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ARTICLE

Time matters: The role of recovery for daily mood trajectories at work

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Abstract

Taking a temporal perspective, we examined how employees' mood (i.e., wakefulness-tiredness, calmness-tenseness, and pleasantness-unpleasantness) develops during the workday and tested employees' daily recovery from work as a predictor of these mood trajectories. Specifically, we analysed a serial mediation model with evening recovery experiences (i.e., psychological detachment, relaxation, mastery experiences, and control) being indirectly related to the development of next-day mood (i.e., linear slopes) via sleep quality and start-of-work mood. We collected data from 124 employees who completed up to 5 daily surveys over two workweeks. Multilevel growth curve models showed that, in general, wakefulness followed a negative quadratic, calmness a positive quadratic, and pleasantness no systematic trajectory during the workday. At the day level, path analyses showed that psychological detachment indirectly and relaxation directly predicted the three start-of-work mood states. Moreover, mastery experiences and control directly predicted start-of-work calmness. Additionally, psychological detachment and relaxation indirectly predicted the development of wakefulness and psychological detachment, relaxation, and mastery experiences indirectly predicted the development of calmness. Results suggest that some benefits of daily psychological detachment, relaxation (i.e., high start-of-work wakefulness and calmness), and mastery experiences (i.e., high start-of-work calmness) tend to subside during the workday.

KEYWORDS
mood, recovery experiences, sleep quality, temporal approach, trajectories

BACKGROUND

Daily recovery from work is important for employees' mood (e.g., Dettmers et al., 2016; Sonnentag et al., 2008). Most diary studies on recovery experiences have focused on short time periods showing that evening recovery experiences are associated with employees' mood at bedtime (Hahn et al., 2014) and in the next morning (Sonnentag et al., 2008). Employees' daily lives, however, are typically characterized by cycles of work and rest (Rook & Zijlstra, 2006) implying that rest phases (e.g., evenings and nights) are followed by work phases. Yet, it remains largely unclear how the benefits of evening recovery experiences in terms of better mood reach into the subsequent work phase during the next day (for exceptions focussing on energetic states see Hülsheger, 2016; Liu et al., 2021). Thus, little is known about how daily benefits of recovery experiences unfold during the next workday and relate to trajectories of mood over the course of the workday (Sonnentag et al., 2022). Addressing this critical gap in literature can provide important insights about how long employees benefit in terms of improved mood states from daily evening recovery and thus lead to a better understanding of daily evening recovery. Consequently, we examine how and why evening recovery experiences relate to mood trajectories during the next workday.

Recovery experiences during non-work time (i.e., psychological detachment, relaxation, mastery experiences, and control) describe the experiences underlying recovery activities (e.g., detaching from work while talking to friends; Sonnentag & Fritz, 2007). Building on previous studies, we aim at showing a more comprehensive picture of how the benefits of evening recovery experiences reach into the next workday. Going beyond research that showed how psychological detachment is related to energetic states during the subsequent day (Hülsheger, 2016; Liu et al., 2021), we propose that not only psychological detachment but also relaxation, mastery experiences, and control are related to mood trajectories during the next workday. Moreover, following the three-dimensional model of mood (Matthews et al., 1990; Steyer et al., 1994) which was found to best capture core mood (Schimmack & Grob, 2000), we focus on the three bipolar dimensions of wakefulness-tiredness, calmness-tenseness, and pleasantness-unpleasantness. While the three mood dimensions refer to bipolar dimensions (Schimmack & Grob, 2000), due to reasons of parsimony and better readability, throughout the article we use the labels of the positive poles, namely “wakefulness”, “calmness”, and “pleasantness” when referring to the bipolar scales of wakefulness-tiredness, calmness-tenseness, and pleasantness-unpleasantness, respectively.

Based on the effort-recovery model (ERM; Meijman & Mulder, 1998), we expect that employees generally experience decreasing levels of wakefulness, calmness, and pleasantness during the workday (i.e., linear decrease of mood). Moreover, referring to literature on higher-order trends of affective experiences (e.g., Hülsheger, 2016; Kahneman et al., 2004), we examine – in an explorative manner – higher-order trends of employees' wakefulness, calmness, and pleasantness during the workday. We combine assumptions of ERM (Meijman & Mulder, 1998) and of conservation of resources theory (COR; Hobfoll, 2001) to build hypotheses on the interplay of employees' recovery and their mood trajectories. In detail, we propose a serial mediation model with evening recovery experiences being related to the linear change of mood during the workday via (a) sleep quality and (b) start-of-work mood. Recovery experiences should be negatively related to the decrease of positive mood (i.e., wakefulness, calmness, and pleasantness) during the workday via sleep quality and start-of-work mood. Figure 1 displays our research model.

Our study makes important contributions to the recovery and mood literatures. First, our study adds to the conversation in work-related mood literature about the relevance of mood trajectories (e.g., Hülsheger, 2016; Weigelt et al., 2021). For instance, Frank et al. (2022) showed that the development of positive and negative affect during the first half of the workday is associated with counterproductive work behaviour and performance. While this study shows that mood trajectories come with consequences for daily work, our study rather focuses on the antecedents of such mood trajectories. We show that intrapersonal differences in daily trajectories of wakefulness, calmness, and pleasantness

Practitioner points

- Organizations should provide employees with sufficient autonomy to schedule their tasks on a daily basis in accordance with their mood trajectories. For instance, on days characterized by a high morning wakefulness or calmness, employees should be able to schedule tasks that need a lot of concentration and energy at the beginning of work.
- Employees should engage in at-work recovery such as breaks also when starting the day with higher favourable mood states than usual. In that way, high levels of wakefulness resulting from high evening recovery experiences and a good sleep quality might last longer during the day.
- Employees should strive for psychological detachment during off-job time because psychological detachment facilitates a good sleep quality. A good sleep quality, in turn, comes along with better start-of-work mood the next day.
- Employees should be encouraged to engage in relaxation because relaxation is, beyond a good sleep quality, important for next day's start-of-work mood.

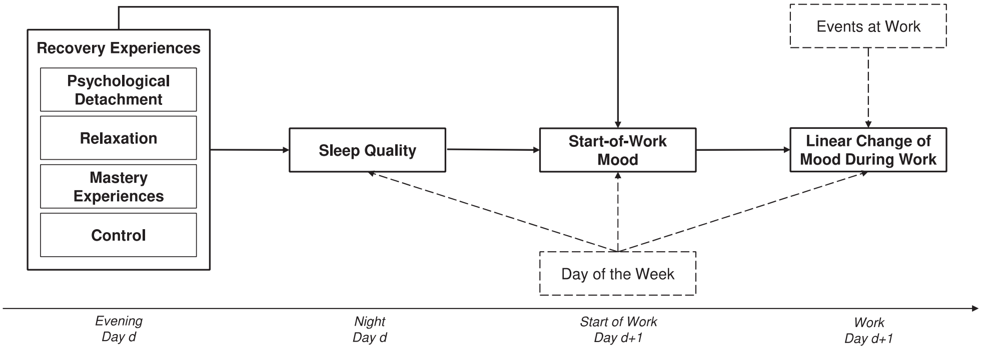

FIGURE 1 Conceptual model at the day level. *Note*: Mood refers to the bipolar mood dimensions wakefulness-tiredness, calmness-tenseness, and pleasantness-unpleasantness. Control variables are indicated by dashed lines. We additionally included whether participants had a break since the survey before as a control variable predicting mood at the occasion level. Day of the week as well as its sine and cosine were included as control variables at the day level. Events at work (i.e., task-related and interpersonal, both positive and negative) were included as predictors of the change of mood during work at the day and person levels. We additionally modelled all direct effects but did not display them in the figure for reasons of clarity.

can be traced back to employees' daily recovery experiences. Hence, what happens during a rest phase might spill over to the subsequent work phase (Rook & Zijlstra, 2006), influencing the development of employees' mood. Further, studying the interplay of recovery experiences and mood over time, we also address calls to adopt temporal approaches within occupational and organizational psychology (e.g., Rauvola et al., 2021; Shipp & Cole, 2015).

Second, from a recovery perspective, examining the interplay of recovery experiences and daily mood trajectories provides important insights into how long employees actually benefit from their previous evening recovery when they are back at work. Thereby, we add to findings from initial studies that examined how evening psychological detachment is associated with energetic states the next workday (Hülsheger, 2016; Liu et al., 2021). Additionally, by examining sleep quality and start-of-work mood as underlying mechanisms linking evening recovery experiences to change of mood, we address the question of why mood might change differently after evenings with good (vs. poor) recovery. Thus, we shed light on whether evening recovery experiences leave employees – partially via a better sleep quality – in a better mood at the beginning of the next workday and whether this mood-improving process has consequences for how mood changes at work.

Third, our expected insights into employees' mood trajectories and their interplay with daily recovery make practical contributions as well. Specifically, these insights can provide guidance for scheduling employees' work tasks in line with their mood states. For instance, employees may organize their tasks according to peaks and nadirs of their mood trajectories while considering their evening recovery. This way, employees can, for instance, avoid working on complex tasks at times of lower levels of wakefulness. Thus, aspects of time and recovery might also be relevant for daily work design (Parker et al., 2014).

Mood trajectories during the workday

Mood refers to unfocused and diffuse affective states fluctuating over time (Russell, 2003; Weiss & Cropanzano, 1996). According to Schimmack and Grob (2000), mood is better captured by a three-dimensional model than by a two-dimensional model (e.g., distinguishing activation and valence). The three-dimensional model of mood (Matthews et al., 1990; Steyer et al., 1994) describes mood by three intercorrelated bipolar dimensions, namely wakefulness–tiredness, calmness–tenseness, and pleasantness–unpleasantness. *Wakefulness-tiredness* is an energetic state ranging from high levels of energetic arousal (wakeful) to low levels of energetic arousal (tired). *Calmness-tenseness* is a tension-related state ranging from low levels of tense arousal (calm) to high levels of tense arousal (tense). *Pleasantness–unpleasantness* is a valence-related state ranging from positive valence (pleasant) to negative valence (unpleasant). Importantly, wakefulness, calmness, and pleasantness[1] do not only vary between but also within days (i.e., between 45% and 59% of the variance of the mood dimensions was within days; Reis et al., 2016).

Based on the effort-recovery model (ERM; Meijman & Mulder, 1998), we expect employees' wakefulness, calmness, and pleasantness to decrease during the workday. At work, employees typically invest effort to fulfil their work tasks and to deal with work-related demands. This load process is accompanied by short-term strain reactions – the destabilization of employees' psychobiological systems (Meijman & Mulder, 1998). This destabilization, in turn, is reflected in changes of employees' mood states. Consequently, employees' mood states should be impaired throughout the workday.

To show the required performance level during a workday, it is necessary that employees invest energy (Meijman & Mulder, 1998). This energy investment, in turn, should be reflected in a decrease of wakefulness during the workday. Because employees continuously invest energy, the discrepancy between demands and energy available to deal with them might increase throughout the workday. This discrepancy, in turn, might come along with higher tension (Quinn et al., 2012). Consequently, we propose that also calmness decreases during the workday.

Regarding pleasantness, there are reasonings for both an increase and a decrease during the workday. For instance, one might argue that positive events at work such as task accomplishment or goal achievement foster pleasantness (e.g., Harris et al., 2003) so that mood valence should become increasingly positive during the workday (Weiss & Cropanzano, 1996). However, there are rarely only positive events during a workday (Ohly & Schmitt, 2015) and negative events such as goal-disruptive events might come along with unpleasantness (Zohar et al., 2003), extinguishing an increase in pleasantness during the workday. Similarly, stressors which employees usually face at work such as task ambiguity and interruptions are also negatively related to pleasantness (Pindek et al., 2019). Additionally, the increasing discrepancy during the workday between demands and energy available might not only come along with tension (Quinn et al., 2012) but also feelings of

[1]As mentioned above, for the purpose of parsimony and readability, throughout this paper we use the label for the positive poles of the mood dimensions, namely "wakefulness", "calmness", and "pleasantness" when writing about wakefulness–tiredness, calmness–tenseness, and pleasantness–unpleasantness, respectively.

dissatisfaction and unpleasantness. Based on this reasoning, we suggest that pleasantness generally decreases during the workday.

In line with our assumptions on a general decrease of positive mood states at work, research showed that positive-energetic states decline (e.g., flow; Debus et al., 2014) and negative-energetic states tend to increase (e.g., fatigue; Hülsheger, 2016) during the day. Similarly, tense states (e.g., feeling stressed or rushed; Stone et al., 1996) seem to increase during working hours. Regarding pleasantness, however, findings are mixed (Dockray et al., 2010; e.g., Kahneman et al., 2004; Stone et al., 2006). Nevertheless, in line with our arguments presented above, we propose that wakefulness, calmness, and pleasantness, in general, show a decrease during the workday.

Hypothesis 1. Wakefulness shows a negative linear time trend such that wakefulness declines during the workday.

Hypothesis 2. Calmness shows a negative linear time trend such that calmness declines during the workday.

Hypothesis 3. Pleasantness shows a negative linear time trend such that the pleasantness declines during the workday.

To investigate the daily mood trajectories in greater detail, we go beyond the linear time trend and use exploratory analyses to examine higher-order time trends such as quadratic or cubic trajectories. Theories (e.g., the two-process model of sleep regulation, Borbély et al., 2016) and studies (e.g., Goel et al., 2013) on the circadian arousal cycle (i.e., arousal-related variables show daily variations that follow a 24-h rhythm) suggest that arousal-related variables follow a quadratic trajectory during wake times, with arousal first increasing and then decreasing. Regarding energetic arousal, this pattern was also found in the work context. For instance, during the day, tiredness followed a positive quadratic (i.e., u-shaped) trend (e.g., Hülsheger, 2016; Kahneman et al., 2004) and vigour followed a negative quadratic trend (Wiegelmann et al., 2023). Similarly, tense arousal might follow a quadratic trajectory. In detail, one might assume that calmness first decreases and then increases during the workday. Stone et al. (1996) reported first findings supporting this assumption.

Again, findings on other variables such as pleasantness are less consistent. For instance, using a day reconstruction approach, Stone et al. (2006) examined whether participants enjoyed themselves and felt happy and warm during the day. Although these authors did not test for systematic time trends, at a descriptive level, these constructs seemed to follow cubic trajectories (i.e., an increase followed by a decrease followed by an increase) over the course of a day. Based on a student's sample, Clark et al. (1989) found that activated positive affect followed an inverted u-shape and activated negative affect followed a weakly pronounced u-shape during the day. Thus, we suggest that also pleasantness might follow a higher-order trajectory during the workday.

Research Question: Which higher-order trends do employees' wakefulness, calmness, and pleasantness follow during the workday?

Evening recovery experiences and mood trajectories during the workday

We expect that employees' mood trajectories differ from day to day and that these differences can be indirectly predicted by daily recovery from work. Specifically, we propose that sleep quality and start-of-work mood serve as linking mechanisms between recovery experiences and the change of mood during the workday. First, we argue that employees' evening recovery experiences are – partially via their sleep quality – related to their start-of- work mood (i.e., intercept). Second, we suggest a serial mediation model with recovery experiences being related to the change of mood during the workday (i.e., slope) via sleep quality and start-of-work mood.

Recovery experiences and start-of-work mood

Evening recovery experiences refer to the recovery process and describe "the underlying psychological experiences associated with recovery" (Sonnentag & Fritz, 2007, p. 204). Specifically, we focus on four core recovery experiences: psychological detachment, relaxation, mastery experiences, and control. These four recovery experiences refer to being physically and mentally away from one's work (psychological detachment; Sonnentag & Fritz, 2007), to a state of decreased activation of the sympathetic nervous system (relaxation; Peters et al., 1977), to experiences resulting from learning opportunities and other challenging situations that are managed successfully (mastery experiences; Sonnentag & Fritz, 2007), and to the degree to which one can autonomously decide about one's own non-work time (control; Sonnentag & Fritz, 2007). In line with previous research, we suggest that recovery experiences are positively associated with start-of-work mood (Sonnentag et al., 2017) and that this association is partly mediated by sleep quality.

Experiencing high psychological detachment means that active cognitive representations of the workday subside or stop (Brosschot et al., 2005). Consequently, adverse cognitions that could impair sleep (Querstret & Cropley, 2012) do not occur which should be reflected in a better sleep quality. Low heart rates and low respiratory rates (Benson et al., 1981) that come with high levels of relaxation help harmonize one's actual arousal pattern with one's biological arousal pattern (Zijlstra et al., 2014). This harmonization is important for a good sleep quality (Loft & Cameron, 2014). Experiencing high mastery implies feelings of competence (Ryan & Deci, 2000). If happening shortly before bedtime, the energetic uplift that is associated with feelings of competence (Sheldon & Houser-Marko, 2001) might hinder falling asleep. However, if employees experience high mastery earlier during the evening, the associated feelings of competence might foster employees' confidence and thus reduce adverse cognitions that impair sleep quality. High control enables employees to design the evening in a way to promote recovery and a good sleep quality. For instance, before going to bed one might rather decide to engage in activities that facilitate a good sleep quality. In sum, recovery experiences should be positively associated with sleep quality. Surprisingly, previous diary studies only examined and supported the association between psychological detachment and sleep quality (e.g., Clinton et al., 2017; Liu et al., 2021). Relationships of relaxation, mastery experiences, and control with sleep quality did not receive a lot of research attention.

Sleep quality, in turn, should predict start-of-work mood. Due to the restorative function of sleep (Horne, 2001), employees' wakefulness should be higher after a night with a good sleep quality. Similarly, employees should face the workday with higher levels of calmness because they have more energy available to deal with the upcoming tasks and demands. Experiencing a good sleep quality might also be a positive event itself and thus be associated with pleasantness (Weiss & Cropanzano, 1996). In line with this reasoning, daily sleep quality was found to be associated with low fatigue, high calmness, and high pleasant affect (Sin et al., 2017; Sonnentag et al., 2008) in the next morning.

However, there might also be parts of the association between recovery experiences and start-of-work mood that are not explained by a better sleep quality. For instance, on mornings when thinking about the mastery experience of the evening before, employees might experience an energetic uplift. Similarly, thinking in the morning about a very relaxing evening might enhance one's pleasantness. Thus, we propose that sleep quality *partially* mediates the relationship between recovery experiences and start-of-work mood.

> **Hypothesis 4.** Evening recovery experiences of (a) psychological detachment, (b) relaxation, (c) mastery experiences, and (d) control show positive relationships with start-of-work wakefulness (i.e., intercept) which are partially mediated by sleep quality.

> **Hypothesis 5.** Evening recovery experiences of (a) psychological detachment, (b) relaxation, (c) mastery experiences, and (d) control show positive relationships with start-of-work calmness (i.e., intercept) which are partially mediated by sleep quality.

Hypothesis 6. Evening recovery experiences of (a) psychological detachment, (b) relaxation, (c) mastery experiences, and (d) control show positive relationships with start-of-work pleasantness (i.e., intercept) which are partially mediated by sleep quality.

Recovery experiences and change of mood

Moreover, we propose that employees' evening recovery experiences are indirectly related to *declines of their positive mood states* (i.e., linear slopes) via sleep quality and start-of-work mood. Specifically, we expect that on days with low levels of positive start-of-work mood states originating from a poor sleep quality following low evening recovery experiences, employees' mood declines less strongly during the workday than on days with high levels of positive start-of-work mood states originating from a good sleep quality following high evening recovery experiences. According to ERM (Meijman & Mulder, 1998), employees choose their work behaviours depending on their current psychophysiological state. Start-of-work mood states constitute such crucial states based on which employees decide what to do at work and consequently, how much effort to invest into work (Zijlstra et al., 2014). On days with comparably low levels of positive start-of-work mood states, employees might show different work behaviours than on days with comparably high levels of positive start-of-work mood states. Consequently, employees' start-of-work mood states can be crucial for how employees handle the workday, that, in turn, is mirrored in mood changes during the workday.

The ERM (Meijman & Mulder, 1998) does, however, not make specific assumptions about *how* employees' mood states change during a workday depending on their psychophysiological states (i.e., start-of-work mood). To shed light on this question, we rely on the conservation of resource theory (COR; Hobfoll, 2001) that argues "when people's resources are outstretched or exhausted, they enter a defensive mode to preserve the self" (Hobfoll et al., 2018, p. 106) and "to conserve remaining resources" (Halbesleben et al., 2014, p. 1337). Employees' start-of-work mood can vary strongly between days (Rothbard & Wilk, 2011) and thus might serve as a daily indicator of how many resources are available on a specific day. Experiencing a lower level of positive mood states than usual might signal that less resources are available. Contrarily, experiencing a higher level of positive mood states than usual might signal the availability of more resources. Accordingly, having lower levels of positive start-of-work mood states than usual can put employees in a defensive state. Hence, employees might use less effortful strategies to meet their work demands on days with lower positive start-of-work mood states than on days with higher positive start-of-work mood states. In turn, employees' mood should show a weaker decline on days with lower positive start-of-work mood states than on days with higher positive start-of-work mood states.

This reasoning is in line with motivational theories such as the expectancy theory (Vroom, 1964). Accordingly, expectancy (i.e., employees' beliefs that their efforts will result in an expected performance), instrumentality (i.e., employees' beliefs that attaining a performance is associated with a certain reward), and valence (i.e., the value that employees attribute to the reward) are the main drivers of motivation (Ilgen et al., 1981). Start-of-work mood states might shape these cognitions involved in motivational processes. For instance, higher favourable start-of-work mood states might broaden employees' thought-action repertoires (Fredrickson, 2001) such that employees experience higher cognitive flexibility and thus expect their efforts to result in higher performance (i.e., higher expectancy). Consequently, employees might experience higher motivation on days that start with higher levels of positive mood states than usual (e.g., Debus et al., 2014; Gerpott et al., 2022). Higher motivation, in turn, comes with a higher investment of resources. Hence, positive mood states might decrease more strongly on days that start with higher levels of these states than on days that start with lower levels of these states.

Starting with lower wakefulness into the workday than usual means that employees have lower energy available than usual. Hence, in line with COR (Hobfoll, 2001), they might try to prevent the already low level of energy from a further decline (Ito & Brotheridge, 2003; Muraven et al., 2006) and aim to conserve the remaining energy (Halbesleben et al., 2014). On those days, employees might, for instance, adapt their work behaviour by focussing on easier tasks or taking more breaks (e.g., Kim et al., 2022). Moreover, on those days, employees might experience lower levels of motivation, however, they usually are still motivated to meet at least minimum performance standards (Howard et al., 2016) investing a certain amount of energy. Consequently, because less energy is invested (Boksem & Tops, 2008) or energy is even regained during breaks (e.g., Bosch et al., 2018), wakefulness should follow a weaker decline throughout the day. In contrast, on days on which employees have a higher start-of-work wakefulness than usual, we do not expect employees to enter such a defensive state. Instead, having more energy available than usual allows them to invest more energy into work (Meijman & Mulder, 1998; Zijlstra et al., 2014). Further one might speculate that having more energy available than usual might make employees perceive that their effort will result in higher performance (i.e., higher expectancy) because of better cognitive functioning (e.g., Horvat & Tement, 2020; Jonsdottir et al., 2013). Hence, employees might be more motivated to work on their tasks resulting in a higher effort and energy investment. Indeed, it was found that employees perform better during the day when starting the day with lower levels of fatigue (i.e., higher levels of wakefulness) than usual (Dettmers et al., 2020). Consequently, when employees experience high start-of-work wakefulness, they should experience a stronger decline in their wakefulness over the course of the day. Taken together, on days that start with lower (vs. higher) wakefulness, employees should experience a weaker (vs. stronger) decline of their wakefulness during the workday.

Similarly, starting the workday with lower calmness than usual refers to an unfavourable state. Again, employees might want to cope with this unfavourable state by trying to avoid a further decline of their already low level of calmness (Hobfoll, 2001). For instance, experiencing lower start-of-work calmness than usual, employees might be more likely to avoid difficult or distressing situations which might further lower their calmness. Furthermore, they might try to reduce their workload, postpone some tasks to the subsequent day or ask colleagues for support. In contrast, experiencing higher levels of start-of-work calmness than usual might allow employees to take a more relaxed view on the upcoming workday. This positive view might make employees reappraise upcoming tasks more favourably resulting in higher motivation (Erez & Isen, 2002). For instance, employees might see difficult situations less distressing or even feel to have the calmness to actually face them and find solutions. Experiencing higher levels of calmness than usual might also convey the feeling of control and competence such that employees might perceive their effort to more likely result in high performance (i.e., higher expectancy). Thus, employees might be more likely to accept additional tasks or to make use of their calmness by trying to find solutions for problems or conflicting situations. These behaviours, however, need an additional effort investment and might make employees upregulate their arousal levels (Zijlstra et al., 2014). Hence, calmness might be reduced more strongly over the workday. In sum, on days with a lower (vs. higher) start-of-work calmness, employees might experience a weaker (vs. stronger) decrease in their calmness during the workday.

Also start-of-work pleasantness can be relevant for how pleasantness changes during the workday. Experiencing lower levels of pleasantness at the beginning of work than usual might, according to COR (Hobfoll, 2001), again signal that less resources are available than usual. Thus, employees might again enter a defensive state motivating them to conserve the remaining level of pleasantness (Hobfoll, 2001). For instance, on days with low levels of morning pleasantness, employees might try to avoid unfavourable tasks (e.g., working on administrative things that are not the core tasks of one's job) in order to preserve their low level of pleasantness from further declining. Similarly, employees were found to take more breaks on days they start with higher levels of negative affect than usual (Rothbard & Wilk, 2011) which might help them to improve their mood (Trougakos et al., 2008). Consequently, employees' pleasantness should decrease less steeply or be rather stable during those days. In contrast, when experiencing a higher start-of-work pleasantness than usual, employees might approach the workday differently. For instance, positive affect was found to be positively associated with perceptions of expectancy, instrumentality, and valence resulting in higher motivation (Erez & Isen, 2002). Hence, on days with higher start-of-work pleasantness than usual, employees might evaluate their work tasks more favourably such that they are more strongly motivated to invest resources to fulfil their tasks. Indeed, it was found that start-of-work positive affect is related to higher daily performance (Rothbard & Wilk, 2011) and proactive behaviour (Ouyang et al., 2019). However, as the day progresses, employees might become aware of this increased resource investment or realize that they took on too much so that pleasantness should decrease more strongly during the workday. Taken together, on days with a lower (vs. higher) start-of-work pleasantness, employees might experience a weaker (vs. stronger) decline of their pleasantness during the workday.

In line with the assumptions of COR (Hobfoll, 2001) that employees enter a defensive mode and try to conserve remaining resources when resources are exhausted, research found that employees show more withdrawal behaviour (Chong et al., 2020) and invest their limited resources strategically (Halbesleben & Wheeler, 2011) when resources are low. Moreover, examining the change of fatigue during a workday, Hülsheger (2016) showed that after a night with a poor sleep quality, employees tended to experience similar levels of fatigue at the beginning and at the end of work, whereas after a night with a good sleep quality, employees experienced an increase of fatigue during the workday. Further, starting into the workday with higher levels of positive mood states than usual was found to come with higher levels of motivation during the workday such as flow and work engagement (e.g., Debus et al., 2014; Venz et al., 2018). Overall, both resource and motivational perspectives help explain the association between start-of-work mood and mood changes during the workday.

Building on our previous set of hypotheses that recovery experiences are – partially mediated by sleep quality – positively related to start-of-work mood, we propose cross-domain effects (i.e., from home to work) of recovery experiences. We suggest a serial mediation model for the relation between recovery experiences and change of mood during the workday. Specifically, recovery experiences should show an indirect negative association with the change of mood during the workday that is serially mediated by sleep quality and start-of-work mood.

> **Hypothesis 7.** Evening recovery experiences of (a) psychological detachment, (b) relaxation, (c) mastery experiences, and (d) control show negative relationships with the linear slope of wakefulness during the workday which are serially mediated by sleep quality and start-of-work wakefulness.

> **Hypothesis 8.** Evening recovery experiences of (a) psychological detachment, (b) relaxation, (c) mastery experiences, and (d) control show negative relationships with the linear slope of calmness during the workday which are serially mediated by sleep quality and start-of-work calmness.

> **Hypothesis 9.** Evening recovery experiences of (a) psychological detachment, (b) relaxation, (c) mastery experiences, and (d) control show negative relationships with the linear slope of pleasantness during the workday which are serially mediated by sleep quality and start-of-work pleasantness.

METHOD

Sample and procedure

We conducted an online diary study with five measurement occasions per day over two workweeks. To recruit employees from various occupations, we posted advertisements about the study on a social networking site (www.xing.com[2]). For participation, employees had to be of legal age and to work full-time

[2]Xing is a professional network mainly used by German-speaking employees and employers. Members can, for instance, provide information about their career and access sector-specific news and job ads. At the time of data collection, Xing had about 17 million members. Organizations from various industries are represented (e.g., internet and information technology (15.6%), consulting (9.6%), marketing (8.3%), consumer goods and trade (8.2%), industry and engineering (8.2%)).

at least 3 days a week. Moreover, shift workers were excluded from participation. Depending on the number of daily surveys completed, participants were compensated with up to 25 Euros.

In total, 215 employees registered for participation. Out of these, 161 employees filled in a general survey (74.88%) and 124 employees completed all five daily surveys on at least 1 day (57.67%). In sum, participants completed 846 surveys at the first occasion, 775 surveys at the second occasion, 756 surveys at the third occasion, 744 surveys at the fourth occasion, and 761 surveys at the fifth occasion (i.e., 3,882 data points in total).[3] On 555 days, participants completed all five surveys. However, as recommended, we also included days with missing values at some occasions (Singer & Willet, 2003). Thus, our final sample comprised 124 employees and 887 days.[4] About two-thirds of the participants were female (63.41%). Participants' age ranged from 21 to 65 years, with the median being between 36 and 40 years (SD = 10.80 years). More than two-thirds held a university degree (67.50%). Participants were employed in various occupations, holding various positions (e.g., business economists, sales managers, and natural scientists). Participants' professional tenure ranged from less than 1 year to more than 30 years with a median between 3 and 4 years. Participants reported that their jobs were generally characterized by medium levels of workload (M = 2.82, SD = 1.01, assessed with five items from Spector & Jex, 1998) as well as relatively high levels of complexity (M = 3.81, SD = .68, assessed with five items from Semmer et al., 1999), autonomy (M = 3.87, SD = .63, assessed with five items from Semmer et al., 1999), and team-member-exchange (M = 3.84, SD = .65, assessed with five items from Seers, 1989). Moreover, participants reported relatively low levels of chronic exhaustion (M = 1.90, SD = .79, assessed with 14 items from Shirom & Melamed, 2006), medium levels of job involvement (M = 3.25, SD = .66, assessed with five items from Kanungo, 1982), and high levels of work-related self-efficacy (M = 4.08, SD = .48, assessed with eight items adapted from Chen et al., 2001).[5]

Approximately 1 week before the daily surveys, participants received the link to a general survey. During registration, participants provided information on their working times allowing us to individually tailor the times when the links to the daily surveys were sent. Participants were instructed to fill in the first daily survey shortly before the beginning of work, the second to fourth daily surveys approximately every 2 h, and the last survey at the end of work. Figure 2 illustrates the administration of daily surveys in greater detail.

Measures

The general survey assessed demographics and background information needed to characterize the sample. In all daily surveys, we measured participants' momentary mood. In the first daily survey, we additionally assessed participants' sleep quality of the previous night and their recovery experiences of the previous evening. In the second to fourth daily survey, we additionally assessed work events and work breaks. Table 1 shows descriptives, correlations, variance decomposition results, and reliability estimates of these variables.

Momentary mood

We measured participants' momentary mood with four items each for wakefulness, calmness, and pleasantness from the Multidimensional Mood Questionnaire (Steyer et al., 1997). Participants reported on a five-point scale (1 = *not at all* to 5 = *totally*), for example, how "awake", "calm" or "pleasant" they felt at the respective moment.

[3]We did not include data collected on Mondays because employees did not work on Sundays and thus did not report after-work recovery experiences in the evening.

[4]Out of the 124 participants, one participant did not report demographic information.

[5]The scales range from 1 to 5 with 1 indicating a low level and 5 indicating a high level of the corresponding construct.

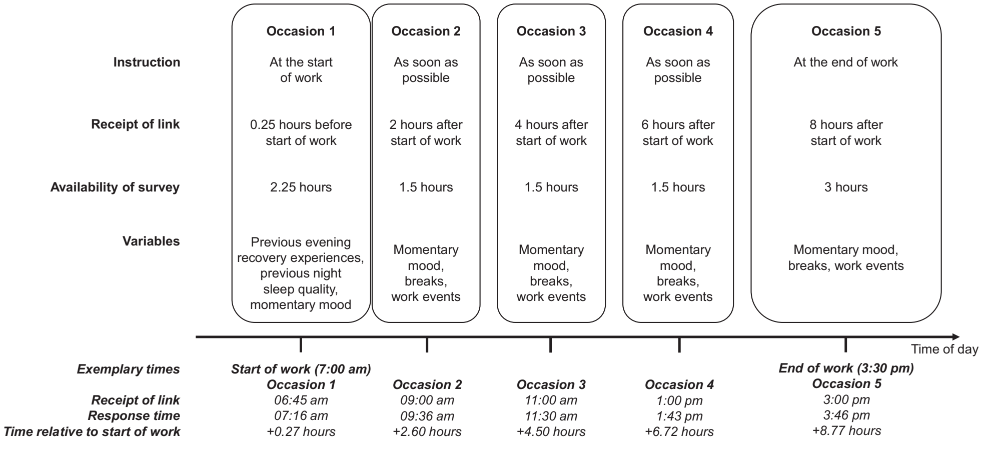

FIGURE 2 Course of daily surveys. *Note*: The width of the boxes corresponds to the accessibility of the daily surveys. Because variables regarding the previous evening and night were assessed in the first survey, this survey was accessible for a longer period than the surveys at occasions 2 to 4. An additional reminder to the first survey was sent 1.75 h after the initial receipt of the link. An exemplary response pattern is displayed in italics at the bottom part of the figure. Hours are relative to the start of work with the start of work representing the time point of zero.

Sleep quality

We measured participants' sleep quality with one item from the Pittsburgh Sleep Quality Index (Buysse et al., 1998; for validity testing see Hahn et al., 2011). Participants answered the question "How do you evaluate this night's sleep?" on a 5-point scale (1 = *very bad* to 5 = *very good*).

Recovery experiences

We measured participants' recovery experiences with the Recovery Experience Questionnaire (Sonnentag & Fritz, 2007) which assesses each recovery experience with four items. Participants answered all items on a five-point scale (1 = *I fully disagree* to 5 = *I fully agree*). Sample items are "Yesterday evening, I didn't think about work at all" for psychological detachment, "Yesterday evening, I used the time to relax" for relaxation, "Yesterday evening, I sought out intellectual challenges" for mastery experiences, and "Yesterday evening, I decided my own schedule" for control.

Control variables

Work events

Because work events are related to affective reactions (Weiss & Cropanzano, 1996), we controlled for work events when predicting mood trajectories. We asked participants whether they had experienced certain events since the previous survey or, in case they did not fill in the previous survey, within the last 2 h. Following Venz et al. (2020), we distinguished four categories of events: Positive task-related events, negative task-related events, positive interpersonal events, and negative interpersonal events. Each event category was assessed with four dichotomous items (i.e., event either occurred or did not occur) which we summed up to one sum score per event category and occasion. Further, we built person means for each event category. All items started with "Since the previous survey, …". Sample items are "… I came across an interesting problem or topic" for positive task-related events, "I have encountered an unexpected or new difficulty in continuing a planned activity" for negative task-related

TABLE 1 Three-level correlations among study variables and descriptive statistics of study variables.

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Occasion level																	
1	Breaks	(–)															
2	Wakefulness	−.01	(.70)														
3	Calmness	−.02	.33	(.66)													
4	Pleasantness	.01	.42	.56	(.63)												
Day level																	
2	Wakefulness		(.94)														
3	Calmness		.60	(.90)													
4	Pleasantness		.76	.80	(.91)												
5	Psychological detachment		.16	.27	.20	(.87)											
6	Relaxation		.23	.35	.26	.43	(.87)										
7	Mastery experiences		.11	.19	.12	.05	.01	(.80)									
8	Control		.15	.35	.20	.37	.66	.10	(.83)								
9	Sleep quality		.51	.31	.36	.19	.11	.08	.09	(–)							
10	Positive task-related events		.22	.20	.22	−.02	.04	.12	.06	.11	(–)						
11	Negative task-related events		−.14	−.32	−.24	−.07	−.14	−.05	−.09	−.05	05	(–)					
12	Positive interpersonal events		.27	.25	.30	.03	.03	.05	.04	.05	.52	11	(–)				
13	Negative interpersonal events		−.01	−.14	−.12	.04	−.04	−.01	−.03	.02	−03	.25	−03	(–)			
14	Weekday		−.03	.01	−.04	−.05	.01	−.05	.01	.02	−.06	−.03	−.02	−.03	(–)		
15	Sine		.03	.001	.04	.05	−.01	.04	−.02	−.03	.05	.02	.02	.02	−.97	(–)	
16	Cosine		−.01	.01	−.01	−.02	−.01	−.05	−.02	−.02	−.06	−.03	−.04	−.05	.56	−.40	(–)

(Continues)

TABLE 1 (Continued)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Person level																	
2	Wakefulness		(.95)														
3	Calmness		.87	(.91)													
4	Pleasantness		.90	.93	(.92)												
5	Psychological detachment		.36	.43	.39	(.99)											
6	Relaxation		.52	.51	.48	.62	(.95)										
7	Mastery experiences		.27	.17	.23	.22	.33	(.96)									
8	Control		.55	.62	.59	.65	.75	.38	(.95)								
9	Sleep quality		.71	.65	.70	.33	.53	.36	.49	(–)							
10	Positive task-related events		.20	.29	.32	.09	.29	.34	.33	.23	(–)						
11	Negative task-related events		–.19	−.27	−.25	−.19	−.11	.15	−.23	−.14	.06	(–)					
12	Positive interpersonal events		.39	.44	.53	.02	.22	.07	.18	.07	.61	.20	(–)				
13	Negative interpersonal events		−.37	−.38	−.42	−.21	−.17	−.05	−.15	−.32	−.22	.48	.13	(–)			
Descriptives																	
Mean		.29	3.70	3.93	4.11	3.63	3.41	2.36	3.87	3.60	.74	1.35	.09	1.48	3.45	−.14	−.46
$SD_{\text{Occasion Level}}$		.46	.46	.41	.35												
$SD_{\text{Day Level}}$			.33	.29	.29	.82	.83	.80	.74	.71	.50	.56	.20	.65	1.11	.75	.46
$SD_{\text{Person Level}}$			.64	.59	.56	.88	.69	.60	.61	.56	.50	.57	.13	.64			
$\text{Var}_{\text{Occasion Level}}$		1.00	.29	.28	.23												
$\text{Var}_{\text{Day Level}}$			.15	.14	.16	.47	.60	.64	.60	.61	.51	.50	.49	.70	1.00	1.00	1.00
$\text{Var}_{\text{Person Level}}$			.56	.58	.61	.53	.40	.36	.40	.39	.49	.50	.51	.30			

Note: Cronbach's alpha at the three levels is displayed in parentheses on the diagonals. *SD* = standard deviation, Var = percentage of variance at the respective level. Correlations at occasion level (3882 observations) are significant on following level: $r \geq .32$ $p < .001$. Correlations at day level (887 days) are significant on following levels: $r \geq |.09|$ $p < .05$, $r \geq |.16|$ $p < .01$, $r \geq |.20|$ $p < .001$. Correlations at person level (124 persons) are significant on following levels: $r \geq |.22|$ $p < .05$, $r \geq |.29|$ $p < .01$, $r \geq |.35|$ $p < .001$.

events, "… I have had a good conversation with other people at work" for positive interpersonal events, and "… other people at work have taken out their bad moods on me" for negative interpersonal events. Because the items of an event category do not have to be interrelated (e.g., encountering an interesting problem and achieving what one has hoped for as examples of the category positive task-related events), we neither computed reliabilities nor ran confirmatory factor analyses.

Breaks

Further, we asked participants whether they had taken a break since the previous survey or, in case they did not fill in the previous survey, within the last 2h. This break variable was dichotomous with the score of 1 indicating that participants had taken at least one break and the score of 0 indicating that participants did not take any breaks. Because breaks bring the opportunity to recover (Bosch et al., 2018) and thus might foster positive mood states, we controlled for breaks when predicting mood trajectories.

Day of the week

We also controlled for the day of the week (i.e., coding the days by increasing numbers, from Tuesdays coded as 2 to Fridays coded as 5). Moreover, we included sine and cosine of the day of the week to control for cyclical trends (Gabriel et al., 2019).

Preliminary analyses

We conducted multilevel confirmatory factor analyses using the R-package lavaan (Rosseel, 2012). The measurement model that specified the recovery experiences to be four different factors (psychological detachment, relaxation, mastery experiences, and control) fit the data best (χ^2 (196) = 477.12, $p < .001$, CFI = .97, TLI = .96, RMSEA = .04) and showed that all four recovery experiences are distinct constructs.

For the three mood constructs, we conducted multilevel confirmatory factor analyses separately for the five occasions. Measurement models that specified three second-order factors (wakefulness, calmness, and pleasantness) with six first-order factors (for each second-order factor one factor on which the respective positively framed items loaded and one factor on which the respective negatively framed items loaded) fit the data at all measurement occasions reasonably well (χ^2 (90) ≥ 454.43, $p < .001$, CFI ≥ .92, TLI ≥ .88, RMSEA = .07).

Further, we tested for measurement invariance of the mood measures across the workday. We therefore used the person-mean centred items and followed the guidelines by Rudnev et al. (2018) for testing measurement invariance in models with higher-order factors. The results indicated second-order scalar invariance for wakefulness (χ^2 (134) = 263.707, $p < .001$, CFI = .98, TLI = .97, RMSEA = .03), calmness (χ^2 (134) = 339.392, $p < .001$, CFI = .97, TLI = .95, RMSEA = .04), and pleasantness (χ^2 (134) = 394.33, $p < .001$, CFI = .96, TLI = .94, RMSEA = .04) over the workday.[6]

Analyses

The nature of our study design resulted in a hierarchically nested data structure (Level 3: person, Level 2: day, Level 1: occasion). To take the nonindependence of our data into account, we conducted multilevel growth curve analyses and multilevel path analyses using Mplus 7.4 (Muthén & Muthén, 1998–2015). We decomposed the variance of the manifest variables by modelling the relationships at multiple levels (Preacher et al., 2010). More specifically, we specified the mood trajectories at the occasion level

[6]Detailed information on the multilevel confirmatory factor analyses as well as analyses of measurement invariance are available in the Appendix S1.

allowing the intercepts and slopes to vary randomly at the day and person levels. Further, we modelled the relationships between the day-level variables and the random intercepts and slopes of the mood trajectories at the day and person levels. Consequently, separate path coefficients for the day-level and person-level relationships were estimated.

Regarding the multilevel growth curve models, we started by specifying the time variable to capture the hours since the beginning of work (based on time stamps from daily surveys) with the time point of 0 representing the beginning of work.[7] Subsequently, we specified separate multilevel growth curve models for the three mood dimensions. In a first step, we tested a linear trajectory by adding the linear time variable as predictor of mood at the occasion level (Hypotheses 1, 2, 3). We thereby specified the intercept and the linear slope to vary randomly at the day and person levels. To answer our research question, we also tested higher-order mood trajectories. Thus, in a second step, we tested a quadratic trajectory by additionally including a quadratic time variable as predictor (and, if possible, specifying the quadratic slope to be random). In a third step, we tested a cubic trajectory by additionally including a cubic time variable as predictor (and, if possible, specifying the cubic slope to be random). In this stepwise procedure, we also controlled for the break variable.

After having specified the trajectories that described the developments of the mood dimensions best, we specified for each mood dimension a set of two mediation models. Following Bliese and Ployhart (2002), we specified one mediation model to predict the intercept (i.e., start-of-work mood) and another mediation model to predict the linear slope of the growth curves. In both mediation models, we controlled for day-of-the-week effects. In the first mediation model (Models a in Table 3), we specified recovery experiences to predict sleep quality and mood intercepts. Further, we included sleep quality as predictor of mood intercepts and modelled the indirect effects of recovery experiences on mood intercepts via sleep quality (Hypotheses 4, 5, and 6). In the second mediation model (Models b in Table 3), we additionally included the prediction of the linear mood slopes. In detail, we specified recovery experiences, sleep quality, and mood intercepts as direct predictors of the linear mood slopes and modelled the indirect effects of the recovery experiences on the linear mood slopes via sleep quality and mood intercepts (Hypotheses 7, 8, and 9). Thereby, we controlled for day of the week, sine, and cosine as predictors of sleep quality, start-of-work mood, and mood slopes as well as for work events as predictors of mood slopes. We further allowed for correlations between the recovery experiences as focal predictors.

RESULTS

We first examined the variance components of the mood dimensions at the person, the day, and the occasion level. As Table 1 shows, the mood dimensions had a relevant amount of variance at each level so that three-level modelling was appropriate.

Mood trajectories

To examine how mood develops during the workday, we first tested a linear trend with random slopes between days and persons and subsequently tested higher-order trends (Table 2). Supporting Hypotheses 1, wakefulness decreased during the workday (linear time trend: $b = -.037$, $SE = .005$, $p < .001$). With respect to higher-order trends, a quadratic trajectory with the linear and quadratic slopes varying randomly between days and persons described the development of wakefulness during the workday best (linear time trend: $b = .010$, $SE = .013$, $p = .410$; quadratic time trend: $b = -.006$, $SE = .001$, $p < .001$).[8]

[7]In case participants did not provide information on their daily beginning of work (3.70% of all days), we imputed their individual mean beginning time.

[8]Without breaks as a control variable at the occasion level a cubic trajectory fit the data best (linear time trend: $b = .040$, $SE = .019$, $p = .032$; quadratic time trend: $b = -.015$, $SE = .005$, $p = .002$; cubic time trend: $b = .001$, $SE = .0004$, $p = .047$).

TABLE 2 Multilevel growth curve models of wakefulness, calmness, and pleasantness.

	Wakefulness			Calmness			Pleasantness	
	Null model	**Linear model**	**Final model**	**Null model**	**Linear model**	**Final model**	**Null model**	**Final model**
Fixed components								
Intercept	3.702*** (.059)	3.824*** (.060)	3.785*** (.060)	3.929*** (.054)	3.968*** (.060)	3.985*** (.057)	4.108*** (.052)	4.121*** (.053)
Occasion-level predictors								
Breaks		.070*** (.019)	.034 (.019)		.014 (.016)	.029 (.017)		.017 (.014)
Time		−.037*** (.005)	.010 (.013)		−.012** (.004)	−.033*** (.009)		−.005 (.003)
Time^2			−.006*** (.001)			.003* (.001)		
Variance components								
Occasion level								
(Residual) Variance	.208*** (.015)	.167*** (.014)	.162*** (.014)	.167*** (.014)	.146*** (.012)	.146*** (.012)	.121*** (.010)	.110*** (.010)
Day level								
Intercept	.107*** (.015)	.110*** (.015)	.112*** (.015)	.086*** (.013)	.084*** (.014)	.084*** (.014)	.080*** (.012)	.078*** (.012)
Time		.001** (.0003)	.0003 (.0004)		.001** (.0002)	.001** (.0002)		.0004* (.0002)
Time^2			<.0001 (<.0001)					
Person level								
Intercept	.408*** (.059)	.405*** (.065)	.404*** (.065)	.345*** (.058)	.366*** (.060)	.365*** (.061)	.316*** (.045)	.320*** (.045)
Time		.002*** (.0005)	.002*** (.001)		.001** (.0004)	.001** (.0004)		.001*** (.0002)
Time^2			<.0001 (<.0001)					

Note: Time is coded as hours since the beginning of work. The table displays the unstandardized estimates and the respective standard errors in parentheses. For pleasantness, the final model represents the linear model.

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

On average, employees experienced a slight increase in wakefulness in the first hour after starting work which was followed by a decrease in wakefulness.

Supporting Hypothesis 2, calmness decreased during the workday (linear time trend: $b = -.012$, $SE = .004$, $p = .004$). With respect to higher-order trends, a quadratic trajectory with the linear slope varying randomly between days and persons described the development of calmness during the workday best (linear time trend: $b = -.033$, $SE = .009$, $p < .001$; quadratic time trend: $b = .003$, $SE = .001$, $p = .009$). On average, employees first experienced a decrease in calmness which was followed by an increase in calmness around 5.5 h after the start of work.

Pleasantness, in contrast, did not show a systematic trend during the workday (linear time trend: $b = -.005$, $SE = .003$, $p = .130$), providing no support for Hypothesis 3. However, to be able to test the prediction of the slope, we included the linear time trend as predictor in our model and allowed the linear slope to vary randomly between days and persons. Figure 3 shows the general daily trajectories for wakefulness, calmness, and pleasantness.

Sleep quality as partial link between evening recovery experiences and mood intercepts

We first tested the effects of evening recovery experiences on mood intercepts that we expected to be partially mediated by sleep quality (Table 3). Concerning the indirect relations between recovery experiences and start-of-work wakefulness, psychological detachment was positively related to start-of-work wakefulness via sleep quality (.038, 95% CI [.0166; .0618][9]), but relaxation (.008, 95% CI [−.0207; .0379]), mastery experiences (.015, 95% CI [−.0024; .0339]), and control (−.002, 95% CI [−.0339; .0280]) were not. Regarding the direct relations between recovery experiences and start-of-work wakefulness, relaxation showed a positive association ($b = .079$, $SE = .024$, $p = .001$), but psychological detachment ($b = -.012$, $SE = .016$, $p = .441$), mastery experiences ($b = .033$, $SE = .018$, $p = .067$), and control ($b = -.001$, $SE = .029$, $p = .984$) did not. These results provide partial support for Hypotheses 4a and 4b. The total effects of recovery experiences on mood intercepts[10] are reported in Table 5.

Concerning the indirect relations between recovery experiences and start-of-work calmness, psychological detachment was positively related to start-of-work calmness via sleep quality (.018, 95% CI [.0071; .0300]), but relaxation (.004, 95% CI [−.0101; .0176]), mastery experiences (.007, 95% CI [−.0011; .0164]), and control (−.001, 95% CI [−.0155; .0138]) were not. Regarding the direct relations between recovery experiences and start-of-work calmness, relaxation ($b = .060$, $SE = .030$, $p = .046$), mastery experiences ($b = .055$, $SE = .018$, $p = .002$), and control ($b = .071$, $SE = .034$, $p = .038$) showed positive associations, but psychological detachment ($b = .031$, $SE = .019$, $p = .108$) did not. These results provide partial support for Hypothesis 5.

Concerning the indirect relations between recovery experiences and start-of-work pleasantness, psychological detachment was via sleep quality positively related to start-of-work pleasantness (.022, 95% CI [.0095; .0359]), but relaxation (.005, 95% CI [−.0115; .0224]), mastery experiences (.008, 95% CI [−.0014; .0202]), and control (−.001, 95% CI [−.0195; .0164]) were not. Regarding the direct relations between recovery experiences and start-of-work pleasantness, relaxation showed a positive association ($b = .066$, $SE = .022$, $p = .002$), but psychological detachment ($b = .015$, $SE = .018$, $p = .425$), mastery experiences ($b = .033$, $SE = .020$, $p = .101$), and control ($b = .014$, $SE = .023$, $p = .537$) did not. These results provide partial support for Hypotheses 6a and 6b.

[9]We computed the confidence intervals (CI) for indirect effects using the Monte Carlo method with 20.000 repetitions (Preacher & Selig, 2010).

[10]We computed the total effects based on the overall models reported in Table 3 by summing up all possible indirect effects and the direct effects of the recovery experiences on mood intercepts and mood slopes, respectively.

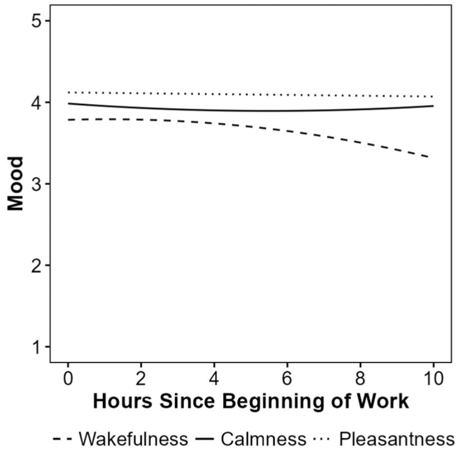

FIGURE 3 General mood trajectories.

Sleep quality and start-of-work mood as sequential links between evening recovery experiences and mood slopes

Next, we tested the effects of evening recovery experiences on mood slopes that we expected to be serially mediated by sleep quality and mood intercepts (Table 4). Regarding the slope of wakefulness as outcome, psychological detachment was negatively related to the slope of wakefulness via sleep quality and start-of-work wakefulness (−.003, 95% CI [−.0066; −.0013]), but relaxation (−.001, 95% CI [−.0041; .0017]), mastery experiences (−.001, 95% CI [−.0036; .0001]), and control (.00008, 95% CI [−.0029; .0030]) were not. Concerning indirect effects via start-of-work wakefulness only, relaxation was indirectly related to the slope of wakefulness (−.007, 95% CI [−.0130; −.0023]), but psychological detachment (.002, 95% CI [−.0013; .0048]), mastery experiences (−.003, 95% CI [−.0066; .00004]), and control (−.0001, 95% CI [−.0036; .0055]) were not. Figure 4a shows that when experiencing a lower start-of-work wakefulness, wakefulness decreased less strongly during the workday (simple slope[11]: $b = -.016$, $SE = .008$, $p = .034$) than when experiencing a higher start-of-work wakefulness (simple slope: $b = -.059$, $SE = .008$, $p < .001$). Thus, results provide partial support for Hypotheses 7a and 7b. Information derived from the confidence areas of the trajectories suggests that the levels of wakefulness did no longer differ significantly about 5.5 h after the start of work. The total effects of recovery experiences on mood slopes are reported in Table 5.

Regarding the slope of calmness as outcome, psychological detachment was negatively related to the slope of calmness via sleep quality and start-of-work wakefulness (−.002, 95% CI [−.0034; −.0005]), but relaxation (−.0005, 95% CI [−.0019; .0009]), mastery experiences (−.001, 95% CI [−.0018; .00001]), and control (−.00001, 95% CI [−.0014; .0014]) were not. Concerning indirect effects via start-of-work calmness only, relaxation (−.004, 95% CI [−.0090; −.0003]) and mastery experiences (−.003, 95% CI [−.0063;−.0004]) were indirectly related to the slope of calmness, but psychological detachment (−.003, 95% CI [−.0061; .0001]) and control (−.003, 95% CI [−.0095; .0007]) were not. Figure 4b shows that when experiencing a lower start-of-work calmness, calmness tended to be stable during the workday (simple slope: $b = .005$, $SE = .007$, $p = .439$) whereas when experiencing a higher start-of-work calmness, calmness decreased during the workday (simple slope: $b = -.029$, $SE = .006$, $p < .001$). Thus, results provide partial support for Hypotheses 8a, 8b, and 8c. About 9.5 h after the start of work, the levels of calmness were no longer significantly different.

Regarding pleasantness, neither indirect effects of recovery experiences on mood slopes via sleep quality and start-of-work pleasantness (psychological detachment: −.001, 95% CI [−.0028; .00001], relaxation:

[11]We report estimations for values minus one standard deviation (i.e., low levels) and plus one standard deviation (i.e., high levels) from the mean value of the mood intercepts.

TABLE 3 Results of multilevel path analysis predicting wakefulness, calmness, and pleasantness.

		Wakefulness		Calmness		Pleasantness	
	Sleep quality	**Model a**	**Model b**	**Model a**	**Model b**	**Model a**	**Model b**
Occasion level							
Breaks		.069*** (.019)	.070*** (.019)	.014 (.016)	.016 (.016)	.017 (.013)	.019 (.013)
Time		−.037*** (.005)	−.123† (.075)	−.012** (.005)	.012 (.061)	−.005 (.003)	.020 (.057)
Residual variance		.163*** (.014)	.152*** (.013)	.145*** (.012)	.138*** (.011)	.108*** (.010)	.105*** (.010)
Day level							
Weekday	−.123 (.146)	−.045 (.080)	−.187† (.106)	.062 (.060)	.023 (.082)	−.003 (.067)	−.048 (.082)
Sine of weekday	−.214 (.194)	−.029 (.108)	−.207 (.141)	.093 (.079)	.048 (.113)	.018 (.090)	−.034 (.111)
Cosine of weekday	−.0004 (.094)	.039 (.050)	.095 (.066)	−.010 (.036)	−.014 (.046)	.013 (.040)	.020 (.049)
Psychological detachment	.154*** (.044)	−.012 (.016)	−.024 (.022)	.031 (.019)	.045† (.024)	.015 (.018)	.007 (.022)
Relaxation	.033 (.060)	.079** (.024)	.105** (.029)	.060* (.030)	.074* (.035)	.066** (.022)	.074** (.025)
Mastery experiences	.059 (.036)	.033† (.018)	.045† (.024)	.055** (.018)	.052* (.022)	.033 (.020)	.035 (.022)
Control	−.010 (.063)	−.001 (.029)	.001 (.034)	.071** (.034)	.062 (.038)	.014 (.023)	.031 (.027)
Sleep quality		.248*** (.026)	.340*** (.029)	.114*** (.022)	.182*** (.025)	.142*** (.021)	.198*** (.023)
Cross-level interactions							
Weekday × Time			.030* (.014)		.009 (.015)		.009 (.014)
Sine of weekday × Time			.038* (.019)		.010 (.021)		.010 (.019)
Cosine of weekday × Time			−.011 (.008)		.002 (.008)		.0003 (.008)
Pos. task-related events × Time			.015*** (.004)		.014** (.005)		.017*** (.004)
Neg. task-related events × Time			−.017** (.006)		−.031*** (.005)		−.021*** (.005)
Pos. interpersonal events × Time			.013* (.005)		.014** (.005)		.010* (.004)
Neg. interpersonal events × Time			.007 (.013)		−.004 (.011)		−.008 (.013)
Psychological detachment × Time			.003 (.004)		−.0003 (.003)		.004 (.003)
Relaxation × Time			−.003 (.004)		−.003 (.004)		−.002 (.004)
Mastery × Time			−.003 (.004)		.002 (.003)		−.002 (.003)
Control × Time			−.001 (.004)		.006 (.004)		−.004 (.005)
Sleep quality × Time			−.010† (.006)		−.013** (.006)		−.013* (.005)

TABLE 3 (Continued)

	Sleep quality	Wakefulness Model a	Wakefulness Model b	Calmness Model a	Calmness Model b	Pleasantness Model a	Pleasantness Model b
Start-of-work mood × Time			−.066*** (.014)		−.059*** (.015)		−.035† (.019)
Residual variance	.467*** (.039)	.072*** (.010)	.107*** (.019)	.060*** (.011)	.081*** (.015)	.060*** (.011)	.069*** (.014)
			Slope: .001*** (.0002)		Slope: .001*** (.0002)		Slope: .001* (.0002)
Person level							
Psychological detachment	−.037 (.097)	.034 (.092)	.048 (.093)	.068 (.094)	.089 (.095)	.049 (.084)	.071 (.086)
Relaxation	.302† (.154)	−.031 (.127)	−.040 (.129)	−.133 (.112)	−.162 (.114)	−.147 (.103)	−.170 (.104)
Mastery experiences	.175† (.100)	−.019 (.081)	−.007 (.080)	−.145† (.084)	−.127 (.085)	−.071 (.082)	−.056 (.081)
Control	.170 (.141)	.266† (.159)	.263 (.162)	.481** (.150)	.498** (.152)	.389** (.134)	.396* (.135)
Sleep quality		.697*** (.119)	.684*** (.121)	.529*** (.105)	.505*** (.107)	.590*** (.103)	.582*** (.107)
Cross-level interactions							
Pos. task-related events × Time			.015 (.011)		.009 (.007)		.011 (.007)
Neg. task-related events × Time			−.016 (.013)		.003 (.008)		−.003 (.007)
Pos. interpersonal events × Time			.002 (.011)		.012 † (.007)		.008 (.006)
Neg. interpersonal events × Time			.00004 (.046)		−.076* (.036)		−.042 (.031)
Psychological detachment × Time			−.013† (.008)		−.013† (.007)		−.012* (.005)
Relaxation × Time			.019 (.013)		.019* (.009)		.011† (.007)
Mastery × Time			−.014 (.012)		−.020** (.007)		−.012* (.006)
Control × Time			−.005 (.015)		.005 (.012)		.002 (.010)
Sleep quality × Time			.007 (.017)		.025* (.011)		.017 (.012)
Start-of-work Mood × Time			−.017 (.013)		−.044*** (.012)		−.031** (.012)
Residual variance	.211*** (.047)	.166*** (.027)	.171*** (.027)	.161*** (.027)	.176*** (.028)	.131*** (.021)	.137*** (.022)
			Slope: .002*** (.0004)		Slope: .0004** (.0002)		Slope: .0005** (.0002)

Note: Time is coded as hours since the beginning of work. The table displays the unstandardized estimates and the respective standard errors in parentheses. For each mood dimension, estimates result from the models describing a linear change in mood only. For each mood dimension, estimates result from two overall models: In Models a, recovery experiences were included as predictors of sleep quality and the mood intercept; sleep quality was included as the predictor of the mood intercept. In Models b, the linear mood slope was additionally predicted by the recovery experiences, sleep quality, and the mood intercept.

†$p < .10$. *$p < .05$. **$p < .01$. ***$p < .001$.

−.0003, 95% CI [−.0015; .0006], mastery experiences: −.0005, 95% CI [−.0015; .00009], control: .00001, 95% CI [−.0011; .0011]) nor indirect effects of recovery experiences on mood slopes via start-of-work pleasantness only (psychological detachment: .0002, 95% CI [−.0022; .0016], relaxation: −.003, 95% CI [−.0069; .0002], mastery experiences: −.001, 95% CI [−.0037; .00045], control: −.001, 95% CI [−.0044; .0007]) were significant. This result is due to the insignificant direct effect of start-of-work pleasantness on the slope of pleasantness ($b = -.035$, $SE = .019$, $p = .070$) and does, thus, provide no support for Hypothesis 9.

Additional analyses

To complement the analyses reported above, we exploratorily examined the prediction of the quadratic slope of wakefulness. However, the quadratic day-level slope of wakefulness was not significantly predicted by any of the variables included in our main analyses (Table S8 in the Appendix S1).

Additionally, because caffeine intake might be negatively related to depletion (Welsh et al., 2014), we examined if employees' caffeine intake predicts mood trajectories. Each day, in the last daily survey, participants reported how many cups of caffeinated beverages they consumed during the day. Results (Table S9 in the Appendix S1) showed that caffeine intake indeed predicts the quadratic slope of wakefulness. On days on which employees drank more caffeinated beverages than usual, the quadratic slope of wakefulness was less strongly pronounced (see Figure S1 in the Appendix S1).

Finally, we tested for the possibility of reverse causation in our model, namely if mood slopes predict subsequent recovery experiences. Results (Tables S10–S12 in the Appendix S1) provided only limited evidence for significant associations. Start-of-work wakefulness negatively predicted sleep quality. Thus, days that start with higher levels of wakefulness than usual seem to be followed by nights of poorer sleep quality. Moreover, the linear slopes of wakefulness, calmness, and pleasantness (marginally) significantly predicted relaxation, beyond the start-of-work wakefulness, calmness, and pleasantness, respectively. Hence, employees tended to experience higher levels of relaxation on days on which their mood states decreased less steeply than usual.

DISCUSSION

In our daily diary study, we investigated trajectories of the bipolar mood dimensions of wakefulness-tiredness, calmness-tenseness, and pleasantness-unpleasantness and their prediction by evening recovery experiences. Focusing our interpretations on the positive poles of wakefulness, calmness, and pleasantness, our study showed that, on average, wakefulness and calmness decreased during the workday, whereas pleasantness remained relatively stable. With respect to higher-order trends, wakefulness followed a negative quadratic and calmness a positive quadratic trajectory during the workday. Moreover, employees' evening recovery experiences were partly related to start-of-work mood. Whereas only psychological detachment was indirectly related to start-of-work mood states (i.e., wakefulness, calmness, and pleasantness) via sleep quality, relaxation was directly related to these mood states. Mastery experiences and control showed direct relationships with start-of-work calmness only. Results regarding the serial mediation are similar. Whereas psychological detachment was indirectly related to the slope of wakefulness and calmness via sleep quality and start-of-work wakefulness and calmness respectively, relaxation was indirectly related to the slope of wakefulness and calmness only via start-of-work wakefulness and calmness. Similarly, mastery experiences showed an indirect relationship with the slope of calmness via start-of-work mood. Overall, the prediction of the mood slopes showed the following pattern: Employees experienced a weaker decline of wakefulness and calmness during the workday after starting with low levels of start-of-work wakefulness and calmness, respectively, originating from low evening recovery experiences and a poor sleep quality. Moreover, our additional analyses on mood slopes predicting recovery experiences and sleep quality provided little support for reverse causation, suggesting that the direction of the effects is in line with our hypotheses.

TABLE 4 Indirect effects: recovery experiences predicting mood intercepts and linear mood slopes.

	Wakefulness	Calmness	Pleasantness
Day level			
Psychological detachment → Sleep quality → Intercept	**.038 [.0166; .0618]**	**.018 [.0071; .0300]**	**.022 [.0095; .0359]**
Psychological detachment → Sleep quality → Intercept → Linear slope	**−.003 [−.0066; −.0013]**	**−.002 [−.0034; −.0005]**	−.001 [−.0028; .00001]
Psychological detachment → Intercept → Linear slope	.002 [−.0013; .0048]	−.003 [−.0061; .0001]	.0002 [−.0022; .0016]
Relaxation → Sleep quality → Intercept	.008 [−.0207; .0379]	.004 [−.0101; .0176]	.005 [−.0115; .0224]
Relaxation → Sleep quality → Intercept → Linear slope	−.001 [−.0041; .0017]	−.0005 [−.0019; .0009]	−.0003 [−.0015; .0006]
Relaxation → Intercept → Linear slope	**−.007 [−.0130; −.0023]**	**−.004 [−.0090; −.0003]**	−.003 [−.0069; .0002]
Mastery → Sleep quality → Intercept	.015 [−.0024; .0339]	.007 [−.0011; .0164]	.008 [−.0014; .0202]
Mastery → Sleep quality → Intercept → Linear slope	−.001 [−.0036; .0001]	−.001 [−.0018; .0000]	−.0005 [−.0015; .00009]
Mastery → Intercept → Linear slope	−.003 [−.0066; .00004]	**−.003 [−.0063; −.0004]**	−.001 [−.0037; .00045]
Control → Sleep quality → Intercept	−.002 [−.0339; .0280]	−.001 [−.0155; .0138]	−.001 [−.0195; .0164]
Control → Sleep quality → Intercept → Linear slope	.00008 [−.0029; .0030]	−.00001 [−.0014; .0014]	.00001 [−.0011; .0011]
Control → Intercept → Linear slope	−.0001 [−.0036; .0055]	−.003 [−.0095; .0007]	−.001 [−.0044; .0007]
Person level			
Psychological detachment → Sleep Quality → Intercept	−.025 [−.1527; .1085]	−.019 [−.1149; .0820]	−.022 [−.1329; .0943]
Psychological detachment → Sleep Quality → Intercept → Linear Slope	.004 [−.0023; .0038]	.001 [−.0034; .0055]	.001 [−.0030; .0048]
Psychological detachment → Intercept → Linear Slope	−.001 [−.0055; .0030]	−.004 [−.0153; .0034]	−.002 [−.0097; .0029]
Relaxation → Sleep quality → Intercept	**.204 [.0447; .4130]**	**.153 [.0024; .3266]**	**.176 [.0028; .3651]**
Relaxation → Sleep quality → Intercept → Linear slope	−.003 [−.0119; .0018]	−.007 [−.0160; .0003]	−.005 [−.0141; .0001]
Relaxation → Intercept → Linear slope	.001 [−.0030; .0057]	.007 [−.0022; .0213]	.005 [−.0009; .0147]
Mastery experiences→ Sleep Quality → Intercept	.117 [−.0151; .2809]	.085 [−.0133; .2047]	.097 [−.017; .2282]
Mastery experiences → Sleep quality → Intercept → Linear slope	−.002 [−.0072; .0012]	−.004 [−.0010; .0008]	−.003 [−.0084; .0007]
Mastery → Intercept → Linear slope	.0001 [−.0027; .0047]	.006 [−.0017; .0151]	.002 [−.0034; .0079]
Control → Sleep quality → Intercept	.118 [−.0716; .3205]	.086 [−.0576; .2378]	.098 [−.0638; .2714]
Control → Sleep quality → Intercept → Linear slope	−.002 [−.0082; .0019]	−.004 [−.0113; .0024]	−.003 [−.0099; .0019]
Control → Intercept → Linear slope	−.004 [−.0169; .0022]	**−.022 [−.0286; −.0077]**	**−.012 [−.0249; −.0023]**

Note: Confidence intervals (95%) are displayed in brackets. We computed the confidence intervals for the indirect effects using the Monte Carlo method with 20,000 repetitions (Preacher & Selig, 2010). Estimates of the indirect effects whose confidence intervals do not include zero are displayed in bold font.

Theoretical implications

Our study has several theoretical implications. First, our study demonstrated that adopting a temporal perspective is important to gain a deeper understanding of the impact of recovery experiences on different mood dimensions. Specifically, our study showed that wakefulness and calmness decreased during work. According to ERM (Meijman & Mulder, 1998), mental and physical energy is required during work. This energy investment destabilizes psychological and physiological systems, implying short-term strain reactions. The declines of employees' wakefulness and calmness during work might reflect these strain reactions which seem to develop rather gradually during the workday. Notably, pleasantness did, on average, not decrease during the workday. Pleasantness potentially depends more strongly on external factors such as specific situations at work (e.g., experiencing success) than arousal-related states (i.e., wakefulness and calmness). Hence, the destabilization of psychobiological systems due to the load process at work (Meijman & Mulder, 1998) might be best captured by arousal-related mood. Moreover, our study showed that these arousal-related mood dimensions follow higher-order trends during the day (i.e., quadratic trajectories) whereas pleasantness did not. One might therefore speculate that valence-related mood dimensions either do not follow systematic patterns of higher order or have an even higher variability which would mean that one needs more than five daily occasions to adequately capture this fluctuation.

Our results regarding the prediction of mood slopes suggest that arousal-related states (i.e., wakefulness and calmness) in the morning but not valence-related states (i.e., pleasantness) might be – in terms of COR (Hobfoll, 2001) – an indicator for the amount of resources available. Hence, when arousal-related resources at the beginning of work are low, employees seem to enter a defensive state (Hobfoll, 2001) which is reflected in weaker declines of positive mood states compared to days when arousal-related resources at the beginning of work are high. Interestingly, sleep quality but not start-of-work pleasantness predicted the linear slope of pleasantness. In combination with the result that sleep quality was positively related to all three mood dimensions in the morning, one might speculate that arousal-related benefits of sleep quality drive the prediction of the linear slope of pleasantness. This suggestion is also in line with the idea that arousal-related states in the morning are indicators for the amount of resources available.

Second, extending the recovery literature, we showed that daily recovery from work is related to start-of-work mood as well as the development of mood during the workday. Specifically, only psychological detachment was associated with start-of-work mood via sleep quality. This finding suggests that psychological detachment in the evening helps improve sleep quality and sleep quality, in turn, is important for morning

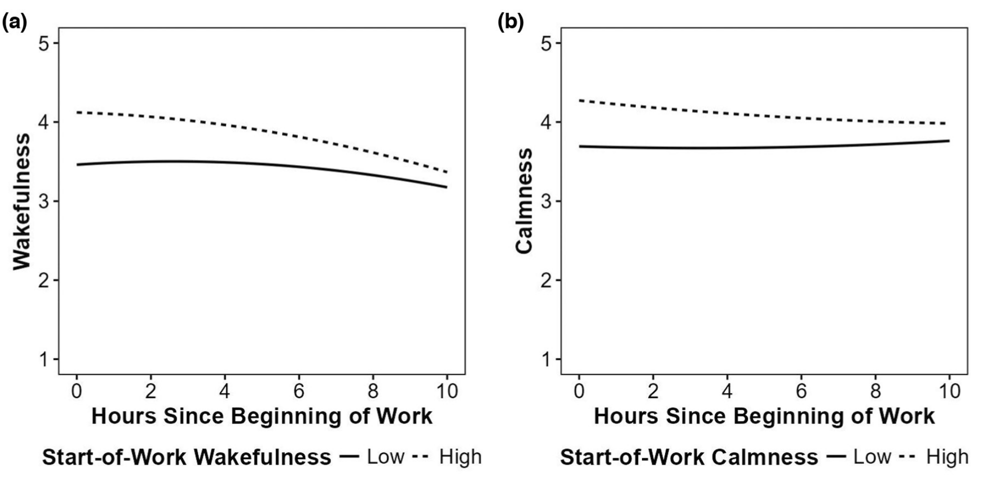

FIGURE 4 Prediction of daily mood trajectories. *Note*: Panel (a) Prediction of wakefulness during the day by start-of-work wakefulness. Panel (b) Prediction of calmness during the day by start-of-work calmness. We plotted the mood trajectories taking the higher-order trends into account. Detailed results of the corresponding analyses are available in the Appendix S1.

TABLE 5 Total effects: recovery experiences predicting mood intercepts and linear mood slopes.

	Wakefulness		Calmness		Pleasantness	
	Intercept	Linear slope	Intercept	Linear slope	Intercept	Linear slope
Day-level predictors						
Psychological detachment	.026 (.019)	.0001 (.005)	.048 (.020)	−.007 (.005)	.036† (.019)	.001 (.004)
Relaxation	.087** (.029)	−.011* (.005)	.064* (.030)	−.008 (.005)	.071** (.023)	−.006 (.004)
Mastery experiences	.047* (.021)	−.007 (.005)	.062** (.019)	−.002 (.004)	.041† (.022)	−.004 (.003)
Control	−.003 (.036)	−.001 (.005)	.070* (.034)	.003 (.005)	.013 (.026)	−.005 (.005)
Person-level predictors						
Psychological detachment	.008 (.084)	−.014† (.008)	.050 (.085)	−.017* (.007)	.027 (.078)	−.014* (.006)
Relaxation	.180 (.115)	.019 (.012)	.027 (.120)	.027** (.009)	.032 (.118)	.016* (.007)
Mastery experiences	.103 (.105)	−.015 (.011)	−.055 (.094)	−.014† (.008)	.030 (.097)	−.011† (.006)
Control	.384* (.186)	−.010 (.014)	.570** (.155)	−.016 (.012)	.490** (.146)	−.010 (.009)

Note: The table displays the unstandardized estimates and the respective standard errors in parentheses.
†$p < .10$. *$p < .05$. **$p < .01$. ***$p < .001$.

mood states. In contrast, relaxation was directly related to start-of-work mood indicating that it fosters positive mood states the next morning potentially via other processes than improved sleep quality. For instance, the absence of load processes (Demerouti et al., 2009), the reduction of tension (Van der Klink et al., 2001), and the perception of relaxation as a positive event might be such explaining mechanisms. Thus, high levels of relaxation imply low energy consumption (Sonnentag & Fritz, 2007), decreased activation of the sympathetic nervous system (Peters et al., 1977), and a pleasant experience (c.f. Weiss & Cropanzano, 1996) which all translate into high levels of wakefulness, calmness, and pleasantness. Mastery experiences and control showed positive associations with calmness only, again not explained by an improved sleep quality. Hence, other processes such as the satisfaction of competence and autonomy needs (Ryan & Deci, 2000; Van Hooff & Geurts, 2014) might explain the benefits of daily mastery experiences and control. For instance, the satisfaction of competence and autonomy needs might foster employees' confidence which might be especially important for facing the next workday with high levels of calmness.[12] Moreover, specific cognitions during the next morning might also come with improved mood states. For instance, remembering an evening characterized by high levels of relaxation, mastery experiences, or control might be associated with higher levels of calmness. Future research might want to examine possible mechanisms explaining the association of relaxation, mastery experiences, and control with next-morning mood states more closely to gain a better understanding of the actual mechanisms underlying the effects of recovery experiences.

Combining our findings, one can conclude that the indirect benefits of psychological detachment via a better sleep quality as well as the direct effects of relaxation and mastery experiences (i.e., higher positive start-of-work moods) partly subside during the workday (i.e., stronger decline of wakefulness and calmness during the workday). A similar pattern was found in vacation research. Vacation fade-out describes the fact that the effect of vacation on well-being by facilitating recovery subsides rather quickly when employees return to work (de Bloom et al., 2009; Westman & Eden, 1997). In detail, employees' well-being seems to gradually converge back towards their typical levels of well-being within 4 weeks after resuming work (Horan et al., 2021). Our study shows that this fade-out also takes place at the day level. Some benefits seem to gradually subside within one workday underlining the importance

[12]Notably, when mastery experiences and control were each examined separately from the remaining three recovery experiences, mastery experiences were marginally significantly, and control was significantly positively related to start-of-work wakefulness and pleasantness.

of engaging in recovery on a daily basis. Additionally, our results indicate that recovery experiences also play a role for mood trajectories at the person level. Future studies might examine this exploratory finding in greater detail.

Limitations and future research

Like other empirical studies, this study has some limitations. First, recovery experiences, sleep quality, and employees' initial morning mood states were assessed at the first daily measurement occasion. This simultaneous measurement might have inflated the relationships between the various variables assessed in the morning. However, we instructed participants to answer the questions by referring to different time periods (i.e., previous evening, previous night, and present moment). In addition, our main interest was in recovery experiences as indirect predictors of the mood intercepts and slopes during the workday. Beyond the first daily measurement of mood, four additional measurements contributed to the estimation of the mood slopes. Moreover, we estimated start-of-work mood states as latent variables based on the mood slopes. By doing so, start-of-work mood states refer to the states at the time point of zero. Because the first daily survey was not always filled in exactly at the beginning of work (i.e., at the time point of zero), the manifest mood states in the morning are not necessarily equal to the latent start-of-work mood states. Additionally, to limit participant burden and to not influence recovery experiences by asking about them, we decided against a sixth daily survey at bedtime. By asking about recovery experiences in the next morning, we also ensured that the assessment of the recovery experiences covered the *entire* evening. Nevertheless, future studies might want to separate measurement occasions even further.

Second, participants provided self-report data only which might raise concern about common method bias (Podsakoff et al., 2012). However, employees' experiences are best captured by self-reports. Further, to minimize common method bias, we referred to different time periods within the instructions when measuring the predictor (i.e., recovery experiences), the mediator (i.e., sleep quality), and the criterion (i.e., mood intercept and slopes) and, moreover, we temporally separated the remaining four measurement occasions of mood (see Podsakoff et al., 2003). Additionally, because the prediction of the mood slopes is statistically a cross-level interaction, common method variance should not be a concern in this case (Siemsen et al., 2010).

Third, suggesting that morning mood states predict mood slopes, we relied on the principle of COR (Hobfoll, 2001) that under conditions of low resources, people try to protect remaining resources as well as on motivational processes (Vroom, 1964). However, with our data, we could neither test the specific assumption that employees want to shield their low positive moods from further declining nor that employees experience different levels of motivation. In line with our assumptions, previous studies showed that when resources are low, people invest resources strategically (Halbesleben & Wheeler, 2011) and show more withdrawal behaviour (Chong et al., 2020). Moreover, favourable morning states were indeed found to predict motivational processes at work (Debus et al., 2014; Ouweneel et al., 2012). Nevertheless, future studies might want to explicitly investigate, whether employees approach their workday differently when resources are low. Additionally, a fruitful avenue for future research might be to examine the actual behaviours that lead to changes in mood, such as whether employees work on more complex tasks on days that start with higher wakefulness and calmness than usual or whether employees actually do invest more energy on those days.

Future studies might also want to examine further day-level or person-level predictors of daily mood trajectories. For instance, to take the interdependence of recovery experiences explicitly into account, researchers might want to examine daily recovery profiles (e.g., Chawla et al., 2020) as predictors of mood trajectories. Moreover, daily job resources (e.g., autonomy) and daily job demands (e.g., time pressure) could be relevant predictors. For instance, on a high-demand workday, calmness might follow a stronger decrease during the workday than on a low-demand workday. Results on our control variables already point towards this direction: Positive mood decreased less strongly on days with more (vs. less) positive task-related and interpersonal events and, in contrast, decreased more strongly on days with more (vs. less) negative task-related events. Further, our additional analyses showed that the quadratic slope of wakefulness depended on caffeine intake. Future research might want to go beyond linear change and focus on further predictors of quadratic change. Moreover, as our person-level results suggest, mood trajectories might also differ between persons. For instance, employees with a high job involvement might perceive work as less effortful and thus experience weaker systematic mood changes during a workday than employees with a low job involvement.

Because our sample mainly included highly educated employees with high levels of autonomy, future research might want to examine whether our findings replicate in different samples. On the one hand, one might argue that employees in a sample characterized by high (vs. low) levels of autonomy have the flexibility to schedule their tasks in accordance with their needs and motivations so that favourable mood declines more strongly. On the other hand, having high levels of autonomy allows to flexibly take breaks and to approach job demands more effectively (Bakker & Demerouti, 2017) which might decelerate the decline of favourable mood states during the day. Thus, future research might, for instance, investigate how the general level of autonomy predicts mood trajectories during the workday to further strengthen the generalizability of our results.

It might also be promising to investigate how employees and organizations can weaken the decline of favourable mood states. Findings from vacation research showed that the vacation fade-out can be slowed down by, for instance, receiving organizational support (Reizer & Mey-Raz, 2019). At the day level, breaks are a good opportunity to engage in recovery (e.g., Bosch et al., 2018; Zhu et al., 2019) and might help weaken the decline of favourable mood states. Although we controlled for breaks at the occasion level, we did not examine the duration of the breaks or the actual opportunity to recover during breaks. Future studies might want to test the role of breaks and especially the role of lunch breaks in greater detail.

Practical implications

Our findings have important practical implications. First, because psychological detachment and relaxation were especially beneficial for employees' start-of-work mood, managers might want to encourage employees to engage in off-job activities that foster these experiences. Organizations could, for instance, establish the organizational culture that employees do not have to be available for work during after-hours (Piszczek, 2017). Moreover, to facilitate employees' relaxation after work, managers could recommend specific trainings such as progressive muscle relaxation (cf. Rausch et al., 2006). Sleep quality was an important driver of favourable start-of-work mood as well. Again, experiencing psychological detachment might facilitate a good sleep quality. Hence, organizations could offer interventions to improve psychological detachment (Karabinski et al., 2021). Additionally, organizations might want to help foster employees' sleep quality, for instance, by reducing social stress at work (Haun & Oppenauer, 2019) and by offering mindfulness interventions (Hülsheger et al., 2015).

Second, as suggested by Hülsheger (2016), employees could use insights into mood trajectories to schedule their tasks. In our study, employees generally experienced their highest level of wakefulness at the beginning of the workday and their highest levels of calmness at the beginning and the end of the workday. Hence, one might recommend that tasks that need high levels of wakefulness (e.g., tasks that require high levels of accuracy such as preparing important reports) or calmness (e.g., negotiating compromises with colleagues in case of conflict situations or working through critical feedback material) should be done in the morning (in the case of wakefulness) or in the morning and towards the end of work (in the case of calmness). Our results further showed that the trajectories change dependent on employees' start-of-work mood states (i.e., wakefulness and calmness). This finding implies that employees might want to reflect on their start-of-work mood before scheduling their tasks for the specific day. To enable employees to do this effectively, in a first step trainings could be offered that teach employees about how to reflect on and to be aware of one's own mood states. Subsequently, on days when employees perceive their start-of-work mood states to be higher than usual, they might schedule tasks that require the highest levels of wakefulness and calmness at the beginning of work. Moreover, our results showed that on days with higher start-of-work wakefulness and calmness, employees experienced higher levels of wakefulness and calmness for about 5.5 and 9.5 h after starting work than on days with lower start-of-work wakefulness and calmness. Hence employees might want to make use of these additional wakefulness and calmness benefits by focussing on important tasks during these specific time windows. Consequently, from an employer perspective, if possible, employees should be given at least some autonomy (e.g., Slemp et al., 2021) to schedule tasks on a daily basis. However, we would like to again emphasize that the benefits of experiencing higher positive mood states than usual do not last the entire day. Thus, also on days starting with higher positive mood states than usual, employees might want to engage in at-work recovery (Chan et al., 2022) by, for instance, planning breaks between tasks our alternate between more effortful and less effortful tasks. In doing so, employees might weaken the decrease of their wakefulness during the day so that benefits of higher positive mood states last longer. Yet, further research is needed in this area.

CONCLUSION

Addressing calls for a temporal perspective, we examined employees' daily mood trajectories at work and potential predictors. Our findings showed that wakefulness and calmness (but not pleasantness) generally declined during the workday and that daily psychological detachment (indirectly via sleep quality), relaxation, and mastery experiences partly predicted these trajectories. After evenings with impaired recovery (i.e., lower levels of psychological detachment, relaxation, or mastery experiences than usual), employees experienced lower levels of wakefulness and calmness which slightly decreased or were stable during the workday. In contrast, after evenings with good recovery, empoyees experienced higher wakefulness and calmness which declined more strongly as the workday progressed. These findings imply that employees benefit from daily recovery – albeit these benefits subside during the workday. Hence, it is important to engage in recovery on a daily basis.

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AUTHOR CONTRIBUTIONS

Maike Arnold: Conceptualization; data curation; formal analysis; investigation; methodology; project administration; writing – original draft, review and editing. **Sabine Sonnentag:** Supervision; writing – review and editing.

CONFLICT OF INTEREST STATEMENT

None to declare.

DATA AVAILABILITY STATEMENT

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

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SUPPORTING INFORMATION

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

Appendix S1

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