Journal of Occupational Health Psychology
2016, Vol. 21, No. 1, 105–118

1076-8998/16/$12.00 http://dx.doi.org/10.1037/a0039602

Extended Work Availability and Its Relation With Start-of-Day Mood and Cortisol

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The opportunity to work at any time and place, which is facilitated by mobile communication technologies, reinforces employer expectations that employees are available for work beyond regular work hours. This study investigates the relation of daily extended work availability with psychological and physiological well-being and the mediating role of recovery experiences. We hypothesized that recovery is limited under conditions of extended work availability, which may impair well-being. A sample of 132 individuals from 13 organizations provided daily survey measures over a period of 4 days during which they were required to be available during nonworking hours and 4 days during which they were not required to be available. A subsample of 51 persons provided morning cortisol levels in addition to the survey data. The analysis of within-person processes using multilevel structural equation modeling revealed significant effects of extended work availability on the daily start-of-day mood and cortisol awakening response. Mediation analysis revealed that the recovery experience of control over off-job activities mediated the observed relationship with start-of-day mood but not the relationship with the cortisol awakening response. The results demonstrate that nonwork hours during which employees are required to remain available for work cannot be considered leisure time because employees' control over their activities is constrained and their recovery from work is restricted.

Keywords: availability, boundary permeability, cortisol, recovery, work–family border

Mobile communication devices, such as smartphones and mobile Internet, allow employees to follow organizational processes, intervene remotely, and remain accessible to supervisors, coworkers, and customers at any time and place. Studies have observed that the mere technical opportunity to work beyond regular working hours and locations may lead to larger workloads and longer working hours (Towers, Duxbury, & Thomas, 2005). Furthermore, mobile technology reinforces employer expectations that employees are available for work outside of normal business hours (Bergman & Gardiner, 2007; Green, 2001). Surveys have found that being "always on" and responsive to short-term work requirements during nonwork hours is widespread among white-collar workers. In 2002, approximately 32% of U.S. workers reported being contacted regularly about work-related matters outside their regular work schedule (Bond, Thompson, Galinsky, & Protta, 2002). A recent representative European survey observed that European workers are often (22.4%) or sometimes (18.7%) contacted outside their regular working hours (Arlinghaus & Nachreiner, 2013). Despite the high prevalence of required work availability beyond regular working hours, few studies have examined the effects of such *extended* availability requirements on employee well-being. This study investigates the effects of extended work availability on employees and the processes that mediate such effects. The aim is to improve the estimation of the potential risks of this increasingly widespread work arrangement and to provide insight into the processes through which this work arrangement affects employee health beyond the simple between-person relationships analyzed in previous studies.

Research on information and communication technologies (ICT) has emphasized the opportunities that such technologies offer to improve productivity and to allow employees to manage work and family according to their individual needs by providing temporal and spatial flexibility (Gajendran & Harrison, 2007). Although these advantages are valued by organizations and employees (Middleton, 2008), there is also evidence that the implied extended work availability may carry risks. Cross-sectional studies have observed that the requirement of being available for work beyond normal work hours is associated with indicators of impaired well-being, such as health problems, absence rates, stress perceptions, or work–family conflict (Arlinghaus & Nachreiner, 2013; Glavin & Schieman, 2010; Kossek, Ruderman, Braddy, & Hannum, 2012; Voydanoff, 2005).

However, extended work availability may be associated with a variety of other work features, such as supervisor functions, larger workloads, and general flexibility (Arlinghaus & Nachreiner, 2013). Therefore, we should remain cautious when inferring causal relationships from between-person differences in cross-sectional studies. Within-person approaches may overcome this limitation. By analyzing within-person relationships, we are able to relate within-person changes in availability requirements to changes in

This article was published Online First August 3, 2015.

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This research was supported by the German Federal Ministry of Education and Research (FK 01FH09083).

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well-being while eliminating all time-invariant, person-related heterogeneity, even when this heterogeneity is correlated with the observed variables. A recent study conducted by Derks, van Mierlo, and Schmitz (2014) applied a within-person approach to analyze the effects of work-related smartphone use during nonwork hours and observed within-person associations with work-related strain and recovery. The present study shares this approach, which improves our understanding of how changing requirements concerning extended availability may affect well-being outcomes within the same persons. However, this study avoids confounding the effects of voluntary action and external requirements. Rather than focusing on the active behaviors related to availability (Derks et al., 2014), we examine the within-person associations related to organizational requirements to be available beyond regular work hours by systematically varying these requirements in the context of on-call work. We add to the existing findings on extended work availability by going beyond self-reported measures of well-being and including physiological data (i.e., saliva cortisol levels) and using a time-lagged design that relates availability on a given day with well-being indicators on the next day. Finally, by analyzing the relationship of extended availability with recovery experiences as mediators for the effect on well-being, we contribute to the limited research on the preconditions for recovery (Sonnentag, Binnewies, & Mojza, 2010).

Extended Work Availability

Bergman and Gardiner (2007, p. 401) define availability as being "accessible in time and space and being responsive to the needs and wants of others." In other words, a person's availability indicates individuals or organizations' level of access to that person's behavior. Availability is a feature of every employment relationship; the employer purchases a part of the employee's availability and decides where the employee directs work behavior within the limits of the defined work hours (Bergman & Gardiner, 2007). The use of modern ICT can extend employee availability beyond regular working hours. The potential to be accessible via ICT and to respond to work assignments outside defined working hours may become a requirement to do so (Green, 2001). In addition to explicit assignments, implicit expectations and cultural norms may force employees to remain available beyond working hours. Availability—once limited to prescribed working hours—now extends to a broader period of time. We define *extended work availability* as a condition in which employees formally have off-job time but are flexibly accessible to supervisors, coworkers, or customers and are explicitly or implicitly required to respond to work requests.

Extended work availability may be associated with impaired employee well-being. Arlinghaus and Nachreiner (2013) demonstrated that the frequency of work contact during nonworking hours is associated with increased health problems and absence rates. Other cross-sectional studies have produced empirical findings linking availability requirements with work–family conflicts and stress perceptions (e.g., Glavin & Schieman, 2010; Kossek et al., 2012; Voydanoff, 2005). In a diary study, Derks et al. (2014) observed relationships between work-related smartphone use and recovery and work-related strain. Similarly, in a diary study of on-call work, Bamberg, Dettmers, Funck, Krähe, and Vahle-Hinz (2012) compared days with availability requirements during on-call duty to days without availability requirements. The results indicated that availability requirements are negatively associated with indicators of well-being and nonwork activities even when no job contact occurs.

Studies have focused on different features of extended work availability to examine its effects. Some studies have examined the use of ICT for work-related matters during nonwork hours and accessibility via mobile technologies (e.g., Derks et al., 2014; Park & Jex, 2011). Other studies have focused on the frequency of job contact during nonwork hours (e.g., Arlinghaus & Nachreiner, 2013; Voydanoff, 2005). Based on the above definition of extended work availability and the findings of Bamberg et al. (2012), in the present study, we focus on organizationally required availability to address work issues during nonwork hours. Such a requirement may be based on either formal or informal expectations of supervisors, coworkers, or customers and may exist independently of actual job contacts during nonwork hours.

Work–Family Border Theory

From the perspective of work–family border theory (Clark, 2000; Nippert-Eng, 1996), extended work availability increases the permeability of the home domain (Golden & Geisler, 2007; Hecht & Allen, 2009), which has been associated with role blurring, potential work–family conflicts, and stress (Leung, 2011; Sonnentag, Kuttler, & Fritz, 2010). Under conditions of extended work availability, competing demands from the work and the home domains may cause role conflicts (Greenhaus & Beutell, 1985). Recent research on work-home boundaries emphasizes that individuals may systematically differ in the ways in which, as active agents, they manage the boundaries between the work and family domains (Kossek et al., 2012; Kreiner, Hollensbe, & Sheep, 2009; Matthews & Barnes-Farrell, 2010) and in their preferences regarding integration or segmentation (Kreiner, 2006). According to this research, rather than the mere boundary characteristic (e.g., permeability), the interaction among boundary characteristics, individual preferences and boundary management leads to increased or decreased well-being (Kossek et al., 2012). Extended availability, however, differs from other flexible work arrangements, such as telework or flextime, which foster the permeability of the work-home boundary. Extended availability implies not only permeable boundaries but also a lack of control over boundary crossings. Under extended availability, boundary crossings in the form of job contacts and work assignments are rarely predictable or controllable. Empirical results emphasize the importance of perceived boundary control as a key characteristic of boundary management that relates to work–family outcomes and distress (Kossek et al., 2012; Kossek, Lautsch, & Eaton, 2006). Furthermore, research on flexible work time arrangements has demonstrated that flexible working times may impair well-being if employees have no control over the time and duration of their work duties (Costa et al., 2004). We therefore expect that regardless of individual differences, extended availability will lead to impaired well-being.

In addition to problems associated with the lack of boundary control, extended availability for work implies a permanent uncertainty for the worker regarding whether work will arise and what demands will be imposed on him or her. The resulting insecurity may produce additional stress. The temporal unpredictability of work episodes when an employee is required to be available for

work is detrimental to the employee because it requires permanent activation. Even if extended availability does not lead to actual work, it produces anticipatory stress effects (McGrath & Beehr, 1990) because employees are required to be mentally and behaviorally prepared for incoming calls and appropriate work reactions. Based on empirical findings concerning the relationships between availability requirements during nonwork hours and indicators of well-being, theoretical considerations related to boundary theory, and the effects of insecurity and anticipatory stress, we propose that extended availability may negatively affect well-being.

For specific well-being outcomes, we distinguish between effects that occur at the cognitive-emotional level and those that occur at the somatic level. A cognitive-emotional outcome that varies by day within a given person is a mood (Rothbard & Wilk, 2011). A mood is a diffuse affective state that provides the affective background for our experience, behavior, and cognition (Wilhelm & Schoebi, 2007). We examine mood at the end of an extended availability period before preparing for regular work (i.e., *start-of-day mood*). Start-of-day mood is predictive of performance and affective experiences during the day. Further, mood is related to several organizational outcomes, such as performance, decision making, creativity, turnover, and intention to quit (Barsade & Gibson, 2007). Moods are often described by two basic dimensions, such as positive and negative affect (Watson, Clark, & Tellegen, 1988) or valence and arousal (Russell, Weiss, & Mendelsohn, 1989). Matthews, Jones, and Chamberlain (1990) criticized the use of different extraction criteria to determine these two mood factors and proposed a three-dimensional mood model. Wilhelm and Schoebi (2007) offered a three-dimensional measure to capture mood in daily life. They differentiated among valence (ranging from unpleasant to pleasant), calmness (ranging from restless/under tension to calm/relaxed), and energetic arousal (ranging from tired/without energy to awake/full of energy) and empirically demonstrated that these three dimensions of mood are distinguishable for within-person variance (Wilhelm & Schoebi, 2007). Previous studies have demonstrated that availability requirements during nonwork hours may be associated with impaired mood (Bamberg et al., 2012). Referring to boundary theory (e.g., Kossek et al., 2012), we assume that a lack of boundary control and work–family conflicts due to extended work availability may decrease positive mood in terms of valence. Furthermore, a feeling of insecurity concerning work demands may impair calmness. Finally, the lack of work time control and the permanent anticipation of work demands further tax one's resources, which fosters feelings of tiredness. Therefore, we assume that work availability during nonwork time will be negatively related to all three facets of mood the next morning (start-of-day mood).

> *Hypotheses 1a:* Extended work availability the previous day is negatively related to start-of-day mood as represented by valence, energetic arousal and calmness.

At the somatic level, we investigate the relationship between extended work availability and saliva cortisol. Cortisol is a marker of the activity of the hypothalamic-pituitary-adrenal axis (HPA). The model of allostatic load states that the body adapts to environmental changes via allostatic reactions such as the activation of the HPA axis, which is one of the central bodily stress responsive systems (Rydstedt, Cropley, & Devereux, 2011). Sustained physiological responses to stress are thought to be detrimental to health. Allostatic load therefore describes the damage to the body resulting from maladaptive physiological reactions to stress (McEwen, 1998). Accordingly, altered cortisol levels have been shown to be related to adverse health effects (Denson, Spanovic, & Miller, 2009; Kudielka & Wüst, 2010). In stress research, the cortisol awakening response (CAR) has received substantial attention (Clow, Thorn, Evans, & Hucklebridge, 2004). The cortisol concentration in the human body follows a distinct diurnal rhythm: it increases during the first hour after awakening and declines thereafter (Fries, Dettenborn, & Kirschbaum, 2009). A higher CAR and the absence of an awakening reaction are associated with several adverse health effects (Almeida, Piazza, & Stawski, 2009; Kudielka & Wüst, 2010). Furthermore, the CAR is proposed to be a reliable marker of HPA axis activity (Kudielka & Wüst, 2010; Pruessner et al., 1997) and has been shown to be related to work stress (Chida & Steptoe, 2009).

In the current study, we expect a positive relationship between extended work availability and the CAR. Research on the relationship between cortisol and stressors has emphasized that the relationship might be stressor specific. Kirschbaum and Hellhammer (1994) proposed that situations involving high ego involvement, low predictability, low controllability, and novelty are a particular trigger for the release of the corticotropin releasing hormone (CRH) and ACTH, with a subsequent rise in cortisol levels. This hypothesis has been supported by the results of meta-analyses indicating that a cortisol response to a stressor is more likely if the stressing situation is socially threatening and/or characterized by high uncontrollability (Dickerson & Kemeny, 2004; Miller, Chen, & Zhou, 2007). As outlined above, we propose that a central feature of extended work availability is the lack of boundary control and the reduced predictability of the occurrence of work demands. Therefore, extended work availability should be accompanied by feelings of low controllability, which should lead to a cortisol response.

In addition to low controllability, extended work availability produces anticipatory stress effects. In their review of the CAR, Fries et al. (2009) noted that initial evidence exists that the CAR might be heightened on days during which stressful situations are expected. On days with an organizational requirement to be available for work, it is unclear whether a work demand outside regular working hours occurs. Nevertheless, when they are available for work during nonwork hours, employees may expect specific work situations characterized by higher individual responsibility and fewer coping options than during regular work time. Therefore, in addition to low control over work demands, anticipatory stress effects that will affect the CAR are to be expected. Based on these considerations regarding anticipatory stress effects and low controllability over the upcoming day, we propose a positive relationship between extended availability and the CAR.

> *Hypotheses 1b:* Extended work availability is positively related to an elevated CAR in the morning.

Recovery

Extended work availability may affect employee well-being by increasing insecurity, anticipation of work stressors, and a lack of boundary control. However, we expected to observe a more direct

effect of extended work availability on employee recovery from work stress. Recent research has stressed the need for recovery (Geurts & Sonnentag, 2006; Zijlstra & Cropley, 2006). Drawing on the effort-recovery model (Meijman & Mulder, 1998), conservation of resources theory (Hobfoll, 1998), and mood and regulation theory (Parkinson & Totterdell, 1999), Sonnentag and Fritz (2007) proposed psychological experiences that are important for employees to recover and repair impaired mood resulting from stressful work. Although the evidence supporting the importance of proposed recovery experiences is accumulating (Fritz, Sonnentag, Spector, & Mcinroe, 2010), few studies have investigated the determinants of recovery experiences (Hahn, Binnewies, & Dormann, 2014; Park, Fritz, & Jex, 2011). We propose that extended availability requirements will specifically affect the recovery experiences of psychological detachment and control over off-job activities (Sonnentag & Fritz, 2007).

Scholars have emphasized the importance of clear boundaries between work and nonwork for realizing psychological detachment (Park et al., 2011). If work and nonwork are not clearly separated, employees may experience difficulty mentally detaching from work, which is considered a fundamental recovery experience (Sonnentag, Binnewies, et al., 2010). Sonnentag, Kuttler, et al. (2010) observed a negative relationship between having an office at home (i.e., a permeable physical boundary at home) and detachment from work. Derks et al. (2014) reported a negative effect of daily work-related smartphone use on daily psychological detachment. Similar findings reported by other authors (e.g., Chesley, 2005; Kreiner, Hollensbe, & Sheep, 2009; Park et al., 2011) suggest that the use of work-related technology at home hampers detachment from work. Some scholars have proposed deliberate restrictions on the use of work technologies at home to enable employees to detach from work (Olson-Buchanan & Boswell, 2006; Towers, Duxbury, Higgins, & Thomas, 2006). On days during which employees remain available to address work-related issues during their nonwork hours and are expected to react appropriately to employers or customers, mental disengagement may be minimal.

Hypotheses 2a: Extended work availability is negatively associated with psychological detachment on the same day.

Another recovery experience that was proposed by Sonnentag and Fritz (2007) is control over off-job activities. Control refers to the degree to which a person can select the activities to pursue during nonwork hours, including when and how these activities are pursued (Sonnentag & Fritz, 2007). Iso-Ahola (1980) considered control and choosing to engage in intrinsically motivated activities to be the basic features of leisure time. Being available for work during nonwork time may impair the experience of control. Control over off-job activities tends to be restricted when employees anticipate interruptions due to work matters. An employee who is expected to react promptly to work demands must remain prepared, and this state of preparation may limit the variety of recreational activities that he or she can pursue. Thus, we hypothesize that on days during which employees are required to be available for work, experiences of control during off-job time are reduced.

Hypotheses 2b: Extended work availability is negatively associated with control over off-job activities on the same day.

Studies investigating the relationship between extended work availability and indicators of well-being have generally observed small effects for both within-subject effects (Bamberg et al., 2012) and between-subjects effects (Arlinghaus & Nachreiner, 2013; Voydanoff, 2005). The above considerations suggest that a more direct relationship exists between extended work availability and reduced recovery experiences. In addition, reduced recovery experiences may lead to impaired well-being (see Figure 1). Psychological detachment has been found to be related to a variety of indicators of well-being and to reductions in strain reactions, such as impaired mood and fatigue (Fritz, Yankelevich, Zarubin, & Barger, 2010; Moreno-Jiménez et al., 2009; Sonnentag, Binnewies, & Mojza, 2008). Control over off-job activities is considered a fundamental resource for employees to regain depleted resources (Hobfoll, 1998). Control allows a person to spend time on activities that best fit personal preferences and reduce the time dedicated to activities that are stressful or incongruent with his or her goals. Thus, control over off-job activities may contribute to well-being (Drach-Zahavy & Marzuq, 2013; Sonnentag & Fritz, 2007). A high degree of perceived control over one's life—and hence a high degree of control during nonwork hours—is generally associated with greater well-being, whereas an absence of control is related to a higher level of strain (Rosenfield, 1989). Based on these considerations, we propose a mediating function of recovery experiences in the relationship between extended work availability and start-of-day mood.

Hypotheses 3a: The effect of extended work availability on start-of-day mood is mediated by the level of psychological detachment the preceding evening.

Hypotheses 3b: The effect of extended availability on start-of-day mood is mediated by the level of control over off-job activities.

In addition, we expect that recovery experiences of control and detachment in the evening will be related to a reduced CAR the next morning. Referring to the effort recovery model (Meijman & Mulder, 1998) and conservation of resources theory (Hobfoll, 1998), we assume that high degrees of recovery experiences may restore depleted resources that are available the next morning to cope with upcoming or anticipated demands, which will reduce anticipatory stress. In addition, control over off-job activities may enable employees to employ preparatory strategies to cope with unpredictable work demands and uncontrollable boundary crossings. Therefore, control may contribute to a decreased CAR, whereas low control over off-job activities may be related to a

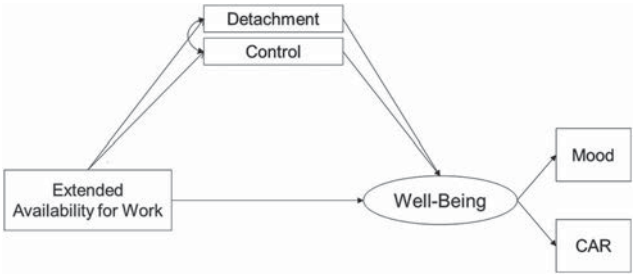

Figure 1. Mediated effects of extended work availability.

higher CAR the following morning. Regarding detachment, we refer to the perseverative cognition hypothesis, which states that reliving stressful work experiences and concerns regarding future stressful events produces physiological reactions in the cardiovascular, endocrine, and immune systems (Brosschot, Pieper, & Thayer, 2005). Indeed, evidence links perseverative cognition with bodily responses (Pieper, Brosschot, van der Leeden, & Thayer, 2007, 2010; Verkuil, Brosschot, Gebhardt, & Thayer, 2010). Detachment from work implies a reduction of perseverative cognition. We therefore assume a negative relationship between detachment and bodily response that may persist until the next morning, thus affecting the CAR. We also assume a negative relationship between the recovery experiences of control and detachment and the CAR and propose a mediating function of recovery experiences in the relationship between extended availability and the CAR.

Hypotheses 3c: The effect of extended work availability on the next morning's CAR is mediated by the level of psychological detachment the preceding evening.

Hypotheses 3d: The effect of extended availability on the next morning's CAR is mediated by the level of control over off-job activities during the preceding evening.

To analyze the within-person association of extended work availability with well-being and recovery experiences, we focused on a particular form of on-call work. In this work arrangement, in addition to their regular working hours, employees have prescribed periods of availability during nonwork hours during which they complete work-related tasks as needed. Whereas other forms of extended availability requirements only allow for analyses of between-subjects effects that are often confounded by additional variables, such as work intensity, supervisor responsibility, and work hours, on-call work provides the opportunity to distinguish periods of extended availability from periods of nonavailability within the same subjects. Furthermore, this specific work arrangement focuses on organizational requirements to be available without confounding requirements with voluntary action.

Method

We used a diary method to compare days of on-call duty (extended availability requirement) with days without on-call duty (no extended availability requirement). By analyzing differences in situational well-being and indicators of recovery, we sought to derive conclusions regarding the within-person effects of extended availability requirements.

Design and Sample

To test our hypotheses, we employed a longitudinal design. On-call duty was determined at the day level, and we assessed recovery experiences at bedtime. Mood and saliva cortisol were assessed in the morning (see Figure 2). We linked the daily survey data assessed at bedtime to the daily survey data assessed during the next morning. To account for different effects of extended availability on nonwork periods with different characteristics, we selected time blocks including normal working days (Tuesday evening–Thursday morning) and weekends (Saturday evening–Monday morning). The final survey and physiological data consisted of 4 days (2 working days, 2 weekend days) during an on-call period and 4 days (2 working days, 2 weekend days) without extended availability for each participant.

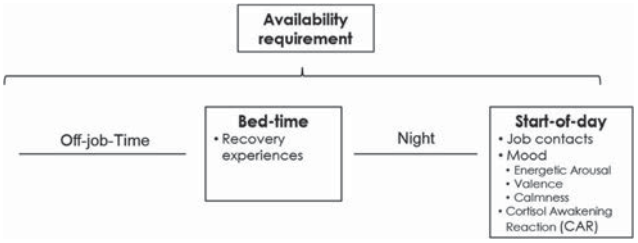

Figure 2. Study design and measurement points.

The participants were employees of 13 organizations (transport and logistics, water supply, IT and technical services, trade, nursery, and hospital). The organizations were recruited through newsletters and calls soliciting participation in a project seeking to optimize on-call work. To encourage organizational participation, we promised organization-specific feedback from the study and a consultation on the design of on-call work. After organization managers provided organizational consent to participate, an event was held to inform employees about the research project (i.e., a study of on-call work) and the data collection procedure. Furthermore, the employees were asked to express their willingness to participate. The number of participants per organization ranged from 41 (transport organization) to only 1 participant (hospital). A typical arrangement of the participants' on-call work included a period of one week (including the weekend) with the requirement to be available for work outside regular working hours and the workplace, followed by 3, 4, or 5 weeks without this requirement. During the former periods, employees were required to respond to incoming calls related to work tasks, such as troubleshooting or customer requests outside their regular work hours.

For each employee who was willing to participate in the study, we scheduled 2 weeks (one with on-call duty, one without on-call duty) to record the daily survey data on handheld computers. During face-to-face meetings, research assistants demonstrated the use of the handheld computers to participants and instructed them on how and when to complete the daily surveys. Generally, the data collection for each person was completed after 2 weeks, with exceptions attributable to vacation or sick absenteeism. To remind the participants to complete the daily survey at the prescribed times, we programmed alarms on the handheld computers that fit the participants' personal schedules. When a participant did not comply with the survey schedule (e.g., a participant reported his start-of-day mood in the afternoon), the data were excluded from the analyses. The entire data collection process within the various organizations took place from September 2010 to March, 2012. In total, 132 persons (91% men) participated in the study and completed the surveys. The average age was 42 years ($SD = 9$), and 92% of the participants had worked in the same organization on a full-time basis (mean work hours: 39 h) for more than 5 years. Most participants (88%) lived with a partner, and approximately half of the participants (53.8%) had children. Including deletions resulting from schedule noncompliance, the response rate for the daily survey was 88% (missing: 4%/noncompliance: 8%) for the

start-of-day surveys and 86.5% for the recovery assessment in the evening (resp. 3%/10.5%). A subsample of 51 participants expressed their consent to provide physiological data, namely, saliva cortisol. With regard to sociodemographics, the subsample did not differ substantially from the total sample (96% men; mean age: 42; mean work hours: 41 h; 91% with a partner; 56% with children). However, among the participants from this subsample, 60% came from only one organization (a transport organization) compared with 32% in the total sample.

Measures

Extended availability. The independent variable, extended work availability, was operationalized as a day-level variable that corresponded to the employees' on-call shifts (i.e., the week with on-call duty vs. the week without on-call-duty). During on-call shifts, the employees were required to remain available for work issues after business hours at night and on weekends. Other than the on-call shifts, the employees had no responsibility to be available for work outside business hours. This operationalization allowed for the assessment of the organizational requirement to be available without involving the volitional aspect of availability. To distinguish the effects of extended availability from those of work demands due to calls received during nonwork hours, we assessed the number of on-call work contacts each morning following an on-call day using the item "How many calls from work did you receive in the last 24 hours?"

Recovery experiences. The bedtime survey assessed recovery experiences using the Recovery Experience Questionnaire (Sonnentag & Fritz, 2007). Psychological detachment from work and control were assessed using four items measured on a 5-point Likert scale that probed participant experiences during nonwork time in the evening. A sample item for psychological detachment was "This evening I didn't think about work at all." For control, operationalized as the degree to which a person has the freedom to choose the activities to pursue during nonwork hours, a sample item was "This evening I determined for myself how I would spend my time." Construct validity and distinctions among the different recovery experiences have been extensively tested in previous diary studies (e.g., Sonnentag, Binnewies, et al., 2010). In this study, Cronbach's alphas were calculated separately for each measurement day and ranged from .89 to .95 (M = .92) for detachment and .85 to .93 (M = .90) for control.

Start-of-day mood. We used a 6-item scale developed by Wilhelm and Schoebi (2007) to measure mood at the beginning of the day. This questionnaire is based on the Multidimensional Mood Questionnaire (Steyer, Schwenkmezger, Notz, & Eid, 1997) and assesses three basic mood dimensions (valence, energetic arousal, and calmness). In the morning surveys using six 6-point bipolar items, the participants responded to the following statements: "At this moment, I feel discontent–content (valence), unwell–well (valence), tired–awake (energetic arousal), without energy–full of energy (energetic arousal), agitated–calm (calmness), and tense–relaxed (calmness)." The reported reliability indices at the state level (within-person) and for the two-item subscales were acceptable (.70-.77; Wilhelm & Schoebi, 2007). In this study, the interitem correlations that were calculated separately for each measurement day ranged from .69 to .90 (M = .80). To test whether the factor structure of the three facets of mood could be replicated in our study, we performed multilevel confirmatory factor analysis (CFA). We tested a three-factor model against a model with a one-factor structure and a hierarchical three-factor model with a second-order (general mood) factor. The results confirmed a model with three independent but correlated factors. This model exhibits a better fit (χ^2 [18, N = 859] = 104.00, $p <$ .01, CFI = .96, TLI = .93, RMSEA = .08, SRMR = .02/.03, AIC = 10292.79) than the alternative models (one factor model: χ^2 [24, N = 859] = 622.35, $p <$ .01, CFI = .71, TLI = .63, RMSEA = .17, SRMR = .07/.13, AIC = 10721.93 | second-order factor model: χ^2 [21, N = 859] = 431.24, $p <$ .01, CFI = .80, TLI = .71, RMSEA = .15, SRMR = .03/.13, AIC = 10443.61).

Cortisol awakening response (CAR). To participate in the cortisol part of the study, employees had to meet the following criteria: no heavy smoking, no continuous drug intake, no chronic disease, not pregnant or nursing, and no diagnosed insomnia. We used Sarstedt Salivettes (Sarstedt Inc., Nürmbrecht) to collect three saliva samples each morning. Participants had to chew on a cotton ball for approximately 45 seconds. The first sample was taken immediately upon awakening, the second sample was taken 15 minutes after awakening, and the third sample was taken 30 minutes after awakening. The participants were instructed not to brush their teeth and to refrain from eating or drinking (except water) during the collection of the three morning samples. Participants stated the date and time of sampling on the Salivettes and completed a cortisol measurement form, on which they could state any nonadherence to measurement protocol. Salivettes were stored in the participant's freezer until collection and then stored at −20°C until laboratory analysis. We excluded all saliva samples that did not comply with the instructed sampling schedule; specifically, we used heart rate and activity data (recorded with an Actiheart monitor, Cambridge Neurotechnology, Cambridge, U.K.) to determine the objective awakening times for each participant and day. Samples were excluded if the objective awakening time and the time of the first saliva sample were more than 10 minutes apart (regarding the determination of objective awakening times, see Stalder, Evans, Hucklebridge, & Clow, 2011). A total of 14% of the measurement days were excluded, which resulted in a subsample of 346 days.

Based on the raw cortisol data, we calculated the area under the curve of the repeated measurements as an indicator of the CAR (Pruessner, Kirschbaum, Meinlschmid, & Hellhammer, 2003). Specifically, we used the indicator area under the curve with respect to increase (AUCi). This indicator describes the steepness of the morning reaction and has been associated with work stress (Chida & Steptoe, 2009). The calculated AUCi values were positively skewed and non-normally distributed, which is typical of cortisol data. In this case, the use of transformations is recommended (Schlotz, 2011). Thus, we used a Box-Cox transformation to transform the data into a normal distribution (Box & Cox, 1964).

Control variables. In addition to the variables used to test the hypotheses, we assessed a set of control variables that may have affected the dependent variables. For start-of-day-mood, we tested the effects of age, sex, and general work hours at the person level and the effects of the type of day (i.e., weekend vs. workday) at the day level. Multilevel analysis with each control variable revealed that only the type of day was significantly associated with start-of-day mood. Therefore, we included the type of day variable in

the subsequent analyses of the start-of-day mood data. For the analysis of cortisol data, scholars have recommended accounting for additional variables (Clow et al., 2004; Fries et al., 2009; Kudielka, Gierens, Hellhammer, Wüst, & Schlotz, 2012). At the person level, we additionally assessed negative and positive affect, depression, subjective health and training constitution, body mass index, smoking status, use of contraceptives, and income among those who participated in the cortisol measurements. Furthermore, we assessed the potential effect of the season. At the day level, we measured participants' waking times (hours after 12 a.m.), physical activity, substance consumption, and medication. Similar to the procedure for the start of-day mood data, we tested the effect of each control variable on the CAR. The analysis revealed that in addition to the type of day, the awakening time and income were significantly associated with the CAR. Thus, we included these variables in subsequent analyses of the cortisol data. To account for reactivity, we analyzed the effect of the measurement day within the survey blocks on the outcome variables. We observed a significant effect of the measurement day on mood but not on recovery or cortisol. Thus, we controlled for the measurement day in the subsequent analysis of start-of-day mood.

As described in the sample section, participants in this diary study derived from different organizations with an unequal distribution. To account for the hierarchical data structure, we calculated the intraclass correlation (ICC) for the person mean outcome and mediator variables. The ICC ranged from .00 for control to .24 for calmness. Because of the small sample size at the organizational level and within individual organizations, it was not possible to integrate this level into a three-level analysis. To control for organization-specific effects and the overrepresentation of the organization with the largest number of participants, we calculated several multigroup models (e.g., largest organization vs. the rest) and calculated χ^2-difference tests between models with free coefficients and models with fixed coefficients. Fixing the hypotheses-related coefficients to be equal between groups did not result in significantly worse model fits. We therefore assume that there were no differences between the participants of the larger organizations and the rest of the sample.

Results

Table 1 displays the means, standard deviations, and correlations of the study variables. The correlations among the day-level variables and between the day-level and individual-level variables were calculated separately for each measurement day. The indicated coefficients are the averaged values across all measurement days. The correlations with the deliberately and equally varied day-level variables (i.e., extended availability and type of day) are based on all measurement days.

This study analyzed the relationships among the variables for which data were collected at multiple time points. We systematically varied the independent variable of extended work availability; hence, this variable had no between-person variance. We were primarily interested in within-person processes. Before testing our hypotheses, we examined whether the within-person variance (day level) of the outcome variables was substantial by analyzing null models for each outcome variable. We found that a substantial portion of the total variance for each scale was within-person variance (M = 56%, ranging from 34% for calmness to 84% for the CAR).

We utilized multilevel structural equation modeling (ML-SEM) in MPlus 6.12 to model within-person processes while controlling for the variation at the between-person level (Muthén & Muthén, 2011). For latent variables that are represented only by two indicators, such as the mood variables, equal factor loadings are recommended to ensure an accurate representation of the underlying factor (see Little, Lindenberger, & Nesselroade, 1999). Furthermore, following this procedure, we achieved a better ratio between the number of parameters to be estimated and the sample size. We therefore set the indicator factor loadings for each mood facet to be equal.

To analyze the effects of extended work availability on start-of-day mood, recovery, and the CAR, we first analyzed for each outcome a model that included only the control variables. In a second step, we added extended work availability to the analysis while controlling for upcoming job contacts to distinguish the effect of availability requirements from effect of work demands

Table 1
Means, Standard Deviations, and Correlations of the Study Measures

Measure	*M*	*SD*	1	2	3	4	5	6	7	8	9	10	11	12
1. Availability	.52	.52												
2. Job contact	.14	.68	.20**											
3. Type of day	.49	.50	.00	.07*										
4. Age	42.0	9.00	.01	.08	−.05									
5. Working hours	39.2	5.07	.02	.07	.01	.18								
6. Control	3.73	.85	−.28**	−.18**	.06	−.10	.01							
7. Detachment	3.76	.99	−.30**	−.33**	.10**	−.10	−.03	.56**						
8. En. arousal	2.76	1.08	−.11**	−.08*	.17**	.09	.02	.26**	.27**					
9. Valence	2.32	.96	−.10**	−.12**	.15**	.04	.07	.33**	.36**	.74**				
10. Calmness	2.18	.92	−.11**	−.14**	.16**	−.10	−.02	.35**	.39**	.63**	.79**			
11. Income	4.96	.86	.02	.08	.01	.17	.05	−.12	−.14	.23	.20	.26		
12. Awake time	6.90	1.25	−.04	.07	.78**	−.03	.18	−.02	−.06	.26	.18	.21	.11	
13. CAR	9.06	1.27	.11*	−.04	−.26**	.13	−.08	−.13	.02	−.05	.01	−.06	−.10	−.14

Note. Day-level data were averaged across eight days with the exceptions of the deliberately and equally varied day-level variables of extended availability and type of day, which are reported at the day level (there was no between-person variance for these variables).
* $p < .05$. ** $p < .01$.

following job contacts (see Figure 3). Table 2 displays the fit indices of the hypothesized between- and within-person models for all outcome variables and the main effects of extended work availability and job contacts. The models for all outcome variables exhibited good fit. Supporting hypothesis 1a, the results revealed significant main effects of extended work availability on the three mood facets. Day-level extended work availability was negatively related to start-of-day energetic arousal, calmness, and valence. Furthermore, in support of hypothesis 1b, the analysis revealed significant main effects of extended work availability on the CAR; that is, extended work availability was positively related to an increased CAR. Finally, in support of hypotheses 2a and 2b, we detected significant negative links between extended work availability and the recovery experiences of control and detachment. Effect sizes, as indicated by the ΔR^2 from adding extended availability to the analysis, ranged from .01 for cortisol to .23 for psychological detachment as outcome measures.

Additionally, we analyzed the random slopes. ML-SEM with random slopes revealed that the effects of extended work availability varied widely among individuals. Table 2 displays the standard deviations of the individual slopes from the overall mean slope. Though not part of the hypothesis, we conducted post hoc analysis to explain the between-person variance of the availability effect. The slope-as-outcome analysis for start-of-day mood revealed that individual-level detachment contributed significantly to the variation of slopes among persons: participants with higher levels of detachment exhibited smaller extended availability effects.

To test the mediation hypotheses 3a through 3d, we extended the models by adding the mediators and analyzing the indirect paths from extended work availability to the outcome variables via the recovery experiences of control and detachment. The results of the hypothesized mediation model for valence with standardized regression coefficients are presented in Figure 4.

Table 3 summarizes the fit indices of the hypothesized between- and within-person models for all outcomes. We analyzed the significance of the indirect effects proposed in the mediation hypotheses using parametric bootstrapping with the Monte Carlo Method adapted for multilevel data (Selig & Preacher, 2008). This procedure performs similarly to other bootstrap methods and can

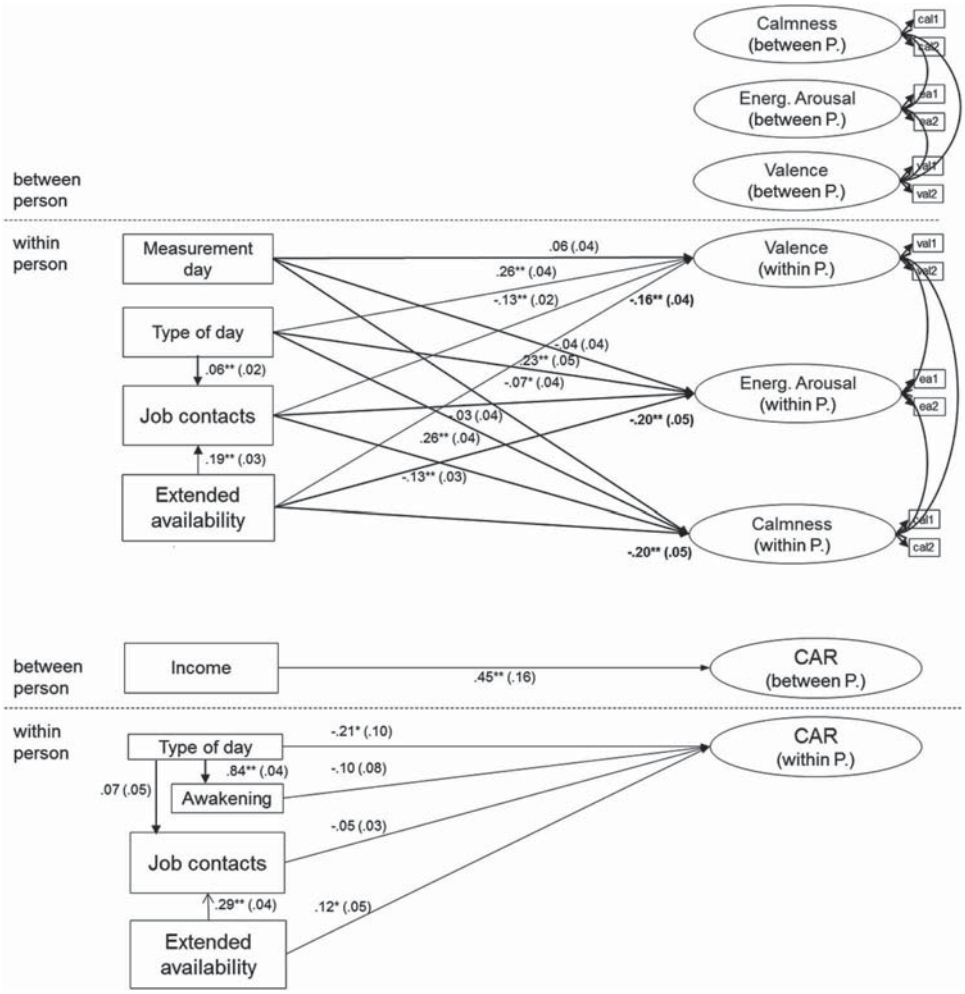

Figure 3. The main effects for start-of-day-mood and the CAR. The coefficients are standardized values (standard errors in parentheses).

Table 2
Model Fits, Coefficients, Effect Sizes for The Main Effects of Extended Work Availability

Outcome	Coeff. (*SE*)	*t*	*SD*	R^2 (ΔR^2)	Fit indices
Valence	−.21 (.06)	−3.63**	.38	.10 (.05)	χ^2 [37, N = 859/132] = 125.79,** CFI = .97, TLI = .94, RMSEA = .053, $SRMR_{within}$ = .016, $SRMR_{between}$ = .065
Energetic arousal	−.33 (.08)	−4.10**	.57	.09 (.05)	
Calmness	−.20 (.05)	−3.96**	.37	.13 (.07)	
CAR	1.05 (.49)	2.14*	.73	.10 (.01)	χ^2 [7, N = 337/51] = 8.25 n.s., CFI = .10, TLI = .99, RMSEA = .023, $SRMR_{within}$ = .005, $SRMR_{between}$ = .142
Detachment	−.67 (.09)	−7.80**	.69	.25 (.23)	χ^2 [72, N = 859/131] = 198.57,** CFI = .97, TLI = .96, RMSEA = .045, $SRMR_{within}$ = .030, $SRMR_{between}$ = .057
Control	−.47 (.08)	−5.80**	.64	.14 (.13)	

Note. Fit indices refer to the model without random slopes. *SD* refers to the variation of effects between persons. R^2 refers to the explanation of within-person variance. ΔR^2 refers to the increase over the model that included only control variables.
* $p < .05$. ** $p < .01$.

be use within multilevel frameworks (Preacher & Selig, 2012). In support of hypothesis 3b, the analysis revealed that the indirect effects of extended availability on start-of day valence and energetic arousal via control were significant, whereas the indirect effect on calmness, at p = .078, was close to being significant (valence = −.11, 95% CI [−.0212, −.2103]; energetic arousal = −.17, 95% CI [−.0492, −.3165]; calmness = −.06, 95% CI [−.0003, −.1224]). No support was found for hypothesis 3a as no significant indirect effect could be detected for detachment when controlling for the indirect effect of control (valence = −.02, 95% CI [.0704, −.1044]; energetic arousal = −.05, 95% CI [.0562, −.1653]; calmness = −.04, 95% CI [.1055, −.0232]). In addition to the indirect effects, the analysis of all model coefficients revealed that the inclusion of recovery experiences as mediators reduced the direct effects of extended work availability on the mood facets and explained additional variance in the outcome, as indicated by the ΔR^2 between .05 and .07. However, significant direct effects remained (see Table 3).

Contrary to hypotheses 3c and 3d, the confidence intervals of the indirect effects on the CAR mediated by both control and detachment included zero. The CAR was not significantly related to control or detachment during the preceding evening.

Discussion

The aim of this study was to examine the within-person relationships of extended work-related availability requirements with psychological and physiological well-being and to explain these relations by analyzing mediating processes. This diary study provided evidence that extended work availability is associated with impaired psychological and physiological well-being and fewer daily recovery experiences. Consistent with hypothesis 1a, the participants reported less energetic arousal, valence, and calmness on days with extended availability requirements. Furthermore, the participants demonstrated a steeper increase in the CAR on days with availability requirements (Hypothesis 1b) relative to days without availability requirements. This effect was not completely attributable to the occurrence of job contacts and resulting work demands; extended work availability had an independent effect after controlling for job contacts. Finally, consistent with hypotheses 2a and 2b, participants reported less control over nonwork activities and less psychological detachment on days with extended availability requirements relative to days without extended availability requirements. These findings indicate that extended work availability has a negative effect on recovery processes (Sonnentag & Fritz, 2007).

Our study contributes to existing research on work–family borders by focusing on the effects of availability requirements outside regular working hours. The results of this study extend the findings of previous studies examining the increasingly blurred work boundaries in modern employment that have demonstrated that job contacts and work availability outside regular business hours are associated with impaired well-being (Arlinghaus & Nachreiner, 2013; Derks et al., 2014; Glavin & Schieman, 2010; Leung, 2011). Whereas most studies employ cross-sectional designs and identify the between-person effects of extended work availability, this study identified within-person associations of extended work availability with well-being via a longitudinal diary design. The use of a diary design allowed us to differentiate between the statistical effects caused by interruptions of private life attributable to the occurrence of job contacts and effects caused by availability requirements per se, which may cause insecurity and reduce mental disengagement. Through our analyses of the relation with recovery experiences, this study heeds the calls for investigation of the determinants of recovery experiences (Sonnentag, Binnewies, et al., 2010). Whereas some studies investigate the relationship between boundary permeability and detachment (e.g., Derks et al., 2014; Park et al., 2011), to the best of our knowledge, this study is the first to demonstrate a relationship between boundary permeability and control over off-job activities. Finally, this study extends existing work on boundary and recovery research by identifying effects not only at the psychological level but also at the physiological level (Sonnentag & Zijlstra, 2006). Thus, this study contributes to the growing body of literature on physiological parameters in psychological research.

Hypotheses 3a through 3d predicted that reductions in the recovery experiences of detachment and control mediate the relation of extended work availability with psychological and physiological well-being outcomes. As demonstrated by our test of hypothesis 2, extended work availability significantly diminished the recovery experiences of control and detachment, and control and detachment have been demonstrated to affect well-being (Sonnentag, Binnewies, et al., 2010; Sonnentag & Fritz, 2007). Supporting hypothesis 3b, the relation of extended availability with start-of-day mood energetic arousal, valence and, by tendency (p = .07), calmness is mediated by the reduction of control over nonwork activities. However, given the remaining direct associa-

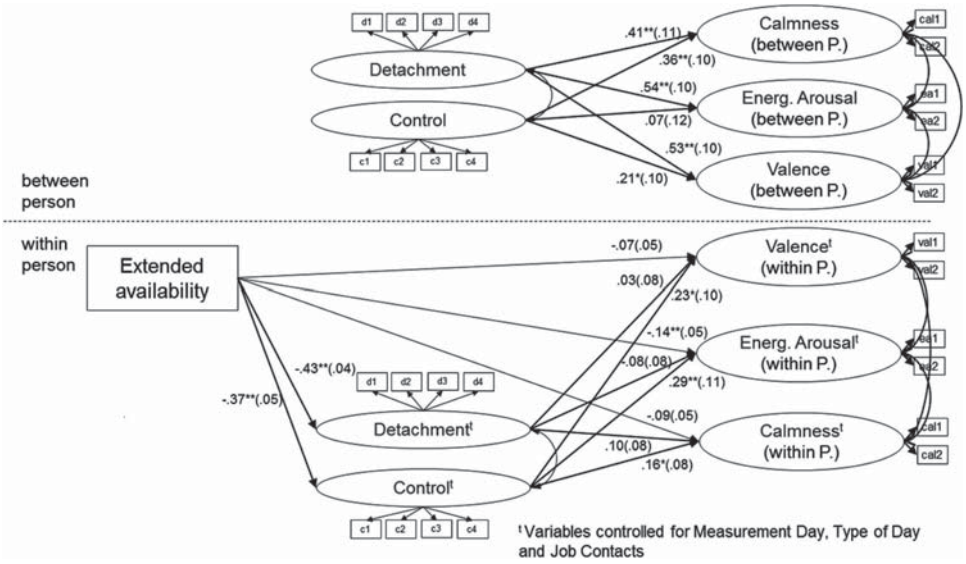

Figure 4. Mediation model for start-of-day-mood facets as outcomes. The coefficients are standardized values (standard errors in parentheses).

tion with energetic arousal, this mediation was only partial. The observed statistical effects were not completely explained by reductions in recovery experiences; thus, additional processes, such as the anticipation of work demands, insecurity, or boundary-spanning demands, may mediate the relation of extended availability with psychological and physiological well-being.

The insignificant indirect relationship of detachment with start-of-day mood was surprising. Although we observed a strong effect of extended availability on psychological detachment, the within-person variance of detachment did not affect the within-person variation of start-of-day mood beyond the effect of control. Only the between-person effect of detachment on start-of-day mood was highly significant. Previous research on the within-person effects of detachment has demonstrated that within-person variation in detachment may affect indicators of well-being (Sonnentag & Bayer, 2005; Sonnentag et al., 2008). Furthermore, Derks et al. (2014) observed that the reduction of psychological detachment might mediate the effect of work-related smartphone use on work-related strain. In this study, however, we did not observe an effect beyond the effect of control. This result indicates that the absolute level of detachment might be more important than the daily variation. Furthermore, the recovery experience of control should be controlled for in future research on detachment.

No significant indirect effects on the CAR were observed. The CAR was not associated with recovery experiences during the preceding evening in this study even though power analysis (ICC = .16, n_{person} = 51, $n_{measuring\ points}$ = 8) revealed that the power was sufficient to detect small to medium-sized effects ($d >$ .19). We hypothesized that a high degree of recovery during the preceding evening would help to restore depleted resources, which should affect the CAR the next morning. We assumed that control would enable employees to better cope with availability requirements, such as unpredictable work demands and uncontrollable boundary crossings. Because we did not observe any association

Table 3
Model Fit and Effect Sizes for the Mediating Effects of Extended Availability Via Control and Detachment

	Direct effect		Indirect effect			
Outcome	Coeff. (*SE*)	*t*	Coeff. (*SE*)	*t*	R^2 (ΔR^2)	Fit indices
Valence	−.09 (.06)	−.16	via control: −.11 (.05)	−2.19*	.17 (.06)	χ^2 [201, *N* = 814/130] = 418.62,**
			via detachment: −.02 (.05)	−.36		CFI = .97, TLI = .96,
Energetic arousal	−.23 (.07)	−3.06**	via control: −.17 (.07)	−2.42*	.16 (.07)	RMSEA = .036, $SRMR_{within}$ =
			via detachment: .05 (.05)	1.00		.028 $SRMR_{between}$ = .055
Calmness	−.09 (.05)	−1.89	via control: −.06 (.03)	−1.76	.17 (.05)	
			via detachment: −.04(.04)	−1.17		
CAR	1.62 (.75)	2.16*	via control: .07 (.15)	.43	.14 (.04)	χ^2 [127, *N* = 160/51] = 140.56 n.s.,
			via detachment: .25 (.25)	1.04		CFI = .99, TLI = .99,
						RMSEA = .026, $SRMR_{within}$ =
						.034, $SRMR_{between}$ = .133

Note. R^2 refers to the explanation of within-person variance. ΔR^2 refers to the increase compared with the simple effects model.
* $p < .05$. ** $p < .01$.

between control and the CAR, future research should follow this coping perspective and investigate the potential moderating function of the recovery experience of control. Our proposed link between detachment and the CAR was based on the understanding that prolonged physiological activity is caused by repetitive thoughts concerning stressful past and future events that may persist until the next morning (Brosschot et al., 2005). However, the exact physiological function of the CAR remains unclear. Fries et al. (2009) hypothesized that the CAR is accompanied by an activation of memory representations and proposed that the CAR might increase because of demand anticipation. Thus, whether a person experienced diminished control or detachment during the preceding evening might be less crucial than the expected events of the coming day. Establishing a relationship between recovery experiences and the CAR will be a challenging task for future studies.

By demonstrating empirical evidence for full and partial mediation, our study provides new insights into the process that explains the negative effects of uncontrollable boundary blurring caused by availability requirements. Specifically, the restrictions that are imposed on employees during nonwork hours under conditions of extended work availability partially explain the effect on start-of-day mood. Unlike other studies on recovery experiences that focus on detachment (Fritz, Yankelevich, et al., 2010; Park et al., 2011; Sonnentag, Binnewies, et al., 2010), this study revealed the particular role of control, which appears to be important in contexts of extended availability.

The values of the standard deviations of the within-person effects indicate that the effects were substantially greater for certain participants and that there were no effects for other participants. This result corresponds to the findings of boundary management research regarding individual difference with respect to the effects of blurred boundaries (Kossek et al., 2012; Kreiner, 2006). The results of the post hoc analysis revealed the moderating role of person-level detachment. Participants who reported high general psychological detachment during nonwork hours perceived fewer detrimental effects of extended work availability. Previous research (Bamberg et al., 2012; Derks et al., 2014) has identified individual (personality, norms) and contextual factors (work resources) that may explain the significant individual-level variation in the effect of extended work availability.

Limitations

Our study has limitations that should be considered when interpreting the results. The mood and recovery measures were self-reported and may have suffered from common method variance. However, the corresponding biases might have been limited because we temporally separated the measures of recovery in the evening and mood during the next morning (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). The inclusion of objective measurements of cortisol in this study overcame the problem of relying exclusively on self-reported data (Sonnentag & Zijlstra, 2006).

The generalizability of this study's findings regarding the effect of extended work availability is limited by the specific sample of on-call employees and the overrepresentation of a limited number of organizations, which restricted the variety of participating professions. In this study, we were more interested in psychological processes within individuals than in differences among individuals. Therefore, the use of representative samples was less important for our study than for studies of between-person differences. On-call work arrangements offer unique opportunities to examine short-term, within-person effects of extended work availability, and we believe that the processes analyzed here are comparable with other forms of extended availability. However, we should be cautious in generalizing our results to all forms of extended work availability. The requirement of availability during on-call shifts is very explicit and more formally regulated than other forms of extended availability. Furthermore, availability requirements are limited to predictable times, which may increase their impact on nonwork activities. These differences from more informal types of extended availability that are more common in modern employment must be considered. One approach to extending our results to other forms of extended availability and strengthening the causal interpretation would be to conduct well-controlled intervention studies (Semmer, 2006) by systematically manipulating the intensity of the availability requirements.

Finally, because of the study design, we must be cautious in drawing causal inferences from the results. The temporal order of measuring independent, mediator, and dependent variables extends existing approaches (e.g., Derks et al., 2014). However, it was not possible to control for autoregressive effects because the measurements always began in the middle of an extended availability period. The data from the previous day were affected by extended availability requirements and were not suitable for calculating change values that corresponded to changes in extended work availability.

Directions for Future Research

Our study investigated the effects of extended availability on psychological and physiological indicators of well-being. Future studies may expand the scope of the outcome variables and include performance measures (e.g., task performance and contextual performance). On the one hand, performance outcomes may be affected by restrictions on recovery during the preceding evening (Binnewies, Sonnentag, & Mojza, 2009); on the other hand, work performance before periods of extended availability may be reduced. Employees might engage in compensatory strategies to conserve resources for periods of extended availability during nonwork hours. Extended work availability might also influence behavior at home. A person who is required to respond to calls from work might be less attentive and less responsive to others in his or her home environment, which may cause conflicts within the family (Greenhaus & Beutell, 1985).

This study revealed significant variation in the random slopes. The effects of extended availability were not equal for all persons or work conditions. Post hoc analyses identified the role of individual-level psychological detachment. Previous studies have examined the role of norms, personality, and work characteristics (Bamberg et al., 2012; Derks et al., 2014). Future research should employ larger samples to analyze which personal or organizational variables explain between-person differences in the effects of extended work availability. The specific features of extended availability (e.g., reaction time, duration, and pay) and characteristics of potential work duties (e.g., time pressure, control, and qualitative overload) might moderate the effect of extended work availability. Analyses of these features will enable employers to

design appropriate work environments with extended availability requirements. Additionally, extended availability may provide benefits such as security, control, and access to support (Middleton, 2008). Day, Scott, and Kelloway (2010) proposed a model of ICT use based on the job demands-resources model (Demerouti & Bakker, 2011), which emphasizes the role of resources associated with ICT use and has several links to extended availability. Future research on extended work availability should account for the resources and benefits associated with extended work availability as potential moderators of the effects of extended availability on employee well-being.

Directions for Practice

This study provides evidence that extended work availability during nonwork hours negatively affects employee well-being and recovery. Nonwork hours during which employees are expected to respond to work issues constrain employee behavior and cannot be considered leisure time because recovery—a crucial function of leisure time—is restricted under such circumstances. The effort–recovery model (Meijman & Mulder, 1998) and previous studies have demonstrated that sufficient recovery is crucial for the maintenance of health (Kivimäki et al., 2006) and work capability (Sonnentag, Binnewies, et al., 2010). Thus, we suggest that periods of extended work availability be minimized and compensated with actual leisure time to ensure sufficient recovery. Specifically, this study and other studies of on-call work (Bamberg et al., 2012) have demonstrated that availability requirements impair well-being even when no job contact occurs. These findings suggest that it is preferable to have shorter periods of availability for fewer employees who are contacted more frequently than longer periods during which more employees are available and are contacted less frequently.

Additionally, this study indicated that the negative effects of extended availability are partially mediated by the restriction of recovery—specifically, the restriction of control over nonwork activities. If extended availability is indispensable for organizations because of customer demands or technical requirements, then organizations should design availability requirements to minimize behavioral restrictions on employees and reduce the effects of availability on control. Training in recovery practices (e.g., Hahn, Binnewies, Sonnentag, & Mojza, 2011) represents another promising approach to enabling employees to cope with required extended availability.

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Received August 12, 2014
Revision received May 19, 2015
Accepted June 29, 2015 ■