with learnings influencing cognitions and behaviours, and cognitions and behaviours influencing well-being (Nielsen & Shepherd, 2022). This was not feasible because we only included two instead of three post-intervention measures, and mediation analyses require a high sample size of training participants. To adequately test for causality, future studies might examine the three levels of training effectiveness at three distinct measurement points after the training. Besides, our results indicate that the process of training transfer might be more dynamic, as we found immediate and sustained changes in both boundary creation and indicators of well-being. Thus, learning, cognitions and behaviours as well as well-being might change as early as during the intervention period. For example, changes in boundary creation and well-being might already occur when participants implement new tactics after the distinct weekly training module (Steidle et al., 2017). As we did not include any surveys during the intervention period, we could not capture these more nuanced fluctuations between indicators of training effectiveness during the intervention. It might be fruitful for future studies to test for this dynamic process of training transfer, for example with a weekly diary study.

Moreover, our follow-up measurement 1 month after the training might be too short to investigate sustainable and stable changes in behaviours and well-being. Future research could choose a study design with a follow-up period of up to several months to examine whether the intervention effects found in this study persist long term. Thereby, organizational contextual factors facilitating or hindering an effective, sustained training transfer should likewise be investigated (Nielsen & Shepherd, 2022).

Finally, individual characteristics such as segmentation preferences might influence the effectiveness of boundary management interventions. While recent meta-analyses showed that integration of work into non-work by ICT use has detrimental effects for individuals' recovery and well-being (Kühner et al., 2023; Thörel et al., 2022), several studies suggest that these detrimental effects on some well-being outcomes (work-life conflict, work-life balance) might be stronger for individuals with a segmentation preference (Reinke & Gerlach, 2022; Thörel et al., 2022). This indicates that individuals with a segmentation preference might benefit more from a boundary management intervention, as the intervention aims at preventing these detrimental effects. In contrast to that notion, Althammer et al. (2021) showed that for psychological detachment, individuals with an integration preference benefited more from their boundary management intervention, while for work-life conflict and satisfaction with work-life balance, segmenters and integrators benefitted equally. This again indicates that both segmenters and integrators should benefit from boundary creation. To shed light on the inconclusive role of segmentation preferences, future research could systematically examine segmentation preferences as moderators for the relationship between boundary creation and well-being, as well as for the effectiveness of boundary management interventions.

CONCLUSION

This study contributes to research on boundary management and well-being in several ways. Building both the training design and the evaluation of training transfer on theoretical propositions, the results of our randomized controlled intervention study indicate that all three levels of training effectiveness,

perceived learning, cognitions and behaviours, as well as well-being, are meaningful for successful training transfer. Further, our study indicates that drawing on SCT for process ingredients of the training design results in significant behaviour change. Finally, our study highlights the power but likewise potential limitations of boundary creation. We show that including boundary work tactics as key content ingredients in a training can effectively increase boundary creation and indicators of well-being. Yet, consistently fostering psychological detachment might require further inclusion of cognitive tactics and addressing work-related contextual factors that hinder employee recovery. Together, our findings provide valuable starting points for future research and for improving employees' well-being.

AUTHOR CONTRIBUTIONS

Kathrin Reinke: Conceptualization; formal analysis; funding acquisition; investigation; methodology; project administration; writing – original draft; writing – review and editing. **Sandra Ohly:** Conceptualization; formal analysis; supervision; writing – review and editing.

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CONFLICT OF INTEREST STATEMENT

We have no known conflict of interest to disclose.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

ORCID


Kathrin Reinke https://orcid.org/0000-0002-1116-4436

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

Table S1.

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