

**A Matter of Timing? A Systematic Review of Work Scheduling Dynamics in Work  
Recovery Research and Applications**

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### **Abstract**

Work recovery reflects the replenishment of personal resources depleted by working, which has implications for employee health and wellness. However, work scheduling factors have received very limited attention in the recovery literature, despite that recovery is a dynamic process widely recognized to be influenced by contextual factors that define and influence the work role. After first conducting a narrative review of whether and how work scheduling factors are accounted for in existing theories of work recovery, we conduct a systematic review of existing work recovery research to identify any past empirical consideration of work scheduling factors in the recovery research base. We then harness the results of this systematic review to develop a taxonomy of work scheduling and related contextual factors that may be relevant to the process of recovery from work. We discuss the theoretical, practical, and methodological implications that emerged from our narrative and systematic reviews, providing guidance for how this newly developed taxonomy can be applied to understanding the implications of scheduling dynamics for work recovery across a range of different work contexts.

**Keywords:** *work recovery; work schedules; shift work; recovery experiences; temporal dynamics*

Work recovery, the replenishment of personal resources (e.g., energy, attention) depleted by work demands, is often theorized to occur during time away from work (Meijman & Mulder, 1998). This work recovery is critical to the maintenance of employee health, well-being, and performance over time (Sonnentag et al., 2022). While empirical evidence suggests that the schedules that employees work may have implications for work recovery outcomes (e.g., Golden, 2015; Torquati et al., 2019; Rivera et al., 2020), extant work recovery theory (e.g., the Effort – Recovery Model [ERM]; Meijman & Mulder, 1998) has given limited attention to work scheduling considerations. Further, empirical researchers often specify inclusion criteria that constrain the variability of work scheduling to reflect only a single type of work schedule in a given study (e.g., Binnewies et al., 2010; Sonnentag et al., 2017; Shimazu et al., 2016; Sianoja et al., 2018), which precludes the implications of different work schedules for work recovery from being compared and evaluated. This limitation has led investigators to question whether and how recovery research generalizes to occupational contexts characterized by work schedules that are less well-represented in the recovery literature (e.g., shift workers, part-time workers; Gabriel et al., 2019). Of particular note, in one of the most expansive recent reviews of recovery research, Sonnentag and colleagues lamented the lack of diversity in occupational contexts in existing recovery research, specifically calling for a need to better understand the recovery implications of different work and rest cycles (Sonnentag et al., 2022). Our overarching goal is to heed this call by developing a taxonomy of work scheduling factors that are relevant to work recovery, leveraging the results of a systematic review of consideration of work scheduling factors in existing recovery research to develop this taxonomy.

Recent recovery research has begun to directly discuss the need to pay greater attention to work scheduling factors across a variety of different cycles of work and rest, highlighting the

need to better understand work scheduling factors in support of advancing the generalizability of recovery theories and models across occupational contexts (Fritz et al., 2022; Sonnentag et al., 2022). At the broadest level, we intend to advance the understanding of work scheduling and related contextual factors that are relevant to recovery. After first providing a broad overview of work recovery and critical concepts in this literature, we then conduct a narrative review of whether and how work schedules have been discussed in the most influential theories and models of work recovery and argue that direct insights about work scheduling factors and recovery from these theories are insufficient. We then turn to extant empirical work and conduct a systematic review of past work recovery research that has considered work scheduling factors. We leverage the results of this systematic review to develop a taxonomy of work scheduling factors that appear relevant to work recovery, drawing attention to how each taxonomic property we identify does or does not align with predictions drawn from existing theories of work recovery and related processes. We then apply this taxonomy to a discussion of potential avenues to advance the work recovery literature toward being more inclusive of a wider range of work schedules and accounting for complexities in how work scheduling factors may inform how recovery unfolds over time.

We aim to make four specific contributions to the work recovery literature. First, we identify and characterize the existing theoretical basis for evaluating work scheduling and related contextual factors in relation to work recovery. In doing so, we evaluate how existing theories have considered work schedule factors in relation to recovery, laying the foundation to ground our subsequent taxonomic development of work scheduling factors relevant to recovery in extant theory. Second, we conduct a systematic review of empirical research on work scheduling factors that have been evaluated in relation to recovery, leveraging observations from this review

to develop a taxonomy of work schedule-related contextual factors that may be relevant to the recovery process. This effort advances the work recovery literature by identifying work scheduling factors whose implications for recovery are not well accounted for by existing theory, providing a roadmap for future empirical research on work scheduling factors that may inform how recovery occurs both from day-to-day and over longer time intervals. This effort also results in the identification of a set of practically relevant, and in some cases potentially modifiable, contextual factors that could be evaluated or altered to facilitate work recovery across a range of occupational contexts and work schedules. Third, we incorporate our observations from our narrative and systematic reviews to elaborate on how work scheduling factors may influence *when* recovery takes place (e.g., after work hours, within the workday, during off-days). This endeavor expands the recovery literature beyond the most commonly assumed considerations of work and rest cycles to account for how recovery may occur across the myriad (e.g., the long-standing prevalence of shift work arrangements, the more recent expansion of short-term project-based work; Cropanzano et al., 2022; Dunham, 1977) and evolving (e.g., greater recognition of the value of flexibility in work scheduling; Demerouti et al., 2014) ways that work is structured in the contemporary workforce. As our fourth and final intended contribution, we apply the insights gained from our narrative and systematic reviews to suggest ways in which this expanded understanding of work scheduling factors relevant to recovery can guide future research, practical applications, and methodological innovation.

### **Theoretical Foundations of Work Recovery Research**

Prior to examining the extent to which existing work recovery research accounts for work scheduling factors, we first provide an overview of the broader theories that underlie this research base. The ERM (Meijman & Mulder, 1998) and Conservation of Resources Theory

(COR; Hobfoll, 1989) are the most frequently invoked perspectives to explain work recovery (i.e., the process of replenishing personal resources depleted by working) and recovery experiences (i.e., psychological appraisals of non-work time that partially underlie work recovery; Sonnentag & Fritz, 2007). The ERM explains how cognitive and energetic resources can be depleted through work-related effort expenditure and how the cessation of work demands presents the opportunity for these resources to be replenished (i.e., recovered). COR expands the concept of resources, explicating that people have a range of different personal resources (e.g., energy, motivation, self-discipline), that these resources can be depleted with consequences for the individual (e.g., psychological and physical strains), and that mitigating resource loss or gaining resources can reduce strain (Hobfoll, 1989; Hobfoll, 2001). A synthesis of these perspectives forms the foundation for modern recovery research, which emphasizes how recovery experiences can facilitate work recovery more passively via the cessation of work demands or more actively by facilitating personal resource gains (Sonnentag & Fritz, 2007; Sonnentag et al., 2022).

Much of the existing empirical research on work recovery has focused on examinations of four recovery experiences (Sonnentag & Fritz, 2007), which include *psychological detachment* (mentally and physically disconnecting from work), *relaxation* (a state of low activation and high positive affect), *mastery* (engaging in learning or efficacy building activities in a non-work domain), and *control over leisure time* (autonomy in how non-work time is spent). These recovery experiences have each been generally supported as facilitating recovery from work by either protecting from resource loss or facilitating resource gain (Bennett et al., 2018). However, we note that this research base on recovery experiences has been criticized for giving insufficient consideration to work scheduling factors (Sonnentag et al., 2017). For example,

while the most widely used measure of recovery experiences (the Recovery Experiences Questionnaire; Sonnentag & Fritz, 2007) is not explicitly described as a measure designed to be used with employees who are working a particular type of schedule, the originally validated scale has instructions to focus on experiences during evenings after work. Similarly, studies of recovery often emphasize the potential for recovery to occur during weekday evenings (e.g., van Hooff & Pater, 2017; Fritz et al., 2022; Park et al., 2018) or on weekends (e.g., Ginoux et al., 2021; Hahn et al., 2012; Ragsdale & Beehr, 2016), which may not reflect time frames with the highest potential for recovery for employees who, as examples, work some or the bulk of their work hours at night or on the weekends. With this discussion of the foundations of and some empirical tendencies in the work recovery research base in place, we now turn to a narrative review of whether and how work scheduling factors have been discussed in major work recovery theories.

### **Direct Theorizing on Schedule Dynamics in Work Recovery**

We examined major foundational writings for the ERM (Meijman & Mulder, 1998) and COR (Hobfoll, 1989; 2001), as well as the theoretical arguments in foundational theorizing about recovery experiences (Sonnentag & Fritz, 2007; Sonnentag & Fritz, 2015), for considerations relevant to work scheduling and related contextual factors relevant to recovery. In an effort to be inclusive of major perspectives that are often cited in recovery studies or in conjunction with the ERM or COR, even if not explicitly work recovery theories themselves, we also evaluated the Job Demands – Resources Model (JD-R; Bakker et al., 2001; Bakker & Demerouti, 2017) and the Work – Home Resources Model (WH-R; Ten Brummelhuis & Bakker, 2012) with respect to discussions of work scheduling factors.

A review of these existing theories found that direct discussions of scheduling dynamics in relation to recovery within these frameworks are quite infrequent and limited. The ERM highlights that perceptions of control over how and when work is done can buffer against fatigue (i.e., the accumulation of a strain reaction caused by work-related effort expenditure; Meijman & Mulder, 1998). However, the ERM does not embed this observation within any specific work scheduling factors, other than suggesting that work recovery occurs only when work demands cease. This approach has parallels to that taken by the JD-R (Bakker & Demerouti, 2017), which includes the constructs of job resources, which encompasses control over the job (Karasek, 1979), and personal resources, which reflect “beliefs people hold regarding how much control they have over their environment” (Bakker & Demerouti, 2017, p. 275). Greater levels of these resources directly influence employee motivation and buffer the effects of job demands on strain, but the specific impact and intersection of work scheduling factors with these resources are not considered in detail.

COR identifies time as a valuable resource that can facilitate opportunities for additional resource gain and help off-set resource loss (Hobfoll, 1989). Specifically, time for work, family, sleep, and free time are all considered unique resources that individuals seek to protect and build within this theory (Hobfoll, 2001). COR also attends to the cycle of work and rest by discussing the antecedents and consequences of loss spirals, which can occur when individuals return to work before they have fully recovered from previously experienced demands. Specifically, attempting to expend further effort while still in a depleted state leads individuals to need to invest even more effort to meet demands, leading to a harmful spiral of resource loss (Hobfoll, 2001). These loss spirals could be particularly relevant to workers who may have unpredictable or prohibitively short recovery periods. The WH-R model (Ten Brummelhuis & Bakker, 2012),



which applies the overarching COR theory perspective to relationships and processes at the work / non-work interface, further elaborates that time represents a volatile personal resource (i.e., a resource proximal to the self that fluctuates over time) that can connect work and home variables through depletion or enrichment processes. Although both COR and the WH-R model provide greater specification to how deficits or surpluses of time can be harnessed to mitigate strain and interference between work and non-work roles, neither perspective draws direct connections to work scheduling factors.

The most direct discussion of work scheduling factors and related temporal dynamics in recovery theory appears in foundational work on the identification of recovery experiences (Sonnentag & Fritz, 2007) and related theorizing focused on the specific recovery experience of psychological detachment, such as the Stressor – Detachment Model (Sonnentag & Fritz, 2015). Within foundational recovery experience theorizing, feelings of control over one's schedule during leisure time, which conceivably could relate to or be influenced by the controllability of scheduling work demands, are argued to be a major aspect of the process of recovering from work (Sonnentag & Fritz, 2007). The Stressor – Detachment Model (Sonnentag & Fritz, 2015) includes discussion of the potential for weekends or days off to provide more opportunities for employees to mentally disengage from work, relative to daily post-work recovery. This model suggests that employees who do not detach on evenings, weekends, or off days may experience chronic strain and that a lack of detachment may become a pattern for these employees (which is related to the loss spiral concept from COR; Hobfoll, 2001). While direct recovery experience theorizing does provide some insights into work scheduling factors relevant to recovery, this and other foundational recovery theorizing do not yield a comprehensive view of specific work scheduling and other related contextual factors that are relevant to work recovery and recovery

experiences. Building off of this narrative review which illustrates that existing recovery theories generally do not extensively account for work scheduling considerations, we next proceed to describe the methodology and results of our systematic review of empirical recovery research, which we use to develop a taxonomy of work scheduling and related contextual factors relevant to recovery from work.

### **Systematic Review Methodology**

We conducted a systematic review of the empirical literature on work recovery to yield insights into whether and how work scheduling factors have been evaluated in investigations of the process of work recovery. We include a PRISMA style flowchart (see Moher et al., 2009) as an overview of our systematic review methodology in Figure 1. To identify potential articles for inclusion in the systematic review, we conducted a keyword search in the Academic Search Complete, PSYCInfo, and Web of Science databases. We screened all articles identified that contained *any* (i.e., search terms separated by “or”) of the following key words: *work recovery*, *recovery experiences*, *recovery from work*, and *psychological detachment*. Our search of these databases yielded 1,937 articles. We expanded our search by identifying articles in the reference sections of extant reviews and meta-analyses on work recovery in the organizational literature (e.g., Sonnentag & Fritz, 2015; Bennett et al., 2017; Sonnentag et al., 2017; Sonnentag et al., 2022). Our reference search yielded 481 additional articles, bringing our total number of articles screened for potential inclusion in the systematic review to 2,418.

The first and second author conducted an initial screening of the 2,418 articles identified in our search strategy and found 518 duplicate articles. Following this initial screening and removal of duplicate articles, the first four authors reviewed the remaining 1,900 articles and screened out articles based on the following criteria: (1) clearly irrelevant to the phenomenon of

interest (e.g., related to energy recovery in mechanical systems;  $k = 1,125$ ), (2) article text could not be obtained, even when using inter-library loan at the university where the study was conducted ( $k = 35$ ), (3) not available in English ( $k = 12$ ), (4) not empirical (i.e., no data was collected or analyzed;  $k = 84$ ), (5) did not measure recovery experiences or any inputs to work recovery ( $k = 169$ )<sup>1</sup>, or (6) contained no mention of any work scheduling considerations or dynamics ( $k = 298$ ). Following this initial screening, the authorship team met to debate any articles for which there was ambiguity in meeting any specific inclusion criteria, coming to a consensus regarding whether each article in question should be included. Following these consensus meetings, 130 additional articles were screened out<sup>2</sup>. Ultimately, forty-seven articles met all inclusion criteria and were included in the systematic review ( $k = 47$ ).

### Systematic Review Results

In laying the groundwork for our presentation of the systematic review results, we begin with a description of the articles that were encompassed in our review. In terms of occupational contexts, medical workers (e.g., hospital nurses, physicians; 21%) and working students (e.g., students working in retail, students working in hospitality; 15%) had a high representation

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<sup>1</sup> When considering this inclusion criteria, we only included articles that measured experiences or activities indicative of the process of recovery but did not include articles that measured indicators of the attainment of recovery (e.g., fatigue, vigor, affective criteria) without any direct recovery-relevant inputs (e.g., recovery experiences, recovery activities) to these recovery attainment indicators. In other words, we focused on articles that measured how a person is recovering, rather than if recovery has occurred. This step was necessary to prevent the inclusion of articles that were ambiguous in terms of their relevance to recovery (i.e., we would be unable to tell if these articles were relevant to recovery solely based on having included commonly measured indicators of recovery, such as fatigue, which have been extensively studied in relation to many other antecedents beyond just recovery [see Ackerman, 2011]).

<sup>2</sup> During the article screening process, the authorship team used a specific coding system to identify any article for which they were not certain about whether inclusion criteria for the systematic review were met. After this initial screening process that yielded 177 potentially relevant articles to consider for inclusion, the first four authors independently reviewed all articles that were flagged as having unclear relevance and voted on whether or not to include them. Then, the first 4 authors held a series of consensus meetings to debate the relevance of any articles for cases in which the authorship team was split on whether or not the inclusion criteria were met. These consensus meetings continued until the authorship team reached agreement about whether or not to include each of the articles that had been flagged as questionably relevant to the systematic review.

among the articles that were included in our review. Other occupational contexts encompassed in the systematic review articles included railway controllers, information technology workers, naval cadets, industrial and manufacturing workers, teachers, and athletic coaches. A majority of the articles retained in our systematic review ( $k = 32$ , 68%) focused on recovery in one specific occupational context (e.g., firefighters; Sawhney et al., 2018; pre-school teachers; Fritz et al., 2010; postal service workers; van der Hulst & Geurts, 2001), while a minority of articles focused on samples of employees working in a variety of different occupational contexts ( $k = 15$ , 32%; e.g., Burke et al., 2009; Dettmers et al., 2016). Participants in the studies included in our systematic review followed a range of work schedules, including working a fixed daytime schedule, rotating shift work, a fixed night shift work schedule, part-time work, and extended periods of work away from home (e.g., naval deployment; Hetland et al., 2021).

The date of publication of the included articles ranged from 2001 and 2022, with 51% of the articles published in 2018 or later. This latter observation suggests that the direct consideration of work scheduling factors in work recovery research has increased in recent years. The samples encompassed in the empirical studies for the included articles were collected in a variety of locations, with the greatest representation coming from Europe ( $k = 22$ ), especially Germany ( $k = 7$ ) and Scandinavia ( $k = 12$ ). There were also a relatively large number of studies conducted in North America (all from the USA;  $k = 12$ ) and Asia ( $k = 7$ ) within our systematic review<sup>3</sup>.

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<sup>3</sup> We note that this represents a geographically narrow section of the global working population. This represents a limitation to the existing research base on the process of recovery in relation to work scheduling dynamics. Given that a majority of the studies in our systematic review come from Europe and the USA, it is likely that any unique work scheduling and contextual factors that exist in other parts of the world (e.g., the Middle East, Africa, South America) may be less well represented in our scheduling taxonomy due to a lack of representative empirical research on work recovery and scheduling factors in these contexts. For example, Burke and El-Kot (2009) highlight the importance of Egyptian cultural norms on work and recovery experiences. Future work should represent a broader array of geographic regions to include a broader set of work schedule experiences in the recovery literature.

In terms of theoretical frameworks applied, studies included in our systematic review consisted largely of applications of the ERM (Meijman & Mulder, 1998;  $k = 20$ ) and COR (Hobfoll, 1989;  $k = 15$ ). The Stressor – Detachment Model (Sonnentag & Fritz, 2015), which we previously noted directly addresses work scheduling dynamics with greater specificity than other work recovery theories, was often cited ( $k = 9$ ), while the JD-R (Bakker & Demerouti, 2017) was also referenced with some frequency ( $k = 7$ ). A number of studies included in our review did not draw on any specific theoretical framework ( $k = 9$ ). In addition, researchers turned to theories outside the scope of direct recovery theorizing, such as the ego depletion framework (Baumeister et al., 1998; Muraven & Baumeister, 1998;  $k = 2$ ) and allostatic load theory (McEwen, 1998;  $k = 2$ ), within studies encompassed within our systematic review.

### **Taxonomic Framework Development**

We harnessed our systematic review findings to develop a taxonomic framework of work scheduling and related contextual factors relevant to work recovery, which is summarized in Table 1. In this table, we identify and briefly define eight contextual features related to work scheduling that emerged as relevant to recovery from our systematic review, reflecting: (1) schedule type (fixed vs. variable vs. autonomous), (2) shift length predictability, (3) the length of the inter-shift recovery interval, (4) the frequency of multi-day recovery opportunities, (5) on-site living arrangements, (6) the predictability and controllability of within-workday breaks, (7) the number of hours worked per week, and (8) requirements for night shift work<sup>4</sup>. Within this table,

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<sup>4</sup> While not cleanly fitting within our overarching focus on work scheduling dynamics and related considerations, we did consider adding a ninth taxonomic category focused on engagement in other effortful roles, which in terms of articles that met the inclusion criteria for our systematic review would have been comprised entirely of studies focused on working students (Andrade, 2018; Cho & Park, 2018; Chu et al., 2021; Gabriel et al., 2019; Liu et al., 2022; Taylor et al., 2020). However, as the foundations of this empirical research base generally tended to extrapolate more strongly from the work / non-work conflict (e.g., Greenhaus & Beutell, 1985), work / school conflict (Butler, 2007), or work / non-work boundary management (Ashforth et al., 2000) literatures, insights to our focus on work scheduling factors relevant to recovery were rather limited. There was also ambiguity in some of these studies regarding the scheduling of participants' *work* hours, as some studies were unclear as to whether time

we identify the potential alignment of each work-schedule related factor with existing recovery-relevant theorizing, explain how each factor is potentially relevant to recovery experiences or the recovery process, and list the occupational groups sampled in studies included within our systematic review corresponding to each factor. In the remainder of this section, we provide a summary of research on each of these contextual factors relevant to work recovery in the articles encompassed in our systematic review. We also refer readers to the Supplemental Online Appendix for a detailed description of the primary theoretical foundations, sample, research design, analytic approach, and main findings of the full set of 47 articles included in our systematic review.

**Schedule Type.** Whether employees work a fixed (i.e., same hours each week), variable (i.e., work hours changing from day to day or week to week), or autonomously set (i.e., self-selected) schedule emerged from our systematic review as potentially relevant to work recovery. Although fixed vs. variable scheduling dynamics have often been considered in broader studies of employees in organizational scholarship (e.g., Blau & Lunz, 1999), there have been more limited direct comparisons of these two types of schedules in studies of work recovery. As an exception, Stieler et al. (2021) observed in a sample of hotel employees that fixed day shift workers (start time 6 a.m. to 9 a.m.; end time 2:30 p.m. to 5 p.m.) reported less trouble relaxing during leisure time than employees with schedules that alternated between morning (start time 6 a.m. – 9 a.m.; end time 3 p.m. – 7 p.m.) and afternoon (start time 12 p.m. – 3 p.m.; end time 9 p.m. – 12 a.m.) shifts.

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spent on school activities was considered “work” or “non-work” time. Accordingly, based on these theoretical alignment and methodological considerations, we ultimately elected not to include this taxonomic category in our framework.

Instead, the most direct recovery-relevant research on the schedule type taxonomic factor has focused on the recovery implications of autonomously set scheduling, with Clauss et al. (2021) arguing that “employees with flexible work hours are particularly likely to remain preoccupied with work-related issues during off-job time, which, in turn, hampers detachment from work and effective recovery” (p. 75). While not extensively evaluated empirically, Michel et al. (2016) has provided some support for this argument in a sample of airport workers with physically demanding jobs. These authors found that employees who could flexibly choose between morning and afternoon shifts reported more problems detaching and relaxing away from work than employees working fixed short morning or afternoon shifts. Interestingly, this argument of the potential costs of autonomous scheduling, as well as preliminary evidence testing this prediction, contrasts with direct recovery-relevant theorizing on this issue. Instead, recovery-relevant theorizing states that the factors facilitating control over when work is done are expected to buffer against strain reactions (Meijman & Mulder, 1998), and work scheduling control may conceivably provide autonomy that can be harnessed to correspondingly enhance the recovery experience of control over leisure time (Sonnentag & Fritz, 2007). However, this one small sample study (i.e., 57 employees) in a single occupational context (i.e., airport workers) is the only investigation in our systematic review that has directly empirically evaluated autonomously set scheduling in relation to recovery (Michel et al., 2016). Thus, this issue and comparisons of whether and how fixed versus variable versus autonomous scheduling influence recovery are crucial issues to consider in future research.

**Shift Length Predictability.** Several authors described unpredictability in the timing of the end of the work shift as a challenge that could be relevant to the recovery process. This factor was frequently discussed in the nursing context in relation to unexpected patient care demands

preventing nurses from ending work at the time they expected (e.g., Alsayed et al., 2022). Other occupational contexts in which this issue was addressed included bed and breakfast innkeepers, who may have difficulty in predicting their work hours because guests may have expectations that innkeepers are available at various points across the day and evening (Shen et al., 2018).

From a theoretical perspective, there is reason to believe that unpredictability in the length of the work shift could be broadly detrimental to work recovery and specific recovery experiences. For example, within the ERM and the JD-R, this shift length unpredictability may undermine feelings of control over work scheduling that could magnify strain reactions (Bakker & Demerouti, 2017; Meijman & Mulder, 1998). Furthermore, when considering recovery experiences, there may be downstream consequences for perceptions of control over leisure time (Sonnentag & Fritz, 2007) if employees are unable to reliably predict when their work shift will end. Psychological detachment may also be impaired when an employee must intermittently and unpredictably engage and disengage from the work role during their planned leisure time. This latter observation may be particularly relevant to understanding work recovery in the specific contexts of off-site on-call workers (i.e., employees who work shifts in which they may be required to be called into work while currently residing off-site) and workers who engage in supplemental work (i.e., continuing to perform work outside of their most typical work hours; see Kühner et al., 2023, for an overview of various terms that may be encompassed within this type of work). We elaborate on each of these possibilities below.

In our systematic review, two studies investigated off-site on-call work. Ziebertz et al. (2020) focused on workers with unpredictable on-call schedules and found that workers reported the unpredictability of their on-call duties to be stressful and experienced both fatigue and sleep problems. Dettmers et al. (2016) assessed the recovery consequences of fixed, mandatory after-



hours availability, finding that participants reported lower levels of recovery experiences during on-call periods as compared to non-work periods with no on-call requirements. These negative relationships with recovery experiences were observed when controlling for actual engagement with work, indicating that remaining on-call disrupts recovery over and above the implications of actual work taking place during the on-call period. Accordingly, whether the schedules of on-call periods themselves are fixed or not, work recovery appears to be disrupted by the unpredictability of work demands during an on-call off-site period. Theoretically, the potential for recovery to be disrupted during on-call periods even when work does not take place could be explained by the potential for a heightened cognitive connection to work (e.g., thinking about work, wondering if work demands will arise) during an on-call off-site period, even if no actual work takes place (Sonnentag & Fritz, 2015).

Richardson and Thompson (2012) investigated a different potential manifestation of shift length unpredictability, focusing on work-related technology use outside of one's typical work hours (e.g., technology-assisted supplemental work; Kühner et al., 2023). This type of supplemental work may sometimes be set more autonomously (e.g., Mazmanian et al., 2013) than formal, scheduled on-call work periods and was observed to be negatively related to recovery experiences, but positively related to perceptions of job control (Richardson & Thompson, 2012). This latter finding is particularly interesting to consider when looking across the landscape of studies relevant to shift length predictability encompassed in our systematic review. Contributors to this work scheduling factor in relation to negative recovery implications seemed to encompass unpredictability stemming from specific core job tasks (e.g., patient care demands that cannot be stopped midstream just because it is the scheduled time to go home), how work is formally scheduled and structured (e.g., on-call work which by definition may or

may not require the employee to work during a given time interval), and even the ability to harness schedule flexibility to meet work demands outside of one's typical work hours (e.g., applying autonomy in the job towards less predictability in when work and recovery periods will occur over time). The interactions between the typical working hours required by a job, any type of supplemental work expectations (be they on-site or off-site), and the recovery process represents a particularly important area for future research, with the importance of this topic arguably heightened further by the rise in flexible remote work options during and following the COVID-19 pandemic (Bick et al., 2023). It is particularly worth considering whether the recovery implications of shift length unpredictability may be influenced by whether this unpredictability is driven by external constraints (i.e., unexpected work demands) or personal choices (i.e., not knowing precisely when one will choose to start and stop working on any given day in a job with significant schedule flexibility).

**Inter-Shift Recovery Interval.** The most widely researched scheduling dynamic within our systematic review was the duration of time between the end of one work shift and the beginning of the next work shift, which is referred to as the inter-shift recovery interval (Alsayed et al., 2022; Karhula et al., 2013). One contributing factor to the relative emphasis on this scheduling-relevant dynamic within the literature is the existence of the Occupational Fatigue Exhaustion Recovery (OFER) scale (Winwood et al., 2006), which includes an inter-shift recovery state subscale designed to examine if employees perceive that acute fatigue from a previous work shift has diminished or dissipated before the start of the next work shift (e.g., Alsayed et al., 2022; Fletcher et al., 2020; Karhula et al., 2013; Min et al., 2022). The first major stream of research in this area has focused on the consequences of “quick returns” (a morning shift after an evening shift; Hakola et al., 2010, p. 390) in nursing and emergency services

personnel, with robust evidence suggesting that short inter-shift recovery intervals yield negative consequences that include diminished sleep time, reduced alertness at work, excessive daytime sleepiness, poorer health and well-being, and elevated job strain (Hakola et al., 2010; Karhula et al., 2013; Patterson et al., 2015). In the two studies included in our systematic review focused on the inter-shift recovery interval outside of a healthcare context, Kubo et al. (2018) and Kubo et al. (2021) observed similar results surrounding the detrimental consequences of short inter-shift recovery intervals, finding shorter rest periods between work shifts in information technology workers to co-vary with lower sleep duration, greater “carryover fatigue” (which is similar to the concept of the inter-shift recovery state; Kubo et al., 2018; p. 395), higher levels of physiological stress indicators, and reduced psychological detachment.

The second major stream of this research on inter-shift recovery has emphasized personal and work scheduling factors that co-vary with tendencies towards a more maladaptive inter-shift recovery state (i.e., incomplete recovery from the previous work shift before beginning the next work shift). Factors that appear to relate to worse inter-shift recovery at a chronic level include having less work experience (Alsayed et al., 2022), greater emailing frequency outside of working hours (Kubo et al., 2021), working more hours, working night shifts (Min et al., 2022), and lower levels of physical and mental health (Patterson et al., 2015). In combination, these findings suggest that there is a myriad of potentially enduring influences on the inter-shift recovery state beyond just the length of the interval between work shifts.

The research tradition focused on the inter-shift recovery interval appears strongly aligned with existing recovery-relevant theorizing pertaining to work scheduling factors. Most notably, one of the central tenets of the ERM is that complete recovery represents a return of cognitive and energetic resources depleted by work demands to their pre-demand exposure levels

(Meijman & Mulder, 1998; see also Bennett et al., 2020). All else being equal, shorter inter-shift recovery intervals would be expected to undermine these personal resources from fully returning to baseline levels, which would yield an impaired inter-shift recovery state that could manifest in a variety of indicators of insufficient recovery (e.g., elevated fatigue, decreased vigor, reduced attentiveness; Bennett et al., 2018). COR theory implies that fulfilling demands when insufficiently recovered requires more effort than fulfilling those same demands in a recovered state (Hobfoll, 1989), suggesting that shorter inter-shift recovery intervals may be precursors to loss spirals initiated by insufficient recovery (Hobfoll, 2001). The Stressor – Detachment Model (Sonnentag & Fritz, 2015) would further contend that chronically insufficient inter-shift recovery intervals would over time begin to yield tendencies towards a typical lack of psychological detachment from work during non-work time and chronic strain. Given the consistency of the empirical findings and the strong grounding of research on the inter-shift recovery interval in existing recovery theorizing, it thus seems advisable to begin to more robustly consider how variability in the length and properties of this interval may co-vary with valued individual (e.g., well-being, health) and organizational (e.g., job performance) criteria over both short (i.e., day-to-day) and longer (i.e., chronic) time frames. Previous research has identified relationships between work recovery, employee well-being, and job performance over both long- and short-term intervals (e.g., Sonnentag et al., 2022; Binnewies et al., 2010; Taylor et al., 2020; Sonnentag, 2001; Sianoja et al., 2018). As research begins to better consider the relationship between work recovery and work scheduling, we encourage investigators to also consider widely studied consequences of work recovery so as to understand work recovery as a linking mechanism between work schedule properties and key organizational outcomes relevant to employee health, wellness, and performance.

**Multi-Day Recovery Opportunity Frequency.** All else being equal, a longer time without effortful engagement in work demands is theorized to yield greater recovery according to the ERM (Meijman & Mulder, 1998). This logic is taken a step further in the Stressor – Detachment Model, as Sonnentag and Fritz (2015) argue that weekends or other recovery periods of multiple consecutive days provide more opportunities for employees to mentally disengage from work, relative to daily post-work recovery periods. Although these predictions have typically been evaluated and supported in relation to weekend experiences for employees working a fixed, weekday, daytime schedule (e.g., Binnewies et al., 2010), we did find further support for these general ideas in the articles included in our systematic review in relation to other types of work schedules as well. However, we note that the recovery indicators considered in this stream of research were somewhat indirect or related correlates of recovery (e.g., job strain, work engagement), rather than direct measures of recovery experiences. For example, Karhula et al. (2013) found that nurses reporting higher job strain tended to more often have single, as opposed to multiple consecutive, days off, a finding that is relevant to the recovery literature due to the theorized connection between job strain and insufficient recovery (Cropley & Millward Purvis, 2003). Additionally, also sampling from nurses, Kühnel et al. (2009) found psychological detachment during a 2 – 4-day respite from work to positively relate to post-respite work engagement, which bolsters the relevance of the disconnection from work theorized in the Stressor – Detachment Model (Sonnentag & Fritz, 2015) to recovery in multi-day recovery opportunities. In a sample of South Korean manufacturing employees who often engage in overtime night work, Jeong et al. (2020) found that greater recovery experiences strengthened the relationship between weekend leisure recovery activities and psychological well-being. On the surface, this result provides support to the ERM- and Stressor – Detachment Model-based

views of the benefits of multi-day recovery opportunities. However, because these authors aggregated all weekend recovery activities (e.g., low effort, social, physical, and intellectual) and also aggregated a subset of recovery experiences (e.g., psychological detachment, relaxation, control over leisure time) that are usually modeled separately in empirical research (e.g., Sonnentag, 2001; Sonnentag & Fritz, 2007), it is difficult to know what specific recovery activities and experiences are driving this interactive relationship.

Given this general alignment of theoretical arguments and empirical evidence, it seems reasonable to conclude that the frequency and duration of multi-day recovery opportunities is relevant to recovery experiences (e.g., psychological detachment) and the level of attained recovery. However, one crucial unexplored issue that we noticed in this research base concerns the comparability of multi-day weekend (i.e., Saturday and Sunday in many countries) recovery opportunities to multi-day recovery opportunities that do not exclusively fall on the weekend days. We did not find direct comparisons in the literature between the underlying recovery-relevant properties of weekend vs. non-weekend multi-day recovery opportunities. We also observed some ambiguity in how researchers translated existing recovery-relevant theorizing pertaining to multi-day recovery opportunities, which has predominately focused on weekends (Fritz et al., 2010; Fritz & Sonnentag, 2005), to the design of their research on this topic. For example, Kühnel et al. (2009) included an information letter for nurse participants explaining that when responding to surveys, they should consider the weekend to refer to periods between 2 and 4 days that do not necessarily have to include Saturday and Sunday. In contrast, some studies (e.g., Karhula et al., 2013) focused on single versus multi-day recovery opportunities without considering whether the days in question did or did not overlap with commonly scheduled

weekend days in many countries (i.e., Saturday and Sunday). Thus, there is a strong need to better understand weekend vs. non-weekend day multi-day recovery opportunities.

**On-Site Living Arrangements.** While the taxonomic properties identified to this point focus most directly on how work is specifically scheduled and the timing of work, we also identified several studies in our systematic review that focused on a related contextual factor centering on the presence of on-site living arrangements. Studies conducted on this theme arguably comprised the greatest range of occupational contexts of any taxonomic property we identified in this research base, encompassing studies of on-site coal miners (Chen et al., 2017), deployed naval cadets (Hetland et al., 2021), off-shore wind workers (Mette et al., 2018), firefighters (Sawhney et al., 2018), and innkeepers (Shen et al., 2018). Interestingly, this area of inquiry also tended to be more directly grounded in extant recovery-relevant theorizing than research on other themes in our systematic review. For example, in studying deployed naval cadets, Hetland et al. (2021) specifically explain that it is important to test the validity of the Stressor – Detachment Model “...under constrained conditions, where off-job time is spent in the work context and participants’ job and off-job activities are similar” (p. 245). These authors observed that psychological detachment can still play a role in stressor – strain relationships even in these constrained recovery conditions, finding the positive relationship between daily work pressure and daily exhaustion to be stronger when employees report lower psychological detachment. The particular importance of carving out opportunities for psychological detachment in on-site living arrangements was further bolstered in a study of off-shore wind workers by Mette et al. (2018), who observed this detachment to partially mediate the relationship between quantitative work demands and stress symptoms, as well as in a study of on-site coal workers by

Chen et al. (2017), who found psychological detachment to negatively co-vary with both counterproductive work behaviors and job anxiety.

In addition to research focusing on psychological detachment, one interesting possibility suggested by authors of studies of on-site living arrangements is that employees in these arrangements may implement strategies to attain recovery that are qualitatively different than strategies undertaken by employees in jobs not characterized by on-site living conditions. For example, in an empirical study of firefighters working 24-hour shifts, Sawhney et al. (2018) suggested that "...given the typical 24-hr shifts worked by firefighters, a good deal of recovery needs to occur at work. Thus, the typical at-home strategies may be less relevant for this particular population" (p. 444). These authors then observed in qualitative interviews several novel recovery activities and experiences in this firefighter sample not typically detected in studies of recovery in other populations, including engagement in work-related talks (i.e., discussing incidents that occur at work), stress-related talks (i.e., discussing issues relevant to work stress), spending time with coworkers/supervisors (i.e., informal time spent with these individuals that is not centered on workplace concerns), and participation in recreational activities at work (e.g., engaging in hobbies or enjoyable activities with others while at work). Thus, it seems plausible that those working with on-site living arrangements may exhibit qualitative differences in the activities they undertake to support recovery, while also potentially seeing constraints on their recovery that result in quantitative differences in other recovery experiences (e.g., potentially diminished psychological detachment from constantly being in the work environment; Sonnentag & Fritz, 2015). Person-centered applications to understanding recovery experiences (e.g., Bennett et al., 2016; Gabriel et al., 2019), which allow both qualitative and quantitative differences in how recovery experiences combine in specific



subpopulations to be examined in relation to antecedents and outcomes, may be particularly well-suited to directly testing this possibility.

**Predictability and Controllability of Within-Workday Breaks.** Building on the idea that the scheduling of work may leave some employees more dependent on within-workday breaks than post-work periods to facilitate recovery (Sawhney et al., 2018), several articles included in our systematic review emphasized the relevance of having more predictable and controllable within-workday breaks to work recovery. This general idea is embedded within both the ERM (Meijman & Mulder, 1998) and JD-R (Bakker & Demerouti, 2017), which combine to suggest that greater perceptions of autonomy over the job can mitigate the accumulation of strain reactions and thereby yield a reduced need for recovery from work-related effort expenditure. Unfortunately, the three studies focused on within-workday breaks included in our systematic review applied sufficiently distinct approaches that drawing general conclusions from this research base about recovery experiences and related processes is difficult. In a study of cheerleading camp counselors, Trougakos et al. (2008) observed engaging in more respite activities (i.e., napping, relaxing, and socializing) to co-vary with more positive emotions and fewer negative emotions during breaks. In a qualitative study of the within-workday breaks of police officers, Toh and Cho (2022) drew a distinction between scheduled breaks taken for meals and rest and less structured breaks that are taken as needed. This study also highlighted an interesting dynamic relevant to recovery for occupations that involve engagement with the public, as the police officer participants in this study discussed striving to have their unstructured breaks be very brief even when they felt a strong need for them in order to avoid being seen taking an extended break by members of the public. In an investigation of lunch breaks, Sianoja et al. (2016) found that workers with longer lunch breaks, those who left the workplace during

their lunch breaks, and those who regularly took a lunch break every day were likely to report more successful lunchtime recovery, as compared to workers who reported less regular, shorter, or at-work lunch breaks. Together, these articles address the idea that workers may feel less able to pursue recovery experiences if they are still psychologically or physically tied to their workplace during break periods. While the limited nature of research on the predictability and controllability of within-workday breaks within the articles encompassed in our systematic review precludes drawing firm conclusions, the grounding of these ideas in broader theories of recovery suggests the value of pursuing this topic more programmatically in future work.

**Number of Work Hours.** In the broader recovery literature, longer work hours are recognized to undermine the potential to experience sufficient recovery (see Geurts et al., 2014, for a review) and the relationship between work hours and engagement in recovery-related experiences and activities has been found to be negative in studies that span different occupational contexts (Mellner et al., 2016; van der Hulst & Guerts, 2001). However, there is some additional evidence to suggest that relationships of work hours to recovery experiences and activities could be a bit more complex than commonly assumed. For example, in a direct comparison of work hours in relation to recovery, Poulsen et al. (2014) found that cancer care workers who worked 21 – 40 hours per week reported higher levels of two recovery experiences (calculated as a sum of scores on the psychological detachment and relaxation subscales of the Recovery Experiences Questionnaire) relative to employees working less than 20 hours or more than 40 hours per week. Moreover, in two studies sampling workers from a broad range of occupations, Burke et al. (2009) and Burke and El-Kot (2009) found evidence to suggest that working longer hours may differentially associate with specific recovery experiences, as working longer hours was associated with greater control over leisure time but reduced psychological

detachment. While the latter finding aligns with broader recovery theorizing extending from the ERM (Meijman & Mulder, 1998) and Stressor – Detachment Model (Sonnentag & Fritz, 2015), Burke et al. (2009) suggest that the positive association of work hours with control over leisure time may be partially driven by employees at higher organizational levels simultaneously working more intense jobs but having greater agency over how they structure their time away from work. Accordingly, and consistent with observations we made earlier surrounding the need to better understand the degree to which shift length predictability is under lesser or greater control of the employee, it seems particularly critical for future researchers to evaluate how work hours influence recovery through comparisons of contexts in which employees are required or assigned to work long hours (e.g., 80-hour work weeks in medical residency that may include individual shifts ranging from 16 – 24 hours; Weaver et al., 2020), as opposed to circumstances in which one may have a greater degree of agency in setting and structuring one's work hours from week to week (e.g., project-based consultant work, working as a university professor).

We do note that we observed a frequent tendency to measure work hours only for statistical control purposes (e.g., Clauss et al., 2021) or to sample from specific populations who tend to work long hours (e.g., Shen et al., 2018), which resulted in relatively few articles included in our systematic review that directly compared the work hours – recovery relationship across a wider range of work hours. The frequency with which the articles in our systematic review either directly hypothesized about the number of work hours or controlled for work hours indicates that work hours are recognized by scholars to be relevant to the recovery process, but there is significant room to advance knowledge on the nature and form of associations linking work hours to different recovery experiences and recovery-relevant activities.

In terms of recovery-relevant theorizing, COR theory (Hobfoll, 1989; 2001) positions time as an important resource that employees can use to off-set resource loss or facilitate resource gain. Thus, all else being equal, working fewer hours would be expected to co-vary with both a lower baseline need for recovery and an enhanced opportunity to experience recovery, given the more plentiful time away from work inherent in working fewer hours. However, as illustrated by the findings of Poulsen et al. (2014), it is possible that the relationship of work hours to recovery could be more complex than it seems on the surface, which aligns with emerging calls to better consider complexities in work hour – criteria relationships in the broader organizational literature (Ten Brummelhuis et al., 2017). Syntheses of efforts to understand work hours and recovery with perspectives emphasizing how different work arrangements (such as working part-time) influence employees' involvement and inclusion within their organization (e.g., partial inclusion theory; Feldman, 1990) may show particular promise to unpack when, why, and how differences in work hours may relate to the process of work recovery.

**Requirements for Night Shift Work.** A final work scheduling factor that appears relevant to work recovery concerns the presence of night shift work (i.e., work that is conducted partially or completely during the overnight hours). Engaging in night shift work appears to engender several difficulties relevant to recovery. For example, in a study of nurses, Karhula et al. (2013) observed nurses to report experiencing poor recovery during sleep following a night shift. In another study of nurses, Min et al. (2022) found that more night shifts worked co-varied with diminished typical levels of perceived inter-shift recovery. In a particularly in-depth study of railway workers, Korunka et al. (2012) found that levels of fatigue at various phases of a night shift are influenced by levels of recovery at shift on-set (which aligns with the aforementioned research on the benefits of inter-shift recovery), psychological detachment between shifts, and

perceived workload during the shift. Interestingly, these authors observed these factors to be more influential in predicting fatigue earlier in the work shift, whereas at the conclusion of the shift (i.e., after 12 hours) only baseline fatigue entering the shift was relevant to predicting acute fatigue. It is worth noting that, although working overnight shifts is considered a long-standing risk factor for diminished occupational health (e.g., Åkerstedt et al., 1984) and has been identified as a potential impediment to sufficient recovery more broadly (Geurts et al., 2014), our review of major theories and models of work recovery suggested that there has been little direct theorizing about how night shift work influences recovery experiences, potentially due to the typical emphasis of these theories on more commonly assumed cycles of work and rest (i.e., working during the day, opportunities to experience recovery during non-work time in the evenings and on weekends; Zijlstra & Sonnentag, 2006). Therefore, we consider the intersection of work recovery with overnight work to be a critical future theory-development need within the work recovery literature.

### **Discussion**

We aimed to respond to calls to advance theory, research, and applications on the relevance of work scheduling and related contextual factors to work recovery by both narratively reviewing existing theories of work recovery and systematically evaluating how work scheduling factors have been evaluated in work recovery research. Below, we summarize key conclusions drawn from our review that are relevant to our overarching goals of identifying existing recovery-relevant theorizing applicable to consideration of scheduling dynamics, explicating schedule-related factors that may be relevant to work recovery, leveraging these factors to consider temporal components of the recovery process, and exploring future directions for

research, practice, and methodological innovation to consider the role of work schedules in work recovery research and applications.

### **Advancing Recovery Theory to Consider Work Schedules**

Our first intended contribution was to evaluate how existing theories of work recovery account for work scheduling dynamics. In our narrative review of recovery theories, we found that these theories raised several points relevant to scheduling dynamics in the recovery process that were subsequently enriched through the taxonomy developed within our systematic review. For example, COR discusses the long-term costs of returning to work before sufficient recovery has been attained, which relates to the commonly empirically identified costs of short inter-shift recovery intervals (Hobfoll, 2001; Hakola et al., 2010). As another example, the ERM suggests that perceptions of control over how and when work is done can provide a buffer against fatigue (Meijman & Mulder, 1998), which informs our identified taxonomic properties of shift length predictability and the predictability and controllability of within-workday breaks. Our work thus highlights the limited ways in which existing work recovery theories have accounted for work scheduling considerations, while going further to provide a road map of taxonomic properties of work scheduling factors relevant to recovery that can be used to enrich and expand understanding of core constructs within these theories moving forward.

Addressing our second intended contribution of leveraging our systematic review of empirical work recovery research to develop a taxonomy of work scheduling factors relevant to recovery, we identified eight work scheduling and related contextual factors that are potentially relevant to the work recovery process. In combination, these factors help to explain how employees' work schedules may inform whether, when, where, and how employees experience recovery from work both in the short-term (i.e., from day-to-day) and over longer time intervals

(i.e., chronic sufficient or insufficient work recovery). By highlighting areas of alignment and misalignment between recovery-relevant theories and the empirical research base in relation to each of the work scheduling factors in our taxonomy, we identify how existing recovery theories can be applied to understand the importance of work scheduling dynamics and explicate where the empirical research base on work scheduling factors contrasts with existing recovery theory (e.g., the potential recovery costs of autonomously set scheduling). Being more intentional about considering the impact of these work scheduling factors on recovery may advance theory to account for the role of specific work scheduling characteristics in the documented disparities in health for employees with particularly long hours or who work rotating or overnight shifts (e.g., cardiovascular disease, sleep problems; Harma, 2006; Rivera et al., 2020). In doing so, we provide important nuance to existing theories of recovery while also providing directions for more targeted theoretical development to understand how work scheduling factors influence work recovery.

Our contributions of reviewing existing theories of work recovery for consideration of work scheduling factors and creating a taxonomy of work scheduling factors relevant to recovery based on existing empirical research also yield important insights for the further development of specific constructs within existing work recovery theories. As one significant example, our work serves to enhance understanding of the construct of control in these theoretical perspectives. Both the ERM (Meijman & Mulder, 1998) and JD-R (Bakker & Demerouti, 2017) emphasize control as a valuable job resource that facilitates recovery and protects against resource loss. However, empirical recovery research is suggestive of the possibility that various manifestations of control over the job (e.g., autonomously set scheduling, schedule flexibility from day-to-day, the ability to work longer hours as needed to meet work demands) may hinder recovery by

engendering difficulties in detaching from work roles, creating greater unpredictability in the timing of the cessation of work demands each day, or increasing work hours such that time for recovery is impaired and inter-shift recovery intervals are shortened (Clauss et al., 2021; Michel et al., 2016). Conversely, however, if control can be harnessed towards having greater predictability in the end time of one's daily work or controllability over the timing and content of one's within-workday breaks, recovery benefits could accrue. Accordingly, our work suggests that the control construct may be critical to understanding how work schedules inform work recovery, while simultaneously directing future theory development towards a more nuanced understanding of how control over the timing of work and recovery periods informs recovery both within and outside of the workday.

As another significant example of the enrichment of core theoretical constructs developed through our enhancement of understanding of work schedule factors in relation to recovery, the emphasis in our taxonomy on factors related to the length of the recovery period expands understanding of the role of time in resource gain and loss processes in COR (Hobfoll, 2001). More specifically, COR can be synthesized with the ERM to posit that employees experience a self-perpetuating loss spiral of resources if returning to work before sufficient work recovery has occurred. Our taxonomy expands understanding of time as a resource by emphasizing how shorter inter-shift recovery intervals and an absence of multi-day recovery opportunities can undermine the return to baseline of cognitive and energetic resources defining work recovery (Meijman & Mulder, 1998), setting the stage for loss spirals that can further contribute to work-related strain (Hobfoll, 1989). Taken together, these factors translate the abstract concept of time as a resource into practically tangible and modifiable work scheduling factors that can be altered to decrease the risk for loss spirals triggered by insufficient work recovery.



### Temporal and Location Factors in Recovery

Our third intended contribution was to consider how work scheduling factors relate to *when* recovery takes place, with our systematic review further revealing that it may be similarly important to consider *where* recovery takes place. Together, temporal considerations (i.e., the length and frequency of break periods) and location considerations (i.e., whether recovery occurs at or away from work) are cited as key variables that may change the recovery process (Colombo & Gallego, 2012; Sonnentag et al., 2017; Sianoja et al., 2016). While recovery is commonly conceptualized as taking place during evenings after work and away from the physical workplace (e.g., Sonnentag et al., 2017; Fritz et al., 2022; Taylor et al., 2020; Mojza et al., 2011; Park et al., 2018; Parker et al., 2020), several of the taxonomic properties that emerged from our systematic review (e.g., on-site work arrangements, predictability and controllability of within-workday breaks) bolster previous suggestions that recovery can take place during the workday or at the workplace for some workers or in some circumstances (e.g., Lilius, 2012; Trougakos & Hideg, 2009). In particular, there seems to be a potential that recovery experiences may differ both quantitatively and qualitatively for employees working in on-site living arrangements (e.g., Sawhney et al., 2018). All else being equal, breaks within the work period are often shorter periods for recovery than evenings or days away from work, so it would also be useful to consider how the length of acute recovery opportunities for employees working in on-site work arrangements influence recovery, relative to longer opportunities to recover off-site that they may have (e.g., leave periods that present the opportunity for the employee to leave the work site).

Additional considerations related to the timing of recovery opportunities that emerged as particularly critical in our systematic review included the length of the inter-shift recovery

interval and how often employees have multiple consecutive days off. Both of these taxonomic properties appear strongly grounded in extant recovery theorizing (e.g., Meijman & Mulder, 1998; Sonnentag & Fritz, 2015). To date, these taxonomic properties have been almost exclusively studied in healthcare contexts (e.g., Alsayed et al., 2022; Karhula et al., 2013), but the strong grounding of the inter-shift recovery interval and multi-day recovery opportunities in work recovery theorizing suggests that these topics may be ideally suited to studies investigating work recovery across a broader range of occupational contexts.

Our work also highlights an interesting role for work location factors connected to work scheduling that may inform where and how recovery occurs. Psychological detachment is defined within the Stressor – Detachment Model as “disengag[ing] oneself psychologically from work *when being away from the workplace* [emphasis added]” (Sonnentag & Fritz, 2015, p. S74). However, our systematic review identified that psychological detachment can take place while employees are still at the physical workplace and that this detachment is still relevant to maintaining occupational health even when the physical work environment may be largely ever-present. For example, Hetland et al. (2021) sampled naval cadets who were on a 75-day sailing voyage across the Atlantic Ocean. In this sample of workers who were unable to leave their physical workplace, participants reported engaging in moderate levels of psychological detachment on average, which was correlated with lower levels of exhaustion (Hetland et al., 2021). This example suggests that some workers engage in detachment while remaining in the physical workplace, and that this detachment can produce resource replenishment. Despite this evidence that psychological detachment can occur while at the workplace, it may conceivably be limited by the demands of clients, customers, or patients that workers may interact with while located in the workplace (Cheng & Cho, 2021; Shen et al., 2018; Sianoja et al., 2016). Thus,

similar to the idea that shorter recovery periods are beneficial but perhaps not as beneficial as longer recovery periods all else being equal, engaging in recovery at work may have the potential to be beneficial but potentially not as beneficial as engaging in recovery away from work. Future research should more directly explore this possibility.

While not directly emerging within our systematic review, it is also worth considering if opportunities for recovery and recovery experiences may unfold differently when recovery opportunities do not align with the most common non-work period times and days for the majority of employees in one's society or culture (e.g., working predominately night shifts in a society where day shift work is substantially more common; working predominately on weekend days when weekday work is substantially more common). For example, access to some of the more active avenues to facilitate recovery (e.g., engaging in social activities; attending leisure activities that occur at particular dates and times, such as exercise classes, concerts, or sporting events) could be impaired when employees have work schedules that regularly conflict with opportunities to pursue these contributors to work recovery. Employees whose typical pattern of timing to potentially experience recovery does not align with the times or days off common in their broader community or social network may be at a greater risk for failing to achieve sufficient recovery due to lack of access to social support and connectedness that facilitates recovery from work (Ginoux et al., 2021; Bosch et al., 2018). Thus, our work highlights a potentially important factor relevant to the timing of recovery periods that may connect with and extend from some of the work scheduling factors identified in our taxonomy.

### **Directions for Future Research, Practice, and Methodological Advancement**

We address our fourth intended contribution of identifying directions for future research, applications, and methodological innovation by describing a set of actionable avenues to

leverage the taxonomy of work scheduling factors developed here to improve the study and applied practice of understanding and harnessing the potential of work recovery. We view the intersection of work schedules and recovery to be a crucial future area of research because work recovery is often studied as a linking mechanism between work experiences and outcomes related to performance and employee health (e.g., Bennett et al., 2017; Fritz & Sonnentag, 2005) and because rapid changes in technology use, accessibility of work, and the times and places people are working (e.g., Chen & Casterella, 2018; Vaziri et al., 2020) are adding complexity to work schedules for many employees across a wide range of occupations. Results of our review of work recovery theory and empirical research suggest that work scheduling dynamics have crucial relationships with work recovery and that those work scheduling dynamics continue to become more complex in the modern work landscape. Accordingly, we believe that the taxonomy developed here can be a catalyst to understand both how contemporary schedules of today and potential changes to work schedules in the future may affect recovery across a wide range of different jobs, schedule types, and industries.

In terms of directions for empirical research, it seems clear that an important first extension of our taxonomy will be to explore the unique and relative contributions of different work scheduling factors to specific recovery experiences (e.g., psychological detachment, control over leisure time; Sonnentag & Fritz, 2007), with further attention to whether specific work scheduling factors may strengthen or weaken the influence of these recovery experiences on common indicators of sufficient and insufficient recovery (e.g., fatigue, vigor, burnout; Bennett et al., 2018; Demerouti, 2015). Furthermore, while comparisons of the influence of the timing and location of work have been common in research focused on physical or mental health, (e.g., long work hours and increased risk of coronary heart disease; Virtanen et al., 2012; shift work

and increased risk of depression; Torquati et al., 2019), work scheduling characteristics have received comparatively less attention in the work recovery literature. The taxonomy developed here yields actionable avenues to understand how factors relevant to the timing of work (e.g., schedule type, inter-shift recovery interval, multi-day recovery opportunity frequency) and the location of recovery (e.g., on-site work arrangements, predictability and controllability of within-workday breaks) may additively and jointly influence work recovery processes.

In addition, developing understanding of whether and how recovery is altered in response to more enduring changes to the work scheduling factors in our taxonomy (e.g., moving from a variable to a fixed schedule) is a crucial need for future research. Investigations of this nature could expand the time scale of efforts to understand within-person changes in recovery beyond the commonly studied daily level of analysis (Demerouti et al., 2009), while also having the potential to move the field towards a better causal understanding of the implications of work scheduling factors for recovery if well-designed field experiments to evaluate and compare changes in work scheduling factors can be harnessed to advance this knowledge base.

Building on our systematic review insights regarding the overlapping considerations relevant to shift length predictability, on-call work, and supplemental work, we argue that future research should investigate the complexity of the ways and reasons why employees continue working beyond the end of the formal work shift for those who have structured work hours, what informs when and how the work shift ends for employees who have greater schedule flexibility, and the relationships between these types of engagement with work beyond one's expected or common workday hours and the recovery process. The concept of supplemental work is substantially more well-developed in the organizational literature relative to contributors to shift length unpredictability stemming from core job tasks (e.g., patient care), formal work scheduling

(e.g., on-call work), or control over the job (e.g., schedule flexibility), as this supplemental work has been understood from many perspectives encompassing organizational culture and normative pressures (e.g., Derks et al., 2014; Foucreault et al., 2018), personal tendencies that relate to supplemental work (e.g., workaholism, telepressure, Bakker et al., 2013; Barber et al., 2015), and technological contributors to supplemental work (e.g., Tedone, 2022; Reinke & Ohly, 2021). Further, supplemental work has long been recognized to generally impair work recovery (Sonnentag, 2001), which is in line with original predictions from the ERM focused on the importance of the cessation of work-related effort expenditure to recovery.

However, whether and how supplemental work is influenced by other work scheduling factors identified in our taxonomy deserves further consideration. As a first observation on this point, articles in our systematic review address the need to distinguish between discretionary vs. non-discretionary work hours (Mellner et al., 2016) and investigate the recovery implications of perceived pressure to work during non-work time (van der Hulst & Geurts, 2001). Future research may apply our taxonomy of scheduling characteristics to consider when work is perceived as supplemental as opposed to a normative feature of the work schedule (see Calderwood et al., 2023) under conditions of fixed, variable, or autonomously set scheduling. Furthermore, it is worth evaluating if employees who have greater control over the timing of their within-workday breaks may be more likely to engage in procrastination at work that could lead to future supplemental work, which could drive greater schedule unpredictability that impairs work recovery. Thus, there appears to be substantial value in exploring applications of our taxonomic framework to the supplemental work literature, with an eye particularly towards understanding how this work may relate to work schedule unpredictability and its implications for work recovery.

Additionally, we note the role that gender may play in moderating relationships between the work schedule characteristics identified through our systematic review and recovery experiences. Two articles in our systematic review highlight gender as an important variable to consider in the recovery process. In a sample of dual-earner couples with at least one child, Saxbe et al. (2011) found that, during time at home, wives engaged in more housework and childcare activities and less leisure activities as compared to husbands. Further, while husbands' work hours were related to a greater percentage of at-home time devoted to leisure, there was no relationship between wives' work hours and percentage of at-home time devoted to leisure. Adding nuance to the potential relationships among gender, work schedules, and recovery, Mellner et al. (2016) found that females, as compared to males, were more likely to engage in work at times or in places outside of what was typical for their organization (e.g., working from home in an organization where most people work in the office). This evidence suggests that females may be more likely to engage in effortful activities in both work-related and non-work related roles at home, which, based on the results of our systematic review, may have implications for the recovery process. While a recent recovery review suggests that gender is unlikely to impact the outcomes of recovery experiences (Sonnentag et al., 2022), the work scheduling lens developed in this manuscript identifies new avenues to consider gender in relation to the recovery process.

One noteworthy aspect of our systematic review findings is that the empirical articles comprising our systematic review contain samples of participants representing a wider range of occupational contexts than is typical in the work recovery literature (which has tended to focus on the experiences of employees working in administrative, knowledge work, and/or office jobs; Sonnentag et al., 2017). In particular, many of the occupational groups encompassed within our

systematic review tended to be working in jobs characterized by relatively lower levels of job control (e.g., nurses, deployed naval cadets) and job status (e.g., coal workers, airport workers), relative to the occupational context more typically examined in the recovery literature.

Occupational differences in job control and status have received relatively little attention in the recovery literature, in comparison to some other organizational literatures (e.g., the work-family interface; Kossek & Lautsch, 2018). Thus, it will be crucial in future research to examine how the different work scheduling factors identified in our taxonomy systematically co-vary with occupational differences in job control and job status, with an eye towards examining how the work recovery implications of these work scheduling factors could be relevant to explaining occupational health disparities across different work contexts.

From a practical perspective, we hope that the development of our taxonomy will better allow organizations to consider the potential impact of their scheduling systems for employees and, where possible, optimize those schedules to facilitate work recovery. Based on the results of our systematic review, specific ways to optimize work schedules to facilitate recovery may include enhancing predictability in end of work shift times, extending inter-shift recovery intervals where possible, and striving to provide more multi-day recovery opportunities. We view these specific suggestions that may optimize work schedules to facilitate recovery to be a particularly crucial area of consideration given widespread acknowledgement of occupational health disparities that correlate with shift work, long work hours, and night shift work (Harma, 2006; Rivera et al., 2020). Further supporting the importance of this area of work, the National Occupational Research Agenda (NORA) in the United States created a council with the explicit purpose of “improv[ing] the safety, health, and well-being of workers with non-standard work arrangements” (NORA, 2020, p. 7). When considering the rapid changes to the nature of work



schedules driven by the rise of the gig economy (Spreitzer et al., 2017), the expansion of the ability to work from home for many employees (Smite et al., 2023), and the pervasiveness of information communication technologies (Reinke & Ohly, 2020), we believe work schedules are becoming more complex, and thus the attention given to how workers are scheduled in practice must also become correspondingly more nuanced.

As a concluding point, we identified two major methodological and reporting recommendations that could help to clarify the relevance of scheduling dynamics to work recovery in future empirical work. First, given the potential theoretical importance of the timing of cycles of work and rest, we encourage researchers to include more thorough descriptive information about the scheduling dynamics of their samples to allow the work scheduling dynamics that may be relevant to recovery of participants in empirical research studies to be better understood. Second, researchers should attend to unique study design and data screening considerations that emerge when study participants follow a variety of work schedules. As examples, additional efforts are likely needed in considering when to schedule survey delivery in repeated measures studies (e.g., a morning and afternoon survey delivered Monday – Friday may not map neatly on to the beginning and end of workdays for many employees), how long surveys should remain available (e.g., to account for the potential unpredictability in when the work shift may end for some employees), and what timeframe participants are asked to reflect on when completing self-report measures (e.g., a framing of recovery around instructions centered on “This evening” or “Last night” may reflect a work, rather than a non-work, period for some employees). In combination, attending to these issues may help to include and more accurately investigate the experiences of workers across many occupational and work scheduling contexts that are relevant to the recovery process.

## References

(\* = Articles Included in Systematic Review)

- Ackerman, P. L. (2011). 100 years without resting. In P. L. Ackerman (Ed.), *Cognitive fatigue: Multidisciplinary perspectives on current research and future applications* (pp. 11–43). American Psychological Association. <https://doi.org/10.1037/12343-001>
- Akerstedt, T. (1988). Sleepiness as a consequence of shift work. *Sleep*, 11(1), 17–34. <https://doi.org/10.1093/sleep/11.1.17>
- Åkerstedt, T., Knutsson, A., Alfredsson, L., & Theorell, T. (1984). Shift work and cardiovascular disease. *Scandinavian Journal of Work Environment & Health*, 10, 409–414. <https://doi.org/10.5271/sjweh.2302>
- \*Alsayed, S. A., Hashish, E. A. A., & Alshammari, F. (2022). Occupational fatigue and associated factors among Saudi nurses working 8-hour shifts at public hospitals. *SAGE Open Nursing*, 8, 1–11. <https://doi.org/10.1177/23779608221078158>
- Althammer, S. E., Reis, D., Van der Beek, S., Beck, L., & Michel, A. (2021). A mindfulness intervention promoting work–life balance: How segmentation preference affects changes in detachment, well-being, and work–life balance. *Journal of Occupational and Organizational Psychology*, 94(2), 282–308. <https://doi.org/10.1111/joop.12346>
- American Psychological Association. (2023). *2023 Work in America Survey: Workplaces as engines of psychological health and well-being*. <https://www.apa.org/pubs/reports/work-in-america/2023-workplace-health-well-being>
- \*Andrade, C. (2018). Professional work load and work-to-school conflict in working students: The mediating effect of psychological detachment from work. *Psychology, Society, & Education*, 10(2), 215–224. <https://doi.org/10.25115/psye.v10i2.1777>
- Arlinghaus, A., Bohle, P., Iskra-Golec, I., Jansen, N., Jay, S., & Rotenberg, L. (2019). Working Time Society consensus statements: Evidence-based effects of shift work and non-standard working hours on workers, family and community. *Industrial Health*, 57(2), 184–200. <https://doi.org/10.2486/indhealth.SW-4>
- Ashforth, B. E., Kreiner, G. E., & Fugate, M. (2000). All in a day's work: Boundaries and micro role transitions. *Academy of Management Review*, 25(5), 472–491. <https://doi.org/10.2307/259305>
- Bakker, A. B., & Demerouti, E. (2017). Job demands–resources theory: Taking stock and looking forward. *Journal of Occupational Health Psychology*, 22(3), 273–285. <https://doi.org/10.1037/ocp0000056>
- Bennett, A., Bakker, A. B., & Field, J. (2017). Recovery from work-related effort: A meta-analysis. *Journal of Organizational Behavior*, 39, 262–275. <https://doi.org/10.1002/job.2217>

- Bennett, A. A., Gabriel, A. S., Calderwood, C., Dahling, J. J., & Trougakos, J. P. (2016). Better together? Examining profiles of employee recovery experiences. *The Journal of Applied Psychology*, 101(12), 1635–1654. <https://doi.org/10.1037/apl0000157>
- Bennett, A. A., Gabriel, A. S., & Calderwood, C. (2020). Examining the interplay of micro-break durations and activities for employee recovery: A mixed-methods investigation. *Journal of Occupational Health Psychology*, 25(2), 126-142. <https://doi.org/10.1037/ocp0000168>
- \*Bentzen, M., Lemyre, N., Kenttä, G. (2017). A comparison of high-performance football coaches experiencing high- versus low-burnout symptoms across a season of play: Quality of motivation and recovery matters. *International Sport Coaching Journal*, 4(2), 133-146. <https://doi.org/10.1123/iscj.2016-0045>
- Bernhardt, J., Recksiedler, C., & Linberg, A. (2022). Work from home and parenting: Examining the role of work-family conflict and gender during the COVID-19 pandemic. *Journal of Social Issues*. <https://doi.org/10.1111/josi.12509>
- Bick, A., Blandin, A., & Mertens, K. (2023). Work from home before and after the COVID-19 outbreak. *American Economics Journal*, 15(4), 1 – 39. <https://doi.org/10.1257/mac.20210061>
- Binnewies, C., Sonnentag, S., & Mojza, E. J. (2010). Recovery during the weekend and fluctuations in weekly job performance: A week-level study examining intra-individual relationships. *Journal of Occupational and Organizational Psychology*, 83(2), 419-441. <https://doi.org/10.1348/096317909X418049>
- Binnewies, C., & Wörnlein, S. C. (2011). What makes a creative day? A diary study on the interplay between affect, job stressors, and job control. *Journal of Organizational Behavior*, 32(4), 589-607. <https://doi.org/10.1002/job.731>
- Blau, G., & Lunz, M. (1999). Testing the impact of shift schedules on organizational variables. *Journal of Organizational Behavior*, 20(6), 933-942. [https://doi.org/10.1002/\(SICI\)1099-1379\(199911\)20:6<933::AID-JOB940>3.0.CO;2-V](https://doi.org/10.1002/(SICI)1099-1379(199911)20:6<933::AID-JOB940>3.0.CO;2-V)
- Bosch, C., Sonnentag, S., & Pinck, A. S. (2018). What makes for a good break? A diary study on recovery experiences during lunch break. *Journal of Occupational and Organizational Psychology*, 91(1), 134-157. <https://doi.org/10.1111/joop.12195>
- Braukmann, J., Schmitt, A., Ďuranová, L., & Ohly, S. (2018). Identifying ICT-related affective events across life domains and examining their unique relationships with employee recovery. *Journal of Business and Psychology*, 33, 529-544. <https://doi.org/10.1007/s10869-017-9508-7>
- Brosschot, J. F., Gerin, W., & Thayer, J. F. (2006). The perseverative cognition hypothesis: A review of worry, prolonged stress-related physiological activation, and health. *Journal of Psychosomatic Research*, 60, 113-124. <https://doi.org/10.1016/j.jpsychores.2005.06.074>

- Brosschot, J. F., Pieper, S., & Thayer, J. F. (2005). Expanding stress theory: Prolonged activation and perseverative cognition. *Psychoneuroendocrinology*, 30, 1043-1049  
<https://doi.org/10.1016/j.psyneuen.2005.04.008>
- \*Burke, R. J., & El-Kot, G. (2009). Benefits of recovery after work among Egyptian managers. *Journal of Transnational Management*, 14(4), 309-331.  
<https://doi.org/10.1080/15475770903334151>
- \*Burke, R. J., Koyuncu, M., & Fiksenbaum, L. (2009). Benefits of recovery after work among Turkish manufacturing managers and professionals. *Education, Business and Society: Contemporary Middle Eastern Issues*, 2(2), 109-122.  
<https://doi.org/10.1108/17537980910960681>
- Butler, A. B. (2007). Job characteristics and college performance and attitudes: A model of work-school conflict and facilitation. *Journal of Applied Psychology*, 92(2), 500–510. <https://doi.org/10.1037/0021-9010.92.2.500>
- Calderwood, C., & Ackerman, P. L. (2011). The relative impact of trait and temporal determinants of subjective fatigue. *Personality and Individual Differences*, 50(4), 441–445. <https://doi.org/10.1016/j.paid.2010.10.030>
- Calderwood, C., Meyer, R. D., & Minnen, M. E. (2023). Situational strength as a lens to understand the strain implications of extra-normative work. *Journal of Business and Psychology*, 38(3), 637-655. <https://doi.org/10.1007/s10869-022-09846-8>
- Chen, A., & Casterella, G. I. (2018). After-hours work connectivity: Technological antecedents and implications. *IEEE Transactions on Professional Communication*, 62(1), 75-93.  
<https://doi.org/10.1109/TPC.2018.2867129>
- \*Chen, Y., Shuang L., Xia, Q., & He. C. (2017). The relationship between job demands and employees' counterproductive work behaviors: The mediating effect of psychological detachment and job anxiety. *Frontiers in Psychology*, 8, 1-15.  
<https://doi.org/10.3389/fpsyg.2017.01890>
- Cheng, Y., & Cho, S. (2021). Are social media bad for your employees? Effects of at-work break activities. *International Journal of Hospitality Management*, 96, 1-15.  
<https://doi.org/10.1016/j.ijhm.2021.102957>
- \*Cho, S., & Park, Y. (2018). How to benefit from weekend physical activities: Moderating roles of psychological recovery experiences and sleep. *Stress and Health*, 34(5), 639-648.  
<https://doi.org/10.1002/smi.2831>
- \*Chu, M. L., Creed, P. A., & Conlon, E. G. (2021). Recovery resources mediate between work-study boundary congruence and wellbeing and engagement in tertiary students, *Journal of Education and Work*, 34(2), 232-246. <https://doi.org/10.1080/13639080.2021.1887828>

- \*Clauss, E., Hoppe, A., Schachler, V., & O'Shea, D. (2021). Occupational self-efficacy and work engagement as moderators in the stressor-detachment model, *Work & Stress*, 35(1), 74-92. <https://doi.org/10.1080/02678373.2020.1743790>
- Colombo, V., & Cifre, E. (2012). The importance of recovery of work: A review of where, how and why. *Papeles del Psicologo*, 33, 129-137.
- Cropanzano, R., Keplinger, K., Lambert, B. K., Caza, B., & Ashford, S. J. (2023). The organizational psychology of gig work: An integrative conceptual review. *Journal of Applied Psychology*, 108(3), 492–519. <https://doi.org/10.1037/apl0001029>
- Cropley, M., & Millward Purvis, L.J. (2003). Job strain and rumination about work issues during leisure time: A diary study. *European Journal of Work and Organizational Psychology*, 12(3), 195-207. <https://doi.org/10.1080/13594320344000093>
- Cropley, M., & Zijlstra, F. R. H. (2011). Work and rumination. In J. Langan-Fox & C. L. Cooper (Eds.), *Handbook of stress in the occupations* (pp. 487–501). Edward Elgar Publishing. <https://doi.org/10.4337/9780857931153.00061>
- Demerouti, E. (2015). Strategies used by individuals to prevent burnout. *European Journal of Clinical Investigation*, 45, 1106 – 1112. <http://dx.doi.org/10.1111/eci.12494>
- Demerouti, E., Bakker, A. B., Nachreiner, F. S., & Wilmar B. (2001). The job demands-resources model of burnout. *Journal of Applied Psychology*, 86(3), 499-512. <https://doi.org/10.1037/0021-9010.86.3.499>
- Demerouti, E., Geurts, S., & Taris, T. (2009). Daily recovery from work-related effort during non-work time. *Research in Occupational Stress and Well-being*. 7, 85-123. [https://doi.org/10.1108/S1479-3555\(2009\)0000007006](https://doi.org/10.1108/S1479-3555(2009)0000007006)
- \*Dettmers, J., Vahle-Hinz, T., Bamberg, E., Friedrich, N., & Keller, M. (2016). Extended work availability and its relation with start-of-day mood and cortisol. *Journal of occupational health psychology*, 21(1), 105-118. <https://doi.org/10.1037/a0039602>
- Dizaho, E. K., Salleh, R., & Abdullah, A. (2017). Achieving Work Life Balance Through Flexible Work Schedules and Arrangements. *Global Business & Management Research*, 9, 455–465.
- Dunham, R. B. (1977). Shift work: A review and theoretical analysis. *Academy of Management Review*, 2(4), 624-634. <https://doi.org/10.5465/amr.1977.4406742>
- Feldman, D. C. (1990). Reconceptualizing the nature and consequences of part-time work. *The Academy of Management Review*, 15(1), 103–112. <https://doi.org/10.2307/258108>
- \*Fletcher, L., Buffington, B., & Overcash, J. (2020). Chronic and acute fatigue and intershift recovery in undergraduate nursing students working 12 or 6-hour faculty-supervised clinical shifts. *Nursing Forum*, 55(3), 491–496. <https://doi.org/10.1111/nuf.12454>

- Fritz, C., & Sonnentag, S. (2005). Recovery, health, and job performance: Effects of weekend experiences. *Journal of Occupational Health Psychology, 10*(3), 187–199. <https://doi.org/10.1037/1076-8998.10.3.187>
- \*Fritz, C., Sonnentag, S., Spector, P. E., & McInroe, J. A. (2010). The weekend matters: Relationships between stress recovery and affective experiences. *Journal of Organizational Behavior, 31*(8), 1137–1162. <https://doi.org/10.1002/job.672>
- Fritz, C., Caughlin, D., & Auten, D. (2022). When a good day makes for a good night: Antecedents of sleep and morning states. *Journal of Business Psychology, 37*, 1235–1253. <https://doi.org/10.1007/s10869-022-09793-4>
- Gaudiino, M., & Di Stefano, G. (2023). To detach or not to detach? The moderating effect of psychological detachment on the relations between heavy work investment and well-being. *Current Psychology, 42*(8), 6667–6681. <https://doi.org/10.1007/s12144-021-01958-3>
- \*Gabriel, A. S., Calderwood, C., Bennett, A. A., Wong, E. M., Dahling, J. J., & Trougakos, J. P. (2019). Examining recovery experiences among working college students: A person-centered study. *Journal of Vocational Behavior, 115*, 103329. <https://doi.org/10.1016/j.jvb.2019.103329>
- Geurts, S. A. E., Beckers, D. G. J., & Tucker, P. (2014). Recovery from demanding work hours. In M. C. W. Peeters, J. De Jonge, & T. W. Taris (Eds.), *An introduction to contemporary work psychology* (pp. 196–219). Wiley Blackwell.
- Geurts, S. A. (2014). Recovery from work during off-job time. *Bridging Occupational, Organizational, and Public Health* (pp. 193–208). Springer, Dordrecht.
- GINOUX, C., ISOARD-GAUTHEUR, S., & SARRAZIN, P. G. (2021). What did you do this weekend? Relationships between weekend activities, recovery experiences, and changes in work-related well-being. *Applied Psychology, Health, and Well-Being, 13*(2), 798–816. <http://dx.doi.org/10.1111/aphw.12272>
- Golden, L. (2015). Irregular work scheduling and its consequences. *Economic Policy Institute, 394*, 1–41. <http://dx.doi.org/10.2139/ssrn.2597172>
- Greenhaus, J. H., & Beutell, N. J. (1985). Sources and conflict between work and family roles. *The Academy of Management Review, 10*(1), 76–88. <https://doi.org/10.2307/258214>
- \*Gupta, N., Wahlin-Jacobsen, C. D., Abildgaard, J. S., Henriksen, L. N., Nielsen, K., & Holtermann, A. (2018). Effectiveness of a participatory physical and psychosocial intervention to balance the demands and resources of industrial workers: A cluster-randomized controlled trial. *Scandinavian Journal of Work Environment and Health, 44*(1), 58–68. <https://doi.org/10.5271/sjweh.3689>



- Hahn, V. C., Binnewies, C., & Haun, S. (2012). The role of partners for employees' recovery during the weekend. *Journal of Vocational Behavior*, 80(2), 288-298. <https://doi.org/10.1016/j.jvb.2011.12.004>
- \*Hakola, T., Paukkonen, M., & Pohjonen, T. (2010). Less quick returns — Greater well-being. *Industrial Health*, 48, 390-394. <https://doi.org/10.2486/indhealth.MSSW-02>
- Haluza, D., Schmidt, V.-M., & Blasche, G. (2019). Time course of recovery after two successive night shifts: A diary study among Austrian nurses. *Journal of Nursing Management*, 27(1), 190–196. <https://doi.org/10.1111/jonm.12664>
- Härmä, M. (2006). Workhours in relation to work stress, recovery and health. *Scandinavian Journal of Work, Environment, & Health*, 502-514.
- Härmä, M., Tarja, H., Irja, K., Mikael, S., Jussi, V., Anne, B., & Pertti, M. (2006). A controlled intervention study on the effects of a very rapidly forward rotating shift system on sleep-wakefulness and well-being among young and elderly shift workers. *International Journal of Psychophysiology: Official Journal of The International Organization of Psychophysiology*, 59(1), 70–79. <https://doi.org/10.1016/j.ijpsycho.2005.08.005>
- \*Hetland, J., Bakker, A. B., Demerouti, E., Espevik, R., & Olsen, O. K. (2021). Work pressure and recovery during a cross-atlantic voyage: A test of the stressor-detachment model. *International Journal of Stress Management*, 28(4), 245-255. <https://doi.org/10.1037/str0000170>
- Hobfoll, S. E. (1989). Conservation of resources: A new attempt at conceptualizing stress. *American psychologist*, 44(3), 513-524.
- Hobfoll, S. E. (2001). The influence of culture, community, and the nested-self in the stress process: Advancing Conservation of Resources theory. *Applied Psychology: An International Review*, 50(3), 337–370. <https://doi.org/10.1111/1464-0597.00062>
- Hobfoll, S. E. (2011). Conservation of resources theory: Its implication for stress, health, and resilience. In S. Folkman (Ed.), *The Oxford handbook of stress, health, and coping* (pp. 127–147). Oxford University Press.
- \*Jeong, J., Kang, S., & Choi, S. B. (2020). Employees' weekend activities and psychological well-being view job stress: A moderated mediation role of recovery experience. *International Journal of Environmental Research and Public Health*, 17(5), 1642-1656. <https://doi.org/10.3390/ijerph17051642>
- Karasek, R. A. (1979). Job demands, job decision latitude, and mental strain: Implications for job redesign. *Administrative Science Quarterly*, 24(2), 285–308. <https://doi.org/10.2307/2392498>
- \*Karhula, K., Härmä, M., Sallinen, M., Hublin, C., Virkkala, J., Kivimäki, M., Vahtera, J., & Puttonen, S. (2013). Association of job strain with working hours, shift-dependent

- perceived workload, sleepiness and recovery. *Ergonomics*, 56(11), 1640-1651.  
<https://doi.org/10.1080/00140139.2013.837514>
- Kim, S., Park, Y., & Headrick, L. (2018). Daily micro-breaks and job performance: General work engagement as a cross-level moderator. *Journal of Applied Psychology*, 103(7), 772–786. <https://doi.org/10.1037/apl0000308>
- Kinnunen, U., Feldt, T., Sianoja, M., de Bloom, J., Korpela, K., & Geurts, S. (2017). Identifying long-term patterns of work-related rumination: Associations with job demands and well-being outcomes. *European Journal of Work and Organizational Psychology*, 26(4), 514-526. <https://doi.org/10.1080/1359432X.2017.1314265>
- \*Korunka, C., Kubicek, B., Prem, R., & Cvitan, A. (2012). Recovery and detachment between shifts, and fatigue during a twelve-hour shift. *Work*, 41(1), 3227–3233.  
<https://doi.org/10.3233/WOR-2012-0587-3227>
- Kossek, E. E., & Lautsch, B. A. (2018). Work–life flexibility for whom? Occupational status and work–life inequality in upper, middle, and lower level jobs. *Academy of Management Annals*, 12(1), 5-36. <https://doi.org/10.5465/annals.2016.0059>
- \*Kubo, T., Izawa, S., Ikeda, H., Tsuchiya, M., Miki, K., & Takahashi, M. (2021). Work e-mail after hours and off-job duration and their association with psychological detachment, actigraphic sleep, and saliva cortisol: A 1-month observational study for information technology employees. *Journal of Occupational Health*, 63(1), e12300. <https://doi.org/10.1002/1348-9585.12300>
- \*Kubo, T., Izawa, S., Tsuchiya, M., Ikeda, H., Miki, K., & Takahashi, M. (2018). Day-to-day variations in daily rest periods between working days and recovery from fatigue among information technology workers: One-month observational study using a fatigue app. *Journal of Occupational Health*, 60(5), 394–403. <https://doi.org/10.1539/joh.2018-0073-OA>
- Kubicek, B., Korunka, C., & Tement, S. (2014). Too much job control? Two studies on curvilinear relations between job control and eldercare workers' well-being. *International journal of nursing studies*, 51(12), 1644-1653.  
<https://doi.org/10.1016/j.ijnurstu.2014.05.005>
- \*Kühnel, J., Sonnentag, S., & Westman, M. (2009). Does work engagement increase after a short respite? The role of job involvement as a double-edged sword. *Journal of Occupational and Organizational Psychology*, 82, 575-594.  
<https://doi.org/10.1348/096317908X349362>
- Kühner, C., Rudolph, C. W., Derks, D., Posch, M., & Zacher, H. (2023). Technology-assisted supplemental work: A meta-analysis. *Journal of Vocational Behavior*, 142, 1–18. <https://doi.org/10.1016/j.jvb.2023.103861>



- \*Liu, M.-S., Wang, M.-L. and Lee, C.H. (2022). Exploring the linkages between job demands and recovery self-efficacy: A resource perspective of the school–work interface. *Personnel Review*, 51(3), 1187-1204. <https://doi.org/10.1108/PR-07-2020-0547>
- Mazmanian, M., Orlikowski, W. J., & Yates, J. (2013). The autonomy paradox: The implications of mobile email devices for knowledge professionals. *Organizational Science*, 24(5), 1337-1357. <http://dx.doi.org/10.1287/orsc.1120.0806>
- McAlpine, K., & Piszczek, M.M. (2022). Along for the ride through liminal space: A role transition and recovery perspective on the work-to-home commute. *Organizational Psychology Review*. <https://doi.org/10.1177/2041386622113139>
- Meijman, T. F., & Mulder, G. (1998). Psychological aspects of workload. In P. J. Drenth, H. Thierry, & C. J. de Wolff (Eds.), *Handbook of work and organizational psychology* (2nd ed., pp. 5–33). Hove, England: Erlbaum
- \*Mellner, C., Kecklund, G., Kompier, M., Sariaslan, A., & Aronsson, G. (2016). Boundaryless work, psychological detachment and sleep: does working ‘anytime–anywhere’ equal employees are ‘always on’?. In *New ways of working practices* (Vol. 16, pp. 29-47). Emerald Group Publishing Limited. <https://doi.org/10.1108/S1877-636120160000016003>
- \*Mette, J., Velasco Garrido, M., Preisser, A.M., Harth, V., & Mache, S. (2018). Linking quantitative demands to offshore wind workers’ stress: Do personal and job resources matter? A structural equation modelling approach. *BMC Public Health*, 18(934), 1-15. <https://doi.org/10.1186/s12889-018-5808-8>
- \*Michel, A., Turgut, S., Hoppe, A., & Sonntag, K. (2016). Challenge and threat emotions as antecedents of recovery experiences: Findings from a diary study with blue-collar workers. *European Journal of Work and Organizational Psychology*, 25(5), 674–689. <https://doi.org/10.1080/1359432X.2015.1128414>
- \*Min, A., Hong, H. C., & Kim, Y. M. (2022). Work schedule characteristics and occupational fatigue/recovery among rotating-shift nurses: A cross-sectional study. *Journal of Nursing Management*, 30(2), 463–472. <https://doi.org/10.1111/jonm.13511>
- Moher, D., Liberati, A., Tetzlaff, J., Altman, D. G., & the PRISMA Group. (2009). Preferred reporting items for systematic reviews and metaanalyses: The PRISMA statement. *Annals of Internal Medicine*, 151(4), 264–269. <https://doi.org/10.7326/0003-4819-151-4-200908180-00135>
- Mojza, E.J., Sonnentag, S., & Bornemann, C. (2011). Volunteer work as a valuable leisure-time activity: A day-level study on volunteer work, non-work experiences, and well-being at work. *Journal of Occupational and Organizational Psychology*, 84, 123-152. <https://doi.org/10.1348/096317910X485737>
- \*Moreno-Jiménez, B., Mayo, M., Sanz-Vergel, A. I., Geurts, S., Rodríguez-Muñoz, A., & Garrosa, E. (2009). Effects of work–family conflict on employees’ well-being: The

- moderating role of recovery strategies. *Journal of Occupational Health Psychology*, 14(4), 427–440. <https://doi.org/10.1037/a0016739>
- National Occupational Research Agenda (NORA; 2020). *National occupational research agenda for healthy work design and well-being*. [https://www.cdc.gov/niosh/docket/archive/pdfs/niosh-328/Final-National-Occupational-Research-Agenda-for-HWD\\_January-2020.pdf](https://www.cdc.gov/niosh/docket/archive/pdfs/niosh-328/Final-National-Occupational-Research-Agenda-for-HWD_January-2020.pdf)
- \*Niks, I., de Jonge, J., Gevers, J., & Houtman, I. (2018). Work stress interventions in hospital care: Effectiveness of the DISCOVERY method. *International Journal of Environmental Research and Public Health*, 15(2), 332–352. <https://doi.org/10.3390/ijerph15020332>
- Nitzsche, A., Neumann, M., Groß, S. E., Ansmann, L., Pfaff, H., Baumann, W., ... & Ernstmann, N. (2017). Recovery opportunities, work–home conflict, and emotional exhaustion among hematologists and oncologists in private practice. *Psychology, Health & Medicine*, 22(4), 462–473. <https://doi.org/10.1080/13548506.2016.1237666>
- Parker, S.L., Sonnentag, S., Jimmieson, N.L., & Newton, C.J. (2020). Relaxation during the evening and next-morning energy: The role of hassles, uplifts, and heart rate variability during work. *Journal of Occupational Health Psychology*, 25, 83–98. <https://doi.org/10.1037/ocp0000155>
- Park, Y., Fritz, C., & Jex, S. M. (2018). Daily cyber incivility and distress: The moderating roles of resources at work and home. *Journal of Management*, 44(7), 2535–2557. <https://doi.org/10.1177/0149206315576796>
- \*Patterson, P. D., Buysse, D. J., Weaver, M. D., Callaway, C. W., & Yealy, D. M. (2015). Recovery between work shifts among emergency medical services clinicians. *Prehospital Emergency Care*, 19(3), 365–375. <https://doi.org/10.3109/10903127.2014.995847>
- Peterson, S.A., Wolkow, A.P., Lockley, S.W., O'Brien, C. S., Qadri, S., Sullivan, J. P., Czeisler, C.A., Rajaratnam, S. M. W., & Barger, L. K. (2019). Associations between shift work characteristics, shift work schedules, sleep and burnout in North American police officers: a cross-sectional study. *BMJ Open*, 9(11), e030302. <http://dx.doi.org/10.1136/bmjopen-2019-030302>
- \*Poulsen, M. G., Poulsen, A. A., Khan, A., Poulsen, E. E., & Khan, S. R. (2014). Recovery experience and burnout in cancer workers in Queensland. *European Journal of Oncology Nursing: The Official Journal of European Oncology Nursing Society*, 19(1), 23–28. <https://doi.org/10.1016/j.ejon.2014.08.003>
- \*Poulsen, A. A., Sharpley, C. F., Baumann, K. C., Henderson, J., & Poulsen, M. G. (2015). Evaluation of the effect of a 1-day interventional workshop on recovery from job stress for radiation therapists and oncology nurses: A randomised trial. *Journal of Medical Imaging and Radiation Oncology*, 59(4), 491–498. <https://doi.org/10.1111/1754-9485.12322>

- Ragsdale, J. M., & Beehr, T. A. (2016). A rigorous test of a model of employees' resource recovery mechanisms during a weekend. *Journal of Organizational Behavior*, 37(6), 911–932. <https://doi.org/10.1002/job.2086>
- Reinke, K., & Ohly, S. (2021). Double-edged effects of work-related technology use after hours on employee well-being and recovery: The role of appraisal and its determinants. *German Journal of Human Resource Management*, 35(2), 224–248. <https://doi.org/10.1177/2397002221995797>
- \*Richardson, K. M., & Thompson, C. A. (2012). High tech tethers and work-family conflict: A conservation of resources approach. *Engineering Management Research*, 1(1), 29–43. <https://dx.doi.org/10.5539/emr.v1n1p29>.
- Rivera, A. S., Akanbi, M., O'Dwyer, L. C., & McHugh, M. (2020). Shift work and long work hours and their association with chronic health conditions: A systematic review of systematic reviews with meta-analyses. *PloS one*, 15(4), e0231037. <https://doi.org/10.1371/journal.pone.0231037>
- Rosekind, M. R., Gregory, K. B., Mallis, M. M., Brandt, S. L., Seal, B., & Lerner, D. (2010). The cost of poor sleep: Workplace productivity loss and associated costs. *Journal of Occupational and Environmental Medicine*, 52(1), 91–98. <https://doi.org/10.1097/JOM.0b013e3181c78c30>
- Sauter, Michael (Jan. 2020). Working for a living: What countries have shorter, or longer, work weeks than the US? <https://www.usatoday.com/story/money/2020/01/28/the-length-of-atypical-work-week-around-the-world/41060709/>
- \*Sawhney, G., Jennings, K. S., Britt, T. W., & Sliter, M. T. (2018). Occupational stress and mental health symptoms: Examining the moderating effect of work recovery strategies in firefighters. *Journal of Occupational Health Psychology*, 23(3), 443–456. <https://doi.org/10.1037/ocp0000091>
- \*Saxbe, D. E., Repetti, R. L., & Graesch, A. P. (2011). Time spent in housework and leisure: links with parents' physiological recovery from work. *Journal of Family Psychology*, 25(2), 271–281. <https://doi.org/10.1037/a0023048>
- \*Shen, R., Miao, L., Lehto, X., & Zhao, X. (2018). Work or/and life? An exploratory study of respite experience of bed and breakfast innkeepers. *Journal of Hospitality & Tourism Research*, 42(1), 142–165. <https://doi.org/10.1177/1096348015597028>
- \*Shepherd, B. R., Fritz, C., Hammer, L. B., Guros, F., & Meier, D. (2019). Emotional demands and alcohol use in corrections: A moderated mediation model. *Journal of Occupational Health Psychology*, 24(4), 438–449. <https://doi.org/10.1037/ocp0000114>
- Shimazu, A., Matsudaira, K., Jonge, J. D., Tosaka, N., Watanabe, K., & Takahashi, M. (2016). Psychological detachment from work during non-work time: linear or curvilinear relations with mental health and work engagement?. *Industrial Health*, 54(3), 282–292. <https://doi.org/10.2486/indhealth.2015-0097>

- \*Sianoja, M., Kinnunen, U., Bloom, J. D., Korpela, K., & Geurts, S. A. E. (2016). Recovery during lunch breaks: Testing long-term relations with energy levels at work. *Scandinavian Journal of Work and Organizational Psychology*, 1(1): 7, 1-12. <http://dx.doi.org/10.16993/sjwop.13>
- Sianoja, M., Syrek, C. J., de Bloom, J., Korpela, K., & Kinnunen, U. (2018). Enhancing daily well-being at work through lunchtime park walks and relaxation exercises: Recovery experiences as mediators. *Journal of Occupational Health Psychology*, 23(3), 428–442. <https://doi.org/10.1037/ocp0000083>
- \*Siltaloppi, M., Kinnunen, U., Feldt, T., & Tolvanen, A. (2012). Development of need for recovery from work over one year: a person-centered approach. *Anxiety, Stress & Coping*, 25(1), 23-42. <https://doi.org/10.1080/10615806.2010.540649>
- Smite, D., Moe, N. B., Hildrum, J., Gonzalez-Huerta, J., & Mendez, D. (2023). Work-from-home is here to stay: Call for flexibility in post-pandemic work policies. *Journal of Systems and Software*, 195, 111552. <https://doi.org/10.1016/j.jss.2022.111552>
- Sonnentag, S. (2001). Work, recovery activities, and individual well-being: A diary study. *Journal of Occupational Health Psychology*, 6(3), 196–210. <https://doi.org/10.1037/1076-8998.6.3.196>
- Sonnentag, S. (2012). Psychological detachment from work during leisure time: The benefits of mentally disengaging from work. *Current Directions in Psychological Science*, 21(2), 114–118. <https://doi.org/10.1177/0963721411434979>
- Sonnentag, S., & Fritz, C. (2007). The Recovery Experience Questionnaire: development and validation of a measure for assessing recuperation and unwinding from work. *Journal of occupational health psychology*, 12(3), 204-221. <https://doi.org/10.1037/1076-8998.12.3.204>
- Sonnentag, S., & Fritz, C. (2015). Recovery from job stress: The stressor-detachment model as an integrative framework. *Journal of Organizational Behavior*, 36(S1), S72-S103. <https://doi.org/10.1002/job.1924>
- Sonnentag, S., Venz, L., & Casper, A. (2017). Advances in recovery research: What have we learned? What should be done next? *Journal of Occupational Health Psychology*, 22(3), 365–380. <https://doi.org/10.1037/ocp0000079>
- Sonnentag, S., Cheng, B. H., & Parker, S. L. (2022). Recovery from work: Advancing the field toward the future. *Annual Review of Organizational Psychology and Organizational Behavior*, 9, 33-60. <https://doi.org/10.1146/annurev-orgpsych-012420-091355>
- Spreitzer, G. M., Cameron, L., & Garrett, L. (2017). Alternative work arrangements: Two images of the new world of work. *Annual Review of Organizational Psychology and Organizational Behavior*, 4, 473-499. <https://doi.org/10.1146/annurev-orgpsych-032516-113332>

- \*Stieler, L., Hunger, B., & Seibt, R. (2022). Cardiovascular and self-reported recovery in two-shift systems: A cross-sectional study in German shift workers of the hotel and catering industry. *Journal of Psychophysiology*, 36(2), 75–82. <https://doi.org/10.1027/0269-8803/a000284>
- \*Taylor, W. D., Snyder, L. A., & Lin, L. (2020). What free time? A daily study of work recovery and well-being among working students. *Journal of Occupational Health Psychology*, 25(2), 113–125. <https://doi.org/10.1037/ocp0000160>
- Ten Brummelhuis, L. L., & Bakker, A. B. (2012). A resource perspective on the work–home interface: The work–home resources model. *American Psychologist*, 67(7), 545–556. <https://doi.org/10.1037/a0027974>
- Ten Brummelhuis, L.L., Rothbard, N.P., & Uhrich, B. (2017). Beyond nine to five: Is working to excess bad for health? *Academy of Management Discoveries*, 3(3), 262 – 283. <https://doi.org/10.5465/amd.2015.0115>
- Thompson, R. J., Payne, S. C., & Taylor, A. B. (2015). Applicant attraction to flexible work arrangements: Separating the influence of flextime and flexplace. *Journal of Occupational and Organizational Psychology*, 88(4), 726–749. <https://doi.org/10.1111/joop.12095>
- \*Toh, S. M., & Cho, E. (2022). Take a break!: A qualitative study of shift-duty police officers' on-the-job breaks. *Police Quarterly*, 0(0), 1-27. <https://doi.org/10.1177/10986111221074907>
- Torquati, L., Mielke, G. I., Brown, W. J., Burton, N. W., & Kolbe-Alexander, T. L. (2019). Shift work and poor mental health: A meta-analysis of longitudinal studies. *American Journal of Public Health*, 109(11), e13–e20. <https://doi.org/10.2105/AJPH.2019.305278>
- \*Troughakos, J. P., Beal, D. J., Green, S. G., & Weiss, H. M. (2008). Making the break count: An episodic examination of recovery activities, emotional experiences, and positive affective displays. *Academy of Management Journal*, 51, 131–146. <https://doi.org/10.5465/amj.2008.30764063>
- Troughakos, J. P., Hideg, I., Cheng, B. H., & Beal, D. J. (2014). Lunch breaks unpacked: The role of autonomy as a moderator of recovery during lunch. *Academy of Management Journal*, 57(2), 405–421. <https://doi.org/10.5465/amj.2011.1072>
- \*Van Der Hulst, M., & Geurts, S. (2001). Associations between overtime and psychological health in high and low reward jobs. *Work & Stress*, 15(3), 227–240. <https://doi.org/10.1080/026783701110.1080/02678370110066580>
- Van Hooff, M. L. M., & de Pater, I. E. (2017). Let's have fun tonight: The role of pleasure in daily recovery from work. *Applied Psychology*, 66: 359-381. <https://doi.org/10.1111/apps.12098>



- \*Varol, Y. Z., Weiher, G. M., Wendsche, J., & Lohmann-Haislah, A. (2021). Difficulties detaching psychologically from work among German teachers: prevalence, risk factors and health outcomes within a cross-sectional and national representative employee survey. *BMC Public Health*, 21, 1-15. <https://doi.org/10.1186/s12889-021-12118-4>
- Virtanen, M., Heikkilä, K., Jokela, M., Ferrie, J. E., Batty, G. D., Vahtera, J., & Kivimäki, M. (2012). Long working hours and coronary heart disease: A systematic review and meta-analysis. *American journal of epidemiology*, 176(7), 586-596. <https://doi.org/10.1093/aje/kws139>
- Vaziri, H., Casper, W. J., Wayne, J. H., & Matthews, R. A. (2020). Changes to the work–family interface during the COVID-19 pandemic: Examining predictors and implications using latent transition analysis. *Journal of Applied Psychology*, 105(10), 1073- 1087. <https://doi.org/10.1037/apl0000819>
- \*Wang, M., & Wong, M. S. (2014). Happiness and leisure across countries: Evidence from international survey data. *Journal of happiness Studies*, 15, 85-118. <https://doi.org/10.1007/s10902-013-9417-z>
- Ward, M. (2017, May 3). A brief history of the 8-hours workday, which changed how Americans work. CNBC. <https://www.cnbc.com/2017/05/03/how-the-8-hour-workdaychanged-how-americans-work.html>
- Ward, M., & Lebowitz, S. (2020, June 12). A history of how the 40-hour workweek became the norm in America. Insider. <https://www.businessinsider.com/history-of-the-40-hourworkweek-2015-10>
- Weaver, M.D., Landrigan, C.P., Sullivan, J.P., O'Brien, C.S., Qadri, S., Viyaran, N., Wang, W., Vetter, C., Czeisler, C.A., & Barger, L.K. (2020). The association between resident physician work-hour regulations and physician safety and health. *The American Journal of Medicine*, 133(7), e343 – e354. <https://doi.org/10.1016/j.amjmed.2019.12.053>
- Winwood, P. C., & Lushington, K. (2006). Disentangling the effects of psychological and physical work demands on sleep, recovery, and maladaptive chronic stress outcomes within a large sample of Australian nurses. *Journal of Advanced Nursing*, 56(6) 679-689. <https://doi.org/10.1111/j.1365-2648.2006.04055.x>
- Winwood, P. C., Lushington, K., & Winefield, A. H. (2006). Further development and validation of the Occupational Fatigue Exhaustion Recovery (OFER) scale. *Journal of occupational and environmental medicine*, 48(4), 381–389. <https://doi.org/10.1097/01.jom.0000194164.14081.06>
- Wittmer, J. L., & Martin, J. E. (2010). Emotional exhaustion among employees without social or client contact: The key role of nonstandard work schedules. *Journal of Business and Psychology*, 25, 607-623. <https://doi.org/10.1007/s10869-009-9153-x>
- Wladislaw, R., Stefan, D., & Klaus-Helmut, S. (2015). Psychological detachment: A moderator in the relationship of self-control demands and job strain. *European Journal of Work and*

*Organizational Psychology*, 24(3), 376-388.  
<https://doi.org/10.1080/1359432X.2014.924926>

\*Ziebertz, C., Beckers, D., van Hooff, M., Ruiters, A., Kompier, M., & Geurts, S. (2020). Characteristics and experiences of off-site on-call work in relation to fatigue and sleep. *Gedrag en Organisatie*, 33, 69-89. <https://doi.org/10.5117/2020.033.001.004>

Zijlstra, F. R., & Sonnentag, S. (2006). After work is done: Psychological perspectives on recovery from work. *European journal of work and organizational psychology*, 15(2), 129-138. <https://doi.org/10.1080/13594320500513855>

**Table 1.** Proposed taxonomic properties of work schedules relevant to recovery

| Property                                                            | Definition                                                                                                                                                                                                  | Recovery-Relevant Theoretical Foundations                                                                                                                            | Alignment with Existing Recovery-Relevant Theory                                                                                                                                                                                                                                                                                                   | Empirical Alignment with Theorizing                                                                                                                                                                                                                                                                        | Sample Occupations from Studies Included in Systematic Review                                                                                                                                                                                 |
|---------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Schedule Type (Fixed vs. Variable vs. Autonomous Scheduling)</b> | Reflects whether employees work the same hours each week ( <i>fixed</i> ), a schedule which may regularly change from week to week ( <i>variable</i> ), or can set their own schedule ( <i>autonomous</i> ) | Effort-Recovery Model (Meijman & Mulder, 1998); Job Demands – Resources Model (Bakker & Demerouti, 2017); Recovery experience theorizing (Sonnentag & Fritz, 2007)   | Perceptions of control over when work is done are thought to diminish strain reactions (Meijman & Mulder, 1998), enhance motivation, and buffer the influence of stressors on strain (Bakker & Demerouti, 2017). Control over one's schedule may help exert greater control over leisure time that facilitates recovery (Sonnentag & Fritz, 2007). | Conceptual (Clauss et al., 2021) and empirical (Michel et al., 2016) arguments yield questions as to whether autonomously set hours are instead a barrier to leisure-time detachment or relaxation. However, there has been very little direct empirical work recovery research on this topic.             | Employees with flexible work hours (Clauss et al., 2021); Airport employees (Michel et al., 2016); Correctional officers (Shepherd et al., 2019); Hotel workers (Stieler et al., 2021); Marketing professionals (Richardson & Thompson, 2012) |
| <b>Shift Length Predictability</b>                                  | The degree to which the end time of work is predictable vs. unpredictable                                                                                                                                   | Effort – Recovery Model (Meijman & Mulder, 1998); Job Demands – Resources Model (Bakker & Demerouti, 2017); Recovery experience theorizing (Sonnentag & Fritz, 2007) | Knowing when work will end should enhance perceived control over work scheduling, which is expected to minimize strain reactions that need to be diminished through recovery (Meijman & Mulder, 1998; Bakker & Demerouti, 2017) and is also likely to facilitate control over leisure time (Sonnentag & Fritz, 2007)                               | Aligning with existing theory, unpredictable work demands during on-call periods or non-work time were negatively related to recovery experiences and recovery attainment. Contrasting with existing theory, flexibility in engaging in supplemental work was positively related to perceived job control. | Nurses (Alsayed et al., 2022); Innkeepers (Shen et al., 2018); Off-site on-call workers (Ziebertz et al., 2020)                                                                                                                               |
| <b>Inter-Shift Recovery Interval</b>                                | The length of time between the end of one shift and the beginning of the next shift                                                                                                                         | Effort – Recovery Model (Meijman & Mulder, 1998); Stressor – Detachment Model (Sonnentag & Fritz, 2015)                                                              | All else being equal, shorter inter-shift recovery intervals would be expected to preclude the theorized return to baseline of cognitive and energetic resources reflecting full recovery (Meijman & Mulder,                                                                                                                                       | Existing empirical research appears to strongly support recovery-relevant theorizing applicable to the inter-shift recovery interval, though it should be noted that research on this topic encompassed                                                                                                    | Nurses (Alsayed et al., 2022; Fletcher et al., 2020; Hakola et al., 2010; Karhula et al., 2013; Min et al., 2022); IT workers (Kubo et al., 2018; Kubo et al., 2021)                                                                          |



|                                                                    |                                                                                                                      |                                                                                                        |                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                              |                                                                                                                                                                                                                                                   |
|--------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                    |                                                                                                                      |                                                                                                        | 1998). Chronically insufficient inter-shift recovery intervals over time would be expected to yield a lack of psychological detachment and chronic strain (Sonnentag & Fritz, 2015)                                                                                                                                             | in our systematic review almost exclusively sampled health care workers.                                                                                                                                     |                                                                                                                                                                                                                                                   |
| <b>Multi-Day Recovery Opportunity Frequency</b>                    | The frequency with which an employee has the opportunity to experience recovery across multiple consecutive days off | Effort – Recovery Model (Meijman & Mulder, 1998; Stressor – Detachment Model (Sonnentag & Fritz, 2015) | A longer time period without effortful engagement with work demands is argued to facilitate greater recovery (Meijman & Mulder, 1998). Multiple consecutive days off are theorized to present more opportunities for employees to mentally disengage with work than daily post-work recovery periods (Sonnentag & Fritz, 2015). | Empirical research generally aligns with theorized predictions, but this empirical research largely relies on indirect indicators and recovery-relevant correlates (e.g., job strain, work engagement)       | Nurses (Karhula et al., 2013; Kühnel et al., 2009); Manufacturing employees (Jeong et al., 2020)                                                                                                                                                  |
| <b>On-Site Living Arrangements</b>                                 | Occupational demands which require that participants live in the same general environment as their workplace         | Stressor – Detachment Model (Sonnentag & Fritz, 2015)                                                  | Detachment, which is a critical mechanism in stressor – strain relationships (Sonnentag & Fritz, 2015), would be expected to be impeded by remaining in the physical work environment                                                                                                                                           | Detachment appears to play a critical role in stressor – strain relationships for employees working in on-site living arrangements                                                                           | Coal miners (Chen et al., 2017); Deployed naval cadets (Hetland et al., 2021); Off-shore wind workers (Mette et al., 2018); Firefighters (Sawhney et al., 2018); Innkeepers (Shen et al., 2018); Off-site on-call workers (Ziebertz et al., 2020) |
| <b>Predictability and Controllability of Within-Workday Breaks</b> | The extent to which an employee can predict and control the timing of within-workday breaks                          | Effort – Recovery Model (1998); Job Demands – Resources Model (Bakker & Demerouti, 2017)               | Perceptions of control over how and when work is done buffer against the accumulation of strain reactions (Meijman & Mulder, 1998; Bakker & Demerouti, 2017), which would be expected to diminish need for                                                                                                                      | Unclear due to the piecemeal nature of this research base. However, support for the general propositions of the benefits of autonomy in breaks in relation to recovery exists (e.g., Trougakos et al., 2014) | Police officers (Toh & Cho, 2022); Cheerleading camp instructors (Trougakos et al., 2008)                                                                                                                                                         |

|                                          |                                                                     |                                                        |                                                                                                                      |                                                                                                                                                                                                                                                         |                                                                                                                                            |
|------------------------------------------|---------------------------------------------------------------------|--------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
|                                          |                                                                     |                                                        | recovery from work-related effort expenditure                                                                        |                                                                                                                                                                                                                                                         |                                                                                                                                            |
| <b>Number of Work Hours</b>              | The number of hours an employee works                               | Conservation of Resources Theory (Hobfoll, 1989; 2001) | Time is identified as a resource that can facilitate further resource gain and off-set resource loss (Hobfoll, 1989) | The relevance of long work hours to insufficient recovery has generally received support in the broader organizational literature (Geurts et al., 2014), although there may be some nuance as to when longer work hours do or do not influence recovery | Cancer workers (Poulsen et al., 2015); Postal service workers (van der Hulst & Geurts, 2001); Teachers (Varol et al., 2021)                |
| <b>Requirements for Night Shift Work</b> | The degree to which the job requires work to be performed overnight | Not Present in Identified Recovery-Relevant Theorizing | N/A                                                                                                                  | N/A                                                                                                                                                                                                                                                     | Correctional officers (Shepherd et al., 2019); Nurses (Karhula et al., 2013; Min et al., 2022); Railway controllers (Korunka et al., 2012) |