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Identifying ICT-Related Affective Events Across Life Domains and Examining their Unique Relationships with Employee Recovery

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Abstract The purpose of this study was to investigate the role of information and communication technology (ICT) use for employees by exploring affective ICT events and their relation to employee recovery. We conducted two daily diary studies with knowledge workers in Germany. In study 1 ($N = 153$), we followed a qualitative approach by developing a taxonomy of negative and positive ICT events at work and at home. We found 11 negative (e.g., multichannel use, work e-mails in the evening) and 10 positive ICT event clusters (e.g., utilizing idle times, availability at home). In study 2 ($N = 154$), we examined how the occurrence of ICT-related events in the evening is related to detachment from work and sleep quality using a multilevel design. Study 2 provided a differentiated picture of relationships between evening ICT events and recovery. Overall, results indicate that work-related ICT events in the evening—even in cases where they are appraised as positive—are detrimental for employee recovery. Our study contributes to the refinement of the operationalization of ICT use for future analyses of ICT impacts and sheds light on the differential effects of specific types of ICT events. ICT use conceptualized as the occurrence of affective events helps to advance our understanding of the diversity of ICT-related

experiences. The negative effects of handling work e-mails at home imply that organizations should engage in optimizing their “e-mail culture.”

Keywords Information and communication technology (ICT) · Affective events · Recovery · Life domains

Introduction

The use of information and communication technology (ICT) has become ubiquitous at work. An increasing number of employees spend a great amount of working time using ICT such as personal computers, smartphones, and tablets (Wajcman & Rose, 2011). The use of technical devices facilitates work processes as it may allow greater access to information, increase flexibility and efficiency, enhance communication and collaboration, and thus may contribute to better work performance (Day, Scott, & Kelloway, 2010; Diaz, Chiaburu, Zimmerman, & Boswell, 2012). However, ICT use also entails particular risks for employees. For example, intense ICT use is associated with information, work, and social overload (Demerouti, Derks, ten Brummelhuis, & Bakker, 2014). In addition, mobile devices enable employees to be constantly connected to work, which, in turn, is associated with an increased “always-on mentality” (Park, Fritz, & Jex, 2011) and organizational expectations regarding employee availability during non-work hours (Barber & Santuzzi, 2015; Derks & Bakker, 2014). In consequence, physical and mental barriers between life domains are fading away (Dénagy, 2014), and the conflict between work and personal life increases (Boswell & Olson-Buchanan, 2007; Diaz et al., 2012). Accordingly, previous research has suggested that ICT use may impair well-being and, in particular, impede on

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recovery processes (Barber & Jenkins, 2014; Derks, van Mierlo, & Schmitz, 2014; Park et al., 2011).

ICT use may therefore be characterized as a double-edged sword for employees (Day et al., 2010; Diaz et al., 2012) that, on the one hand, may support processes in all life domains, but, on the other hand, may also act as a stressor and hinder recovery from work. This ambiguity is the reason for rising calls to examine the conditions under which ICT use is beneficial or harmful for employee well-being (Day, Paquet, Scott, & Hambley, 2012; Demerouti et al., 2014; Korunka & Hoonakker, 2014). While there is already an array of studies investigating the role of moderators on the individual, job, or organizational level (e.g., Boswell & Olson-Buchanan, 2007; Derks et al., 2014; Fenner & Renn, 2010), we currently know very little about the specific situations that are associated with beneficial or detrimental consequences of ICT use (Ďuranová & Ohly, 2016). Initial evidence points at the importance of considering context and content of ICT use (Butts, Becker, & Boswell, 2015) and taking event-based fluctuations into account (Ganster & Rosen, 2013). Thus, breaking down ICT use into specific events occurring on a daily basis may provide a more comprehensive and detailed picture of varying effects of ICT use on daily well-being outcomes.

The purpose of this work is to examine (a) in which specific situations ICT use is perceived as beneficial or detrimental and (b) how ICT-related events outside of regular working hours are related to indicators of employee recovery. We conducted two diary studies among knowledge workers, for whom ICT plays an important role (Wajcman & Rose, 2011). We aim to contribute to the existing ICT literature by applying an event-based approach: In study 1, we identify ICT-related events that employees encounter in the course of the day and that they appraise as beneficial or detrimental (Lazarus & Folkman, 1984). We develop a taxonomy of affective ICT events, applying the concept mapping approach (Jackson & Trochim, 2002). We contribute to the literature on ICT use and well-being by identifying specific negative and positive ICT events on a day-to-day basis. Compared to traditional research on ICT use, an event perspective extends the common feature-oriented research by examining specific happenings bound in time and place. This way, it becomes possible to trace the dynamics of specific effects, to reduce retrospective biases, and to study short-term consequences for individual well-being (Ganster & Rosen, 2013; Morgeson, Mitchell, & Liu, 2015).

In study 2, we analyze the short-term effects of ICT events in the evening on employee recovery. Recovering, i.e., unwinding and recuperating from work during leisure time (Sonnentag & Fritz, 2007), is crucial for employee well-being and health (Geurts & Sonnentag, 2006), and empirical evidence suggests that work-related ICT use in particular impairs recovery processes (for an overview, see Ďuranová & Ohly, 2016). For instance, research suggests that ICT use might impair psychological detachment and sleep quality

(e.g., Barber & Jenkins, 2014; Lanaj, Johnson, & Barnes, 2014; Park et al., 2011). In our study, we examine potential effects of ICT-related events outside working hours on recovery indicators.

The Relationship between ICT use, Well-being, and Recovery

Many studies provide evidence for detrimental consequences of ICT use such as technostress, psychosomatic complaints, anxiety, or low job performance (e.g., Salanova, Llorens, & Ventura, 2014; Tarafdar, Tu, Ragu-Nathan, & Ragu-Nathan, 2007). The potential downsides of life domain crossing ICT use are addressed within the frameworks of work-family border theory (Clark, 2000) and boundary theory (Ashforth, Kreiner, & Fugate, 2000). Both theories contribute to our understanding of how ICT use may cause daily role blurring and conflict between the work and home domain. Several studies have shown how ICT use affects other life domains by leading to negative spillover, increased stress, and lower work satisfaction (e.g., Chesley, 2005; Derks & Bakker, 2014). In addition, ICT use for work purposes during non-work time may aggravate the conflict between work and personal life and impair employee well-being and recovery (e.g., Arlinghaus & Nachreiner, 2013; Boswell & Olson-Buchanan, 2007; Diaz et al., 2012; Park et al., 2011). The few studies on positive consequences of ICT use suggest that it may—at least subjectively—increase efficiency, flexibility, and the sense of autonomy (Middleton, 2007; Cavazotte, Lemos, & Villadsen, 2014).

ICT-Related Affective Events and Individual Appraisal

Most studies that examine the consequences of ICT use on well-being or recovery either focus on general ICT characteristics or operationalize ICT use solely by intensity or frequency of use (cf. Dén-Nagy, 2014; Ďuranová & Ohly, 2016). This feature-oriented perspective does not account for potentially unique attributes of ICT-related experiences that determine the effects on employee well-being (Butts et al., 2015). According to event system theory (Morgeson et al., 2015), an event-oriented approach may extend the usual feature-oriented and process-oriented perspectives in organizational research. Event-based accounts are less subject to retrospective biases and have been proven appropriate for assessing short-term effects of stressors on well-being and recovery (Ganster & Rosen, 2013).

According to Weiss and Cropanzano (1996), an event is “a happening, especially an important happening”, “something that occurs in a certain place during a particular time”, and that involves a “change in circumstances” (p. 31). In our study, we focus on everyday work events as we expect that those everyday events are particularly relevant for employee well-being

(Sinclair et al., 2015). Specifically, we define ICT events as discrete happenings involving ICT use, thereby explicitly including everyday workplace occurrences. We argue that breaking down ICT use into discrete events helps identify in which situations specific characteristics (e.g., technology features) become salient and meaningful and may allow for a more differentiated prediction of the effects of ICT use on recovery.

Affective events theory (Weiss & Cropanzano, 1996) and cognitive appraisal theories (Lazarus, 1991; Scherer, 2001) provide useful frameworks to further define the relevance and potential impacts of ICT-related events. Both of these theories assume that the emotional reaction to an event depends on the individual's cognitive appraisal. The core assumption of cognitive appraisal theories is that in a first appraisal process, a person detects whether an event is relevant (and congruent) to his or her goals, thus, leading to an evaluation of the event as beneficial or harmful (Lazarus, 1991; Scherer, 2001). From a stress theory perspective, those primary appraisal processes define if a given event will act as a stressor or not (Lazarus & Folkman, 1984). Furthermore, the affective state elicited by the appraisal of an event is related to attitudes, satisfaction, and subsequent behavior (Weiss & Cropanzano, 1996). Thus, it depends in part on the person's appraisal if ICT events result in negative consequences (Day et al., 2010, 2012; Derks & Bakker, 2010).

Overall Study Approach

Our study followed a two-step mixed-method approach to combine exploratory methods with the testing of hypotheses regarding the effects of ICT-related events on indicators of recovery (Creswell & Plano-Clark, 2007; Edmondson & McManus, 2007). We used qualitative data for gaining an in-depth understanding of ICT-related affective events from the participant's perspective, complemented by quantitative data for the further examination of the frequency of occurrence of evening events and their further effects on recovery (Lee, Mitchell, & Sablinski, 1999). We extend previous cross-sectional research on ICT use by applying a diary study design in order to investigate within-person relationships between daily perceived events and recovery (Butts et al., 2015; Ohly, Sonnentag, Niessen, & Zapf, 2010). Thus, we were able to assess recovery in its natural context close to the event in order to examine the immediate effects (Derks et al., 2014). In addition, this approach allowed for potential lagged effects in the course of the day.

Study 1: Development of the Event Taxonomy

Study 1 aimed at extending previous research regarding positive or negative experiences of ICT use. We followed an

inductive approach to examine which specific ICT events are relevant on a day-to-day basis and appraised as detrimental or beneficial by employees (Lazarus & Folkman, 1984; Lee et al., 1999). The focus was on the differential role of ICT at work as compared to during non-work time (Day et al., 2010; Korunka & Hoonakker, 2014). The main research question of study 1 was which *positive* or *enriching* as well as *negative* or *detrimental* ICT-related affective events do knowledge workers experience during and after work?

Data Collection and Measures

We collected data within the framework of a larger scale research project. Participants were knowledge workers from a wide range of industries and professions. We recruited employees working in different companies throughout Germany. In total, 165 employees initially agreed to take part. They were requested to fill in a general online questionnaire as well as three daily questionnaires (T1 in the morning, T2 after work, T3 before going to bed)¹ over the course of seven consecutive working days. Overall, 153 persons provided daily survey data and were included in this study (response rate 92%). Of all 139 participants who provided demographic information in the general questionnaire, 57.6% were female. Mean age was 37.3 years ($SD = 9.9$). In terms of family status, 31.1% were single, 42.4% married, 22.7% living together with a partner, and 3.8% divorced. Of participants, 43.9% had children. Participants came from different sectors (23.8% service business, 18.5% IT and media, 17.7% industry, 13.1% consulting, and 26.9% from different other sectors). Of participants, 62.8% had a leadership position. Mean professional experience was 14.8 years ($SD = 10.8$); mean working time per day were 8.8 h ($SD = 1.3$). Participants worked on average 3.6 h per day from home ($SD = 6.4$).

For the assessment of daily affective ICT events, participants reported twice a day if they encountered positive or negative ICT-related events: at T2 (after work between 3 p.m. and 8 p.m. with regard to working time) and at T3 (before going to bed between 9 p.m. and 1 a.m. with regard to after working time). Cognitive appraisal theories suggest that an event needs to be appraised as beneficial or harmful (positive or negative) in the primary appraisal process in order to be worth reporting at all (Ellsworth & Scherer, 2003; Lazarus, 1991). Therefore, at both data points, the first question was “Were there any situations today [T2]/after work [T3] which were related to the use of ICT (PC, Smartphone, Tablet) and which you evaluate as being negative or stressful?” (see also Ohly & Schmitt, 2015). We used the same question to ask for positive or enriching events. In the second step, participants were instructed to briefly describe the situation in an open question format: “Please describe the situation: where have

¹ Only data from T2 and T3 were included in this study.

you been (location, presence of others)? What were your perceptions and thoughts?” Thus, participants had the opportunity to further elaborate the situation’s appraisal beyond “positive” or “negative.” In total, participants reported 234 negative events (145 at T2; 89 at T3) and 371 positive events (224 at T2; 147 at T3). The total number of observations was 717 at T2 and 683 at T3. All items in this study were processed in German.

Strategy of Data Analysis

The purpose of our qualitative analysis of the reported ICT events was to provide a taxonomy of event clusters which reflects the most relevant affective ICT event types that employees consider to be beneficial or harmful. We applied the concept mapping approach (Jackson & Trochim, 2002; Kane & Trochim, 2007), a “hybrid between traditional content analysis and semantic mapping analysis” (Behfar, Peterson, Mannix, & Trochim, 2008, p. 174). We chose this method instead of traditional, researcher-driven content analysis because we were interested in how knowledge workers themselves perceive and categorize ICT-related events. In order to avoid the problem of researchers imposing their own subjective interpretation on the data, the original participants and people with a similar professional background are chosen to categorize the statements in the form of a card sorting task (Jackson & Trochim, 2002). By statistically aggregating the individual judgements of different sorters, a high level of reliability may be reached (Jackson & Trochim, 2002). Accordingly, we followed the steps recommended by the authors (see also Behfar et al., 2008; Ohly & Schmitt, 2015).

We excluded events that were not related to ICT use, leaving 346 positive and 220 negative events for further analyses. We chose a random sample of 70 positive and 70 negative ICT events for the card sorting task (Ohly & Schmitt, 2015). Twelve independent sorters grouped the positive events; 13 other sorters grouped the negative events according to event similarity and labeled each card pile. Following the approach by Jackson and Trochim (2002, p. 315), we relied on study participants as well as “proxy sorters” to conduct the sorting task. Four sorters were original study participants; 10 were university employees, and 11 were students with work experience in organizations. Sorters’ individual judgements were then analyzed with the concept mapping tool CardZort to re-enact the 25 manually conducted sortings and CardCluster to conduct a cluster analysis on the data (Toro, 2001). As we were interested in specific and subtle differences of events, we chose the complete linkage method which is suitable for producing a larger number of tightly related groups (Courage & Baxter, 2005). The algorithm groups statements together into clusters by ensuring that dissimilar items are grouped in different clusters in a stepwise way. In the first step, all

statements represent their own clusters, whereas in the last configuration, all statements are grouped into one large cluster. Based on the resulting distance matrices and the visualization in the form of dendograms, the researcher has to decide which level of clustering to employ, balancing the informational values derived from a given solution with consideration of sample size and parsimony (Jackson & Trochim, 2002, p. 316; see also Behfar et al., 2008; Ohly & Schmitt, 2015). We decided on a final cluster solution of 10 positive and 11 negative meaningful clusters and reverted to the sorters’ cluster labels for defining the final cluster names.

In order to also capture event prevalence, we extended the regular concept mapping process by coding all reported events along our event taxonomy (binary variables: event reported or not). In order to ensure the reliability of the coding, we determined interrater agreement. For the analysis, another random sample of 80 positive and 80 negative events was chosen and coded independently by two researchers. There was substantial agreement between the two researchers’ judgements with $\kappa = 0.80$ for the negative events and $\kappa = 0.77$ for the positive events (Landis & Koch, 1977).

Results

We came up with a final cluster solution which covers 10 positive and 11 negative event clusters, displayed in Table 1. The table contains cluster labels, representative statements, and frequencies of occurrence. The event clusters will be further defined and elaborated in the following section.

Negative ICT Events In the cluster *Technical Problems*, which is defined as a work impediment or delay caused by technical failure, lack of connectivity, poor reception, or a lack of data access, 20.5% of all negative ICT events were subsumed. *Disruption Meeting* (10.0%) refers to situations where the employee is disrupted during a meeting or phone call by incoming calls, messages, or memos. *Disruption Workflow* (5.9%) incorporates the same type of interruptions occurring during the regular workflow at work or when working at home. *Communication Overload* (9.1%) contains situations where the study participants perceived a high ICT-mediated workload, usually in the form of incoming e-mails. Also related to information overload is the event cluster *Multichannel Use* (5.0%), which is defined as the simultaneous use of multiple communication channels or devices. *Disturbance on the Way* (5.5%) refers to disruptions by work calls or messages while being on the way home in the train or car, or during a break. Another event cluster describes situations of *Being On-Call* (2.3%) during business trips, seminars, breaks, or meetings.

Table 1 Event taxonomy: description and frequencies of event clusters

No.	Cluster name	Representative statement ^a	Frequency ^b
Negative workday ICT events			
N1	Disruption meeting	Urgent call/email during a meeting. Stress, impoliteness to the colleagues.	10.00
N2	Disruption workflow	Calls on my smartphone have continually disrupted my workflow in the office.	5.91
N3	Communication overload	Emails, emails, emails—it just went on and on the whole day.	9.09
N4	Technical problems	Breakdown of telephone systems, so I wasn't reachable in the office.	20.45
N5	Multichannel use	The usage of Lync, thereby communicating via different channels in parallel.	5.00
N6	Private disturbance	Private messages distracted me from work.	3.64
N7	Being on-call while absent	During a seminar I regularly checked my mails, worried that sth. Wouldn't work during my absence	2.27
N8	Disturbance on the way	Important call with customer from the car, which reduced my attention to the traffic.	5.45
Negative evening ICT events			
N9	Continuing work tasks (NEG)	At home, I had to work off left-over to-dos.	13.64
N10	Work calls at home	My mobile rang while I was preparing dinner, while spending time with my kids...	11.36
N11	Work e-mails at home	Emails in the evening with the expectation to reply immediately, regular mail check.	13.18
Positive workday ICT events			
P1	Multitasking meeting	Even though I was in a meeting, I could check my emails.	4.34
P2	Information accessing	I quickly found helpful data in the internet to prepare a project draft.	5.78
P3	Coordination	Complex coordination of appointments.	8.09
P4	Work facilitation	Fast and efficient communication channels.	19.65
P5	Personal affairs at work	It is essential that I can reach my child anytime and anywhere when I am in the office.	6.65
P6	Availability absence	During a meeting I was still available, I could' miss anything and I was up-to-date	8.09
P7	Utilizing idle times	I could read my emails on my way to the office.	8.96
Positive evening ICT events			
P8	Continuing work tasks (POS)	I could finish something at home without having to be in the office.	7.51
P9	Availability at home	Because I was available, I could help a colleague out.	12.72
P10	Personal affairs at home	Exchange with my friends via What's App.	18.21

^a For the sake of conciseness, short statements were chosen as exemplary events

^b Frequency: relative frequencies in percent based on the total number of positive ($n = 346$)/negative ($n = 220$) events

The remaining four clusters are related to the interference between life domains. Only 3.6% of all negative events were categorized as *Private Disturbances* during work time. Three other events involve the interferences of work with personal life and together account for more than 38% of all negative events. *Continuing Work Tasks* (13.6%) involves strain by pursuing or finishing work tasks outside working hours (e.g., postprocessing/preparation of work day). *Work Calls* (11.4%) is defined as a disruption by incoming work calls during private time. *Work E-mails* (13.2%) means a disruption by (urgent) incoming work e-mails during private time.

Positive ICT Events Participants' statements were subsumed in 10 positive event clusters. Of all events, 19.7% were characterized as *Work Facilitation* with the help of ICT, including quick problem solving, work organization, or multichannel availability. *Information Accessing* (5.8%) encompasses events in which our

participants report the benefits of quick and easy information access and updates via ICT, particularly while absent (business trip, traveling). *Coordination* (8.1%) contains situations of a productive exchange and interconnected work with others via ICT. Thirdly, *Multitasking Meeting* (4.3%) is defined as ICT-mediated correspondence or information research during a meeting or phone call. *Availability Absence* (8.1%) encompasses situations where the participants subjectively gain from being available via ICT while traveling, working from home, or during breaks. Related to this, participants appreciate *Utilizing Idle Times* (9.0%) while traveling or waiting by working via ICT. Also, participants report positive events in which they deal with *Private Affairs at Work* (6.7%). This cluster incorporates situations where the employees handle private matters such as calls, e-mails, or personal research via ICT during working time. On the other hand, also *Availability During Private Time* for work contacts was seen as a positive event (12.7%). *Continuing Work Tasks*

(POS)² (7.5%) shows how participants appreciate continuing or finishing left-over tasks or preparing the upcoming working day outside working hours. Finally, the cluster *Personal Affairs* (18.2%) incorporates all events in which the participants handle personal matters via ICT during private time.

Discussion Study 1

Study 1 revealed 11 negative and 10 positive ICT event categories. Some of the aspects that emerged from our event taxonomy have been addressed in the existent literature (e.g., Day et al., 2012; Demerouti et al., 2014). We add to this literature by showing which of the general features of ICT use translate to concrete day-to-day events and how they are being evaluated by employees.

The event clusters Communication Overload and Multichannel Use reflect the relevance of ICT-mediated overload which has been related to negative consequences in previous research (Dabbish & Kraut, 2006; Day et al., 2012). The cluster Technical Problems may be characterized as a disruption of functions or regulation difficulty that potentially acts as a stressor (Frese & Zapf, 1994; Hacker, 2003), similar to the concept of ICT hassles (Day et al., 2012). With more than 20%, technical problems proved to be the most frequently reported negative event and seem to be highly salient to the study participants. The two event clusters Disruption Meeting and Disruption Workflow involve interruptions, which may have harmful impacts on well-being—in particular when accumulated over time (Baethge, Rigotti, & Roe, 2015). Disturbance on the Way as another form of interruption, however, may also involve the feeling of role ambiguity (Rizzo, House, & Lirtzman, 1970) to some extent. Being at a different work setting or at the transition between work and private time when being interrupted, employees may have to deal with potentially conflicting demands of two different settings. Our results further suggest that Being On-Call should be conceptualized as unique events that have to be distinguished from the event of actually being disturbed. Being on call or being available via ICT has been defined as an ICT demand that may increase work-family conflict and impair well-being (Day et al., 2012).

The following categories encompass the interference between work and personal life. Private Disturbances during work time may be seen as interruptions, and these events often make conflicting demands between one's work and family roles. Thus, disturbances may be associated with feelings of family-to-work conflict, high levels of

which are associated with increased work stress (Frone, Russell, & Cooper, 1992). In addition, Continuing Tasks (NEG), Work Calls, and Work E-mails involve the interferences of work with personal life. Previous studies have shown how being contacted outside working hours via phone or e-mail is linked to health problems (e.g., Arlinghaus & Nachreiner, 2013). All three event clusters can be characterized as work-family conflict situations which have been found to be detrimental for employee well-being and work-life balance (e.g., Amstad, Meier, Fasel, Elfering, & Semmer, 2011; Frone, Russell, & Cooper, 1997). While Continuing Work Tasks (NEG) usually may be characterized as self-initiated and may not necessarily involve immediate communication with others, Work Calls and Work E-mails include being contacted by others. Thereby, Work Calls are usually singular, disruptive, rather short-lasting externally triggered events. Work E-mails, however, often involve a longer period of work and in part also depend on the employees' initiative to check the e-mail account.

The positive event categories reflect situations where knowledge workers perceive ICT use as beneficial, covering Facilitated Work to increase productivity or efficiency (Day et al., 2010; Wajcman & Rose, 2011), Access to Information as well as opportunities for Coordination and exchange (Day et al., 2010, 2012; Wajcman & Rose, 2011). The event cluster Multitasking Meeting, however, describes positive situations that have not been covered in previous research and offers a further differentiation of situations where ICT may be perceived as beneficial. The positive event cluster Availability Absence may be seen as the antipole to the negative event Being On-Call. With being available outside working hours, employees may experience greater flexibility and freedom and value of the benefits of high ICT control (Day et al., 2010; Mazmanian, Orlikowski, & Yates, 2013). This is also reflected in the event Utilizing Idle Times, which also touches the positive ICT features of accessibility and availability (Day et al., 2010), but more specifically emphasizes the efficient use of "worthless" time periods.

Personal Affairs at Work may again be seen as the antipole of the negative event Private Disturbances at work, showing that the intrusion of personal affairs at work may be positive or negative. In our study, the positive cluster occurred more frequently (see Table 1). Also within the framework of family-to-work spillover, these situations have been shown to be perceived rather positive than negative from the employees' perspective (e.g., Kirchmeyer, 1992; van Steenbergen, Kluwer, & Karney, 2014). The organization's perspective may differ from that of the employee: Framed as cyberslacking, negative consequences for the organization become apparent (e.g., Vitak, Crouse, & LaRose, 2011).

² In order to discriminate between the negative and the positive event clusters that are both labeled "Continuing Work Tasks," we will further refer to them as "Continuing Work Tasks (NEG)" (negative event) and "Continuing Work Tasks (POS)" (positive event).

The event taxonomy also contains positive situations in which work interferes with personal life. Within the event cluster Availability During Private Time, participants reported events where they felt benefits from being available for urgent work matters via ICT, demonstrating how the control over ICT may act as a resource to personal life (Day et al., 2010). Also, positive work news was often seen as beneficial rather than a negative disruption (sample statement: “*I received good news regarding order fulfillment.*”). These situations may be seen as a specific form of positive work-to-family spillover (e.g., Grzywacz & Marks, 2000). Research has shown how connectivity outside working hours may have positive but also negative effects (Diaz et al., 2012; MacCormick, Dery, & Kolb, 2012; Middleton, 2007) which is reflected in our study with both negative and positive events related to availability during private time. Similarly, the positive event category Continuing Work Tasks (POS) shows how the possibility to accomplish work at home may help to coordinate work and personal life (sample statement: “*I was able to handle something at home without having to be in the office. My son was with me then.*”). This also reflects the role of ICT control as a helpful resource (Day et al., 2010). The two latter clusters also show how ICT may be actively used for boundary management (Sayah, 2013).

Overall, our study contributes to previous research with a systematization of situations where ICT use is perceived as beneficial or detrimental (see also “[General discussion](#)” section). Our results further show that the occurrence of an (at first neutral) ICT-related event may turn into an affective event of either positive or negative valence depending on the person’s appraisal, reflecting the ambivalent character of ICT as a double-edged sword. This ambiguity was particularly visible in those event clusters occurring in the evening. Thus, study 2 was designed to take a closer look at those evening events that involve the interference of work-related ICT use with private time and examine effects of employee recovery: Is the appraisal of an event as positive or negative reflected in the employee’s subsequent recovery processes?

Study 2

Based on the results of study 1, we conducted a second diary study to further examine the role of specific affective ICT events occurring in the evening for employee recovery. While study 1 was only able to provide evidence on the nature and frequency of affective events, the goal of study 2 was to analyze potential effects of affective events on indicators of recovery as a first validation of our event taxonomy. Specifically, we examine detachment as one core experience of recovery (Sonnentag & Fritz, 2015) and sleep quality as an outcome of recovery in the evening (Demerouti, Bakker, Geurts, & Taris, 2009). Psychological detachment from work refers to “the individual’s sense of being away from the work situation” (Etzion, Eden, &

Lapidot, 1998, p. 579). Previous studies showed how boundary crossing ICT use impedes employees’ psychological detachment from work (Barber & Jenkins, 2014; Derks et al., 2014; Ohly & Latour, 2014; Park et al., 2011). In the framework of our study, we expected employees to be less able to detach from work when experiencing negative evening ICT events that are related to work:

Hypothesis 1: The occurrence of negative evening ICT events is related to lower detachment from work.

In addition, recent studies have linked late-night ICT use to sleep (Barber & Jenkins, 2014; Lanaj et al., 2014) and showed that work-family conflict is related to lower sleep quantity and quality (Crain et al., 2014). Sleep quality as the overall evaluation of the sufficiency of sleep as well as the difficulty initiating or maintaining sleep at night (Crain et al., 2014) seems to be particularly influenced by ICT use compared to sleep quantity (Barber & Jenkins, 2014). Thus, we expected that employees who deal with negative work-related ICT events in the evening are more likely to suffer from impaired sleep in the following night.

Hypothesis 2: The occurrence of negative evening ICT events is related to lower sleep quality.

Our event taxonomy from study 1 also offers positive affective events related to ICT use after hours. Theory and some initial evidence suggest that ICT use after hours may have positive effects: It allows for flexibility (Middleton & Cukier, 2006), and it may be an opportunity to better balance work and personal life (Day et al., 2010). Also, getting unfinished work tasks done at home may subsequently help employees to better detach from work (Ohly & Latour, 2014), which, in turn, is conducive for sleep (Barber & Jenkins, 2014). In line with this argument, Syrek and Antoni (2014) showed that unfinished tasks were associated with higher levels of rumination in the evening—the opposite of detachment—and lower sleep quality. Therefore, we expected that the positive experience of finishing tasks by being available or pursuing work-related issues in the evening would facilitate subsequent recovery processes:

Hypothesis 3: The occurrence of positive evening ICT events is related to higher detachment from work.

Hypothesis 4: The occurrence of positive evening ICT events is related to higher sleep quality.

Data Collection and Measures

In total, 181 knowledge workers from different industries initially agreed to participate in the study. Participants filled in a

general questionnaire as well as daily questionnaires during eight consecutive days. Overall, 154 persons provided daily survey data and were included in this study (response rate 85%). During workdays, they filled in three questionnaires: in the morning, after work, and before going to bed. On the weekend, participants filled in only two questionnaires: one in the morning and one before going to bed. With the daily questionnaires, we assessed ICT events as well as indicators of employee recovery. Ďuranová and Ohly (2016) suggest that the effects of ICT use should not only be measured directly after usage (as the immediate emotional reaction), but also they hypothesize potential sustained effects on well-being and recovery throughout the day. In our study design, the immediate emotional reaction was indirectly assessed categorizing the event as either “positive” or “negative.” We further examined medium-term effects later in the day on indicators of employee recovery measured before bedtime and in the next morning.

For this study, we only used data provided on workdays, leading to 538 observations at T1, 669 at T2, and 515 at T3. Of our participants, 50.0% were female. Mean age was 36.56 years ($SD = 10.9$). In terms of family status, 34.9% were single, 34.9% were married, 24.7% were living together with a partner, and 5.5% were divorced. Only 16.4% of this sample had children. Participants came from different sectors (23.0% chemistry and pharmacy, 14.2% industry, 11.5% service industry, 10.8% trading and marketing, 10.1% banks and insurances, and 20.3% from different other sectors). Of all participants, 55.5% had a leadership position. Mean professional experience was 15.0 years ($SD = 11.2$); mean working time per day was 8.9 h ($SD = 1.1$).

Positive and Negative Evening ICT Events Our approach in study 1 was limited as we were only able to consider events that participants actively reported within the open-question format. It is possible that more events occurred, but were not recalled or reported. Thus, in order to provide a more objective picture of the distribution of the event categories, we developed an event checklist (Reis & Gable, 2000) based on the three negative and two positive events from study 1 that deal with work-related ICT use in the evening. Specifically, we assessed Availability and Continuing Work Tasks (POS) as positive events and Work E-mails, Work Calls, and Continuing Work Tasks (NEG) as negative events. Before going to bed, participants were asked to check the events that had occurred during the evening. In order to avoid ambiguity in event valence and in order to capture only those events that are appraised as meaningful affective events in the primary appraisal process (cf. Ellsworth & Scherer, 2003; Lazarus, 1991), participants were specifically asked only to consider events that they perceived as positive/negative in the first place. Thus, event occurrence in this study does not represent the occurrence of a neutral event, but in line with affective

event theory (Weiss & Cropanzano, 1996) includes the appraisal as positive or negative. Sample items are “Today, I had to finish off work tasks during private time (i.e., postprocessing/preparation of work day)” (negative event Continuing Work Tasks (NEG)) or “Today, I was available via ICT for urgent work matters during private time (calls, e-mails)” (positive event Availability).

Recovery To measure indicators of recovery, we relied on established scales. Before going to bed, we assessed the level of *detachment from work* (Cronbach $\alpha = 0.92$) with three items from the Recovery Experience Questionnaire (Sonnentag & Fritz, 2007), adapted to the daily level. A sample item is “Today after work I didn’t think about work at all” (five-point Likert scale). In the next morning, we assessed the *quality of sleep* during the night with a single item adapted from the Pittsburgh Sleep Quality Index (Buysse, Reynolds, Monk, Berman, & Kupfer, 1989) (“During the past night, how would you rate your sleep quality overall?” four-point Likert scale).

Control Variables There is evidence that time pressure is a strong predictor of detachment (Kinnunen, Feldt, Siltaloppi, & Sonnentag, 2011; Sonnentag & Fritz, 2007; Sonnentag, Kuttler, & Fritz, 2010) as well as other well-being and health-related outcomes (e.g., Sonnentag, Mojza, Binnewies, & Scholl, 2008). Also, working hours were shown to be a significant predictor of well-being and health (Sparks, Cooper, Fried, & Shirom, 1997). Therefore, in our study, we controlled for time pressure, measured by one item of the Instrument for Stress-Oriented Task Analysis (ISTA; Semmer, Zapf, & Dunckel, 1995), and the total number of working hours at the respective day. In addition, we controlled for the duration of ICT use in the evening in order to capture the effects of the event’s specific nature irrespective of its length.

Strategy of Data Analysis

The data had a two-level structure (days nested within persons). To test our hypotheses, we used hierarchical linear regression analysis (HLM7; Raudenbush & Bryk, 2010). As we were only interested in within-person relationships, all predictor variables were centered around the person-mean (Enders & Tofighi, 2007). For both outcome variables, we entered our control variables in step 1 and each event in a single predictor model in step 2 which were tested against the control model. Means and standard errors of all study variables can be found in Table 2.

Results

Negative ICT Events Of our control variables, only the duration of ICT use significantly predicted a lower detachment from work. The occurrence of the negative events Work E-

Table 2 Means, standard deviations, and correlations for study 2 variables

	Mean	Std.	N	1	2	3	4	5	6	7	8	9
Negative evening events												
1. Continuing work tasks (N9)	0.28	0.45	501									
2. Work calls (N10)	0.17	0.38	500	0.36**								
3. Work e-mails (N11)	0.28	0.45	502	0.51**	0.52**							
Positive evening events												
4. Continuing work tasks (P8)	0.37	0.48	502	0.61**	0.29**	0.48**						
5. Availability (P9)	0.42	0.49	504	0.38**	0.42**	0.46**	0.44**					
Dependent variables												
6. Detachment	3.44	1.29	512	−0.38**	−0.18**	−0.31**	−0.32**	−0.27**				
7. Sleep quality	2.98	0.66	645	−0.06	−0.14**	−0.17**	−0.08	−0.09	0.21**			
Control variables												
8. Time pressure	2.75	1.43	611	0.14**	0.00	0.07	0.10*	0.07	−0.19**	−0.12*		
9. Working hours	8.63	2.50	510	0.18**	0.06	0.12**	0.14**	0.12**	−0.15**	0.05	0.25**	
10. Duration of ICT use	16.43	42.34	510	0.37**	0.17**	0.29**	0.38**	0.28**	−0.31**	0.02	0.08	0.17**

Correlations represent the daily level

* $p < 0.05$; ** $p < 0.01$

mails and Continuing Work Tasks (NEG) predicted a lower detachment from work after controlling for time pressure, working hours, and the duration of ICT use (see Table 3).

Thus, on days where employees reported—and evaluated negatively—that they received or had to write work e-mails or had to continue work tasks, they were less able to detach

Table 3 Multilevel results of the relationship between evening ICT events and detachment

	Detachment											
	Control model		Predictor model 1		Predictor model 2		Predictor model 3		Predictor model 4		Predictor model 5	
	Est.	SE	Est.	SE	Est.	SE	Est.	SE	Est.	SE	Est.	SE
Step 1: control variables												
Intercept	3.514 ***	0.091	3.502***	0.092	3.507***	0.092	3.508***	0.092	3.502***	0.093	3.516***	0.092
Time pressure	−0.065	0.052	−0.062	0.052	−0.055	0.052	−0.041	0.051	−0.063	0.049	−0.054	0.051
Working hours	−0.058	0.031	−0.060	0.031	−0.051	0.031	−0.045	0.030	−0.051	0.030	−0.053	0.030
WINT	−0.013***	0.003	−0.012***	0.003	−0.011***	0.003	−0.009***	0.003	−0.009***	0.003	−0.012***	0.003
Step 2: predictors												
Negative events												
Work calls			−0.359	0.209								
Work e-mails					−0.531***	0.164						
Contin. tasks (N)							−0.717***	0.159				
Positive events												
Contin. tasks (P)									−0.806***	0.150		
Availability											−0.448**	0.153
min2Log-likelihood	1193.58 (df = 6)		1166.50 (df = 7)		1161.90 (df = 7)		1150.96 (df = 7)		1140.78 (df = 7)		1169.83 (df = 7)	
χ^2 statistic (compared to control model)			27.09*** (df = 1)		31.68*** (df = 1)		42.62*** (df = 1)		52.80*** (df = 1)		23.75*** (df = 1)	

N (control model) = 389 observations nested within 106 individuals. N (predictor models) = 381 observations nested within 105 individuals. Unstandardized coefficients are reported. Standard errors are indicated in parentheses

N neg, P pos

*** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$

compared to days where those events did not occur. Work Calls was not a significant predictor of detachment. Thus, the level of detachment was not influenced by the occurrence of work calls in the evening. Sleep quality was predicted by Work Calls and Work E-mails, but not by Continuing Work Tasks (NEG) (see Table 4). Thus, hypotheses 1 and 2 were partially supported.

Positive ICT Events Both positive events were unrelated to sleep quality. Thus, hypothesis 4 was rejected. In contrast to our expectations, both Continuing Work Tasks (POS) and Availability predicted a lower detachment from work. Thus, on days where employees reported—and evaluated positively—that they were able to continue work tasks or were available for urgent work matters, they were still less able to detach from work. Thus, hypothesis 3 was rejected.

Discussion Study 2

The aim of study 2 was to extend previous research as well as findings from study 1 by providing a more differentiated picture on the positive and negative consequences of work-related ICT use in the evening on recovery. Results showed

that specific positive and negative ICT events in the evening related to detachment from work or sleep quality in the following night. In line with results from study 1 and our hypotheses for study 2, we found detrimental effects for negative evening events, supporting the view that ICT is a life domain crossing demand with the respective detrimental effects (e.g., Boswell & Olson-Buchanan, 2007; Diaz et al., 2012; Fenner & Renn, 2010; Park et al., 2011). More specifically, results suggest that Work E-mails are both associated with a lower detachment from work and a poorer sleep quality in the following night. Detachment from work was further related to Continuing Work Tasks (NEG), but not to Work Calls. This may not be explained by time effects, as we controlled for the duration of ICT use in all analyses.

One reason for those distinctive effects may be that work calls as synchronous form of communication may be handled more flexibly; the employee may take an active part in how deeply the work issue is discussed and gets instant feedback on his own reply. With e-mails, however, the recipient may not influence which information is being delivered initially and, due to asynchronous communication, will usually not receive an instant reply and continue thinking about the issue. Thus, work e-mails may be associated with a higher level of rumination, which is characterized by recurrent thoughts

Table 4 Multilevel results of the relationship between evening ICT events and sleep quality

	Sleep quality											
	Control model		Predictor model 1		Predictor model 2		Predictor model 3		Predictor model 4		Predictor model 5	
	Est.	SE	Est.	SE	Est.	SE	Est.	SE	Est.	SE	Est.	SE
Step 1: control variables												
Intercept	3.001***	0.043	2.992***	0.044	2.991***	0.044	2.992***	0.044	2.994***	0.044	2.992***	0.044
Time pressure	−0.059	0.033	−0.052	0.032	−0.046	0.032	−0.053	0.033	−0.056	0.033	−0.059	0.033
Working hours	0.000	0.021	−0.006	0.021	0.006	0.021	0.003	0.021	0.000	0.021	0.001	0.021
WINT	−0.001	0.002	0.000	0.002	0.001	0.002	0.000	0.002	0.000	0.002	−0.000	0.002
Step 2: predictors												
Negative events												
Work calls			−0.319**	0.122								
Work e-mails					−0.377***	0.101						
Contin. tasks (N)							−0.161	0.101				
Positive events												
Contin. tasks (P)									−0.174	0.100		
Availability											0.017	0.099
min2Log-likelihood (compared to control model)	526.17 (df = 6)		509.06 (df = 7)		504.90 (df = 7)		515.76 (df = 7)		511.04 (df = 7)		517.18 (df = 7)	
χ^2 statistic			17.11*** (df = 1)		21.27*** (df = 1)		10.40** (df = 1)		15.13*** (df = 1)		8.990** (df = 1)	

N (control model) = 299 observations nested within 99 individuals. *N* (predictor models) = 294 observations nested within 97 individuals. Unstandardized coefficients are reported. Standard errors are indicated in parentheses

N neg, *P* pos

*** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$

about (work-related) issues and considered “not compatible with detachment” (Cropley & Zijlstra, 2011). Similarly, after continuing—and potentially not finishing—work tasks at home, the employee might have to further ruminate about work which may explain the association of the cluster Continuing Work Tasks (NEG) to detachment. Further studies may take a closer look at how different forms of ICT use in the evening are related to rumination, thereby also considering the difference between affective rumination, which has been linked to negative outcomes, and problem-solving pondering as the beneficial form of rumination (Cropley & Zijlstra, 2011).

There is a different picture for the relationship between negative ICT events and sleep. Results suggest that Work Calls and Work E-mails are related to a poorer sleep quality, while Continuing Work Tasks (NEG) is not. Work Calls and E-mails are both intrusive events that are associated with communication to others, while this is not necessarily the case for Continuing Work Tasks (NEG). Communicative intrusions may be conceptualized as interruptions which have been shown to be related to irritation, mediated by time pressure and mental demands (Baethge et al., 2015). This may be associated with a higher level of stress and, thus, impede on the following night's sleep. Future research should examine different levels of mental demands and perceived time pressure associated to the specific forms of work interruptions in the evening.

In this study, we did not find positive associations of positively evaluated ICT events and recovery. This finding is in line with Lazarus' (1991) argument regarding the strength of negative emotions relative to positive emotions and in line with research on positive-negative asymmetry effects, indicating that negative emotions are more influential for well-being related outcomes (Baumeister, Bratslavsky, Finkenauer, & Vohs, 2001). On the contrary, results indicated that, despite the characterization of such events as positive, the risk of an impeded recovery seems to prevail, as both Continuing Work Tasks (POS) and Availability were related to a lower detachment from work. One might think that this is because the occurrence of those positive events is confounded with longer working hours. For example, completing work tasks using ICT takes time which adds up to overtime. The negative consequences of overtime have been shown in various studies (e.g., Van Der Hulst & Geurts, 2001). Both positive events are indeed significantly correlated to the duration of ICT use. However, both events predicted a lower detachment from work after controlling for the duration of ICT use, so there have to be additional reasons. Employees might not be aware of potential negative consequences and, thus, adhere to a positive evaluation, or they might accept negative side effects for the sake of pursuing their professional goals. Another explanation for negative effects of positive events may be drawn from cognitive dissonance theory (Festinger, 1957): Employees may evaluate potentially detrimental behavior

they exhibit more positively in order to reduce cognitive dissonance (see also Middleton, 2007).

Overall, results show that while employees experienced both positive and negative events (with an even higher prevalence of positive events in both studies), subsequent detrimental effects on recovery prevailed. This supports the perspective of ICT use as a demand resulting in negative consequences for employee well-being (Day et al., 2010, 2012; Derks & Bakker, 2010; Ďuranová & Ohly, 2016).

General Discussion

Theoretical Contribution

In our studies, we followed the rising calls to address the double-edged sword character of ICT use and to examine when exactly ICT use turns into a beneficial or detrimental experience (Day et al., 2010; Demerouti et al., 2014; Korunka & Hoonakker, 2014). In a first step, we identified typical ICT events that occur on a daily basis, underlining the importance of an event-based approach (Morgeson et al., 2015) and daily fluctuation of stressor exposure (Ganster & Rosen, 2013). Our event taxonomy shows how the same ICT-related situation may turn into a positive or negative event, highlighting the additional value of conceptualizing ICT use as affective events (Weiss & Cropanzano, 1996). In the second step, we showed how these specific events relate to employee recovery.

Our findings contribute to the literature on ICT use and occupational health and well-being as well as research on the interface between life domains. Our newly developed taxonomy provides a basis for the examination of temporal dynamics of ICT use and respective consequences for employee recovery. Used as a checklist in diary studies, the taxonomy allows for examining the prevalence of ICT-related stressful or enriching events as well as potential fluctuations over time including accumulative effects (Ganster & Rosen, 2013).

The event taxonomy provides a more fine-grained approach of specific ICT events and, given the distinctive effects of different forms of evening ICT use on recovery, contributes to the refinement of the operationalization of ICT use after hours beyond frequency or duration for future analyses of ICT impacts (see also Butts et al., 2015; Dén-Nagy, 2014; Ďuranová & Ohly, 2016). The present study further adds to the ICT literature by showing which of the previously postulated beneficial or harmful ICT characteristics actually occur on a daily basis and are perceived to be relevant for employees. While four of the ICT demands suggested by Day et al. (2012) appear as daily events in our event taxonomy (response expectations, availability, hassles, and workload), our results suggest that it is valuable to differentiate interruptions and hassles depending on the context in which they occur, during meetings, during regular workflow, or on the

way. Also, we distinguish between the ICT demand “workload” in terms of the amount of communication (Communication Overload) and its nature (Multichannel Use), which pose different demands on employees. While Communication Overload may increase time pressure, Multichannel Use may distract attention and impair concentration. In terms of evening events, our study further differentiates ICT use during non-work time considering what a person actually does (e-mails, phone calls, other tasks). Initial evidence for the usefulness of a finer distinction was provided in study 2 where work-related e-mails seem to be more detrimental than other forms of ICT use.

It is interesting to note that ICT learning expectations and employee monitoring, postulated as ICT demands by Day et al. (2012), did not emerge within our taxonomy. This indicates that for the participants of our study, these potentially demanding aspects of ICT use either did not occur on a daily basis or were not important/salient enough to be mentioned.

One might wonder how certain events fulfill the criteria to be “bounded in time and space” (Morgeson et al., 2015, p. 13), while some of the clusters encompass continuous states (e.g., being on call). A closer examination suggests that these state-like situations are characterized by the anticipation of events. This becomes evident in statements such as “*Availability via e-mail on the smartphone, despite pre-arranged absence I felt pressured to check mails*”; “*I was in a meeting. As our department was scarcely manned, I constantly checked my phone. Unfortunately, reception was poor. This put me under stress*” (N7). The anticipation of events might become stressful in itself. The anticipation may, in particular, be associated with negative outcomes because it leads to rumination (Cropley & Zijlstra, 2011; Syrek & Antoni, 2014). In summary, it seems worthwhile to further explore the nature of such anticipated events and the processes of how they unfold their effects.

Study 1 yielded different kinds of situations where employees experienced their ICT use as beneficial (positive event categories). While the overall prevalence of positive events compared to the prevalence of negative events was higher in both studies, this did not translate to higher levels of recovery. On the contrary, our study showed that also in situations where employees appreciate being available or pursuing work tasks in the evenings, their detachment from work suffers. Thus, a positive ICT feature may turn into a negative event, which further confirms the value of considering discrete events rather than general characteristics. These findings extend previous literature by giving empirical evidence for what has been described as “illusions of balance and control” (Middleton, 2007). While employees might appreciate flexibility and control over when and where they work, they often underestimate potential downsides regarding their recovery. However, employees might still be motivated to engage in such detrimental behavior as it may help them to achieve long-term

professional goals via goal attainment or task accomplishment (Ohly & Schmitt, 2015).

Our study shows that work-related ICT events in the evening were particularly salient and relevant for employees (study 1) and significantly affected recovery (study 2). This is in line with border theory (Clark, 2000) and boundary theory (Ashforth et al., 2000) which describe that work-related ICT use during non-work time may be detrimental as it is associated with role blurring and a higher level of work-family conflict. Our results suggest that of all ICT events in the evening, work e-mails seem to be the most detrimental form, impeding on both detachment and sleep quality. While the importance of e-mails for work-related stress (Derks & Bakker, 2010) as well as their potentially detrimental effect during non-work time (Butts et al., 2015) have been emphasized before, we add to the literature by providing evidence for a more comprehensive approach in terms of a direct comparison of effects of different forms of ICT use on recovery.

We further contribute to the literature on the interface between work and personal life by differentiating between different events relating to work-home interference and by specifying in which way work may interfere with personal life. For future research, it might be worthwhile to tap deeper into the question what exactly makes the difference between work calls, work e-mails, or other ICT-mediated work at home. Time pressure, working hours, and the duration of ICT use after hours do not seem to be the driving factors. Relevant factors may be if ICT use is associated to an intrusion, if it was self-initiated or not, as well as the specific content of messages or calls (see also Butts et al., 2015).

Practical Implications

The events identified in this study and their frequencies of occurrence may raise organizational awareness on how employees feel positively or negatively impacted by ICT. During work, the most frequently occurring negative event was Technical Problems, suggesting that the disturbing character of technical malfunctioning should not be underestimated by organizations. Also, our study suggests that extending work to the evening hours together with a constant availability is in many cases detrimental to employees’ well-being. This means that organizational availability norms should be addressed and excessive ICT use after hours be limited. In this regard, it is important, however, not to enforce strict prohibitions, as this may limit autonomy and lead to a feeling of external control, which has been shown to be detrimental for well-being (Ohly & Latour, 2014). Instead of company-wide rules, it might be advisable for team leaders to negotiate transparent guidelines within their teams regarding availability and response times. In addition, our study provides evidence for the necessity to raise

awareness among employees regarding possible pitfalls of evening ICT use, a behavior they might appraise as positive.

The negative effects of e-mails in particular imply that organizations should engage in optimizing their “e-mail culture,” e.g., by establishing clear rules, questioning implicit response time expectations and norms, and offering specific e-mail trainings. Negative effects of ICT use after hours proved to be stronger than positive effects. This suggests that the attenuation of negative consequences by the avoidance of negative events during non-work time should be given priority. However, the opportunities of ICT as a resource should not be neglected. Therefore, for the individual employee, it is advisable to carefully reflect on—and in consequence restrict—one’s own usage behavior and decide when availability may be beneficial or detrimental. One solution here might be to deactivate the push function on smartphones in order to decide autonomously when checking e-mails is actually necessary (see also Ďuranová & Ohly, 2016).

Limitations and Future Research

Our study design followed a mixed-method approach to address our research questions. The participant-centered, qualitative approach in study 1 proved to be valuable to capture the participants’ perspectives on ICT-related events, but also came with some conceptual and methodological challenges. First, not all of the event clusters were on the same level of abstraction. For example, the category Communication Overload may also contain situations like Disruptions During a Meeting. We decided to adhere to the participant-centered approach in that we follow the sorters’ clustering and the subjective descriptions in order to reflect the employees’ perspectives and mental models in the best possible way. This approach seemed more important than the rigid construction of selective and distinct event clusters and ideal conceptual equivalence, as it mirrors where participants feel the need to differentiate and where they do not.

Also, results of both study 1 and study 2 were limited in that they only considered ICT events that reached level of consciousness with the study participants and were appraised as positive or negative in the first step. In line with cognitive appraisal theory, we assumed that all events had to go through this primary appraisal process to be noteworthy at all (cf. Ohly & Schmitt, 2015). Future research may further elaborate the event taxonomy, also considering subliminal user experiences and habitual behavior (Oulasvirta, Rattenbury, Ma, & Raita, 2012) as well as events that are not pre-determined in their valence. Also, factors leading to a positive or negative appraisal should be further examined. One important cognitive process that determines the situation’s valence may be the appraisal of goal congruence (Lazarus, 1991): When personal goals correspond to organizational goals, availability may be

seen as beneficial; otherwise, it may be perceived as a duty (“being on-call”).

In study 2, we applied a quantitative approach to investigate the relationships between specific ICT-related events and recovery as experienced in the evening and the next morning. Other outcome variables and timeframes (e.g., recovery on the weekend) might be worthwhile to consider in future studies. In the case of positive ICT experiences in particular, future research could further analyze the role of positive ICT events as a resource by additionally examining the indirect positive effects of such events (reduction of potential stressors, buffering of the stressor-strain association). For the effects of the negative events, it seems worthwhile in future studies to also consider potential mediation effects. For example, it is possible that a lack of detachment mediates the negative effects of ICT use in the evening on sleep quality.

Future research should also consider potential moderator variables. For example, the effects of evening ICT events on employee recovery may depend on a person’s general attitude towards technology use as well as their preference to segment or integrate life domains (Butts et al., 2015; Sayah, 2013). It is likely that employees who prefer to segment life domains experience work-related events during evenings as more intrusive and stressful and that “integrators” may profit more from positive events (see also Derks, Bakker, Peters, & van Wingerden, 2016). Also, Oulasvirta et al. (2012) found checking habits to increase the overall technology use, which may result in an increase in the prevalence of certain events found in this study (e.g., Work E-mails, Disturbance on the Way, Disruption During Meeting).

In addition, it is likely that employees’ job type may have affected our results. Future research might examine how often ICT events occur in different jobs and how they affect recovery and well-being, for example, in jobs where there is by definition no clear boundary between private time and work time. In study 2, we focused on those events from our taxonomy related to ICT use for work during non-work time. Future studies may further examine effects of events during the workday. For example, a diary study recording ICT-related interruptive events may shed further light on accumulative effects of interruptions on well-being which have been largely neglected previously (Baethge et al., 2015).

It is possible that the effects we found in study 2 were also in part inflated by common source biases (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). However, the fact that not all relationships between ICT events and recovery indicators were significant speaks against this threat. Furthermore, because we assessed factual information (occurrence of ICT events) low in ambiguity and used different rating formats for our dependent and independent variables, we believe that the likelihood of common source bias is low (Podsakoff, MacKenzie, & Podsakoff, 2012). Furthermore, the assessment

of sleep quality and ICT events were separated in time which also reduces common source bias (Podsakoff et al., 2012).

In study 2, we concentrated on daily outcomes. In future research, it may be worthwhile to extend this perspective to further examine longer term effects such as the development of burnout (Day et al., 2012). Whereas we focused on an occupational health perspective, future research should also consider effects of ICT use on individual performance. Particularly in the case of positive events, performance indicators may be more sensitive. For example, positive ICT events may enhance goal attainment or task accomplishment (Ohly & Schmitt, 2015). In our study, these facets were only implicitly covered in the participants' events' descriptions (study 1) and ratings (study 2), but were not included as outcome variables. It is also possible that positive ICT events only unfold positive effects on well-being and recovery experiences via goal attainment or task accomplishment. Future studies should consider those indirect effects.

Conclusion

With our mixed-method approach, we provided a fine-grained differentiation of ICT-related daily affective events at work and in the evening, revealing demanding or enriching situations of very different kinds. We showed that different forms of work-related ICT use in the evening had distinctive effects on recovery. Being available for work issues at home, dealing with work e-mails and work calls as well as continuing tasks in the evening proved to be detrimental for recovery. These effects were found to be largely irrespective of negative—or even positive—individual appraisal. Our results extend literature on the effects of ICT use and contribute to research on the interface between life domains and occupational health.

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