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An Examination of Nurses' Schedule Characteristics, Recovery From Work, and Well-Being

by

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Abstract

Recovery from work refers to the replenishment of energetic and affective resources depleted while meeting job demands, predominately conceptualized as a process that unfolds throughout the day. This study examined the shift work schedule demands presented by round-the-clock patient care needs on health care providers, and potential recovery opportunities during mid-shift meal and rest breaks. The cross-sectional data were collected via electronic questionnaire among registered nurses (N = 134) working in direct patient care roles in 24-hour healthcare organizations in the Northwestern United States (91.0% female-identified; mean age = 45.3 years). The main effects of adverse scheduling characteristics common among U.S. hospitals (10+ hour shifts, mandatory overtime, and time pressure), and recovery experiences (psychological detachment, relaxation, mastery experiences, and control during within-work breaks) as well as interactive effects of adverse scheduling characteristics and recovery experiences on nurses' occupational well-being (work engagement, work-related fatigue, and need for recovery) were tested. Hierarchical moderated regression analyses were conducted to test each combination of the focal study variables. Significant main effects were found for adverse scheduling characteristics on nurses' level of work-related fatigue and need for recovery, but no main effects for work engagement on well-being were detected. Psychological detachment, relaxation, and control during within-work breaks were significantly negatively associated with nurses' need for recovery at the end of a shift, and psychological detachment during within-work breaks was significantly negatively associated with nurses' work-related fatigue. Mastery experiences during within-work

breaks were significantly positively related to nurses' levels of work engagement. No moderation effects were detected among the sets of analyses, which may be related to nurses' relatively infrequent within-work breaks in comparison to non-shift work populations. Examination of the temporal and built environment characteristics related to within-work breaks indicated that nurses had limited access to space away from the patient care environment to take rest and meal breaks during a typical shift. This study contributes contextual and cultural insights from an essential occupational group defined by shift work, an under-researched population in the recovery from work literature.

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Chapter 1: Introduction

Frontline health care providers have experienced unprecedented increases in the volume and pace of work during the COVID-19 pandemic, conjoining with concern during the last decade over the effects of transformations in clinical care in the U.S. healthcare system (e.g., adoption of electronic health records, inefficient work processes, excessive workload) on clinical performance, patient safety, and health care providers' well-being (Dyrbye et al., 2017; Shanafelt, Dyrbye, & West, 2017; Sinsky & Linzer, 2020). An expanding body of research in related disciplines (e.g., occupational medicine, health services research, ergonomics, occupational health psychology) has extended the study of occupational stress and work-related fatigue to protect and promote the well-being of health care providers (Cochran, 2021; Montgomery, Panagopoulou, Esmail, Richards, & Maslach, 2019; Montgomery, Van der Doef, Panagopoulou, & Leiter, 2020; Rajbhandary & Basu, 2010; Trinkoff, Le, Geiger-Brown, & Lipscomb, 2007). In concert with two resource-based theoretical frameworks of stress and motivation, the job demands-resources model (JD-R; Demerouti, Bakker, Nachreiner, & Schaufeli, 2001), and the conservation of resources theory (COR; Hobfoll, 1989), the present dissertation investigated resource recovery within work hours as a method for health care providers to maintain energy and focus during extended shifts with heavy job demands (Cochran, 2021; Ejlertsson, Heijbel, Brorsson, & Andersson, 2020; Sonnentag, Venz, & Casper, 2017; ten Brummelhuis & Trougakos, 2014). *Recovery from work stress*, aligned with the effort-recovery model (ERM; Meijman & Mulder, 1998), has received increasing research attention in the fields of occupational health psychology and workplace safety as

a conceptual framework to study mental workload and a way to mitigate work-related negative physiological outcomes. Recovery refers to the process that occurs when an individual halts or reduces their exposure to episodic stressors in the work environment to allow their psychophysiological systems to return to pre-stressor levels of activation, thus replenishing mental and physical energetic reserves (Craig & Cooper, 1992).

Recovery from work stress has been theorized as an ongoing process that unfolds throughout each day (Geurts & Sonnentag, 2006). Most of the recovery research has focused on that which takes place outside of standard work hours (e.g., evenings after work, weekends, and vacations). Over the past two decades, scholars and practitioners have accumulated evidence of the effect that recovery during non-work hours (or lack thereof) has on employees' job performance, health, and the work-family interface (Bennett, Bakker, & Field, 2018; Sonnentag, Unger, & Rothe, 2016; Steed, Swider, Keem, & Liu, 2021). Recovery research has examined the recovery potential of specific activities that individuals engage in during non-work time, including physical, social, or low-effort activities (e.g., Sonnentag, 2001). As individual differences may influence the level to which specific activities lead to employees' successful recovery from work stress, the underlying attributes of non-work activities have been theorized to either promote or inhibit the recovery process (Sonnentag & Fritz, 2007). That is, upon discontinuation of work tasks and separation from job stressors, *recovery experiences* (e.g., recovery mechanisms, such as relaxation) are thought to enable the replenishment of personal energy resources.

Recently, organizational scholars have directed more attention towards *within-work recovery* opportunities, periods during which employee are neither required nor expected to engage in work tasks (Trougakos & Hideg, 2009). Federal- and state-level authorities provide guidance to employers regarding the regulation of rest and meal breaks, but the U.S. Federal Code of Regulations (CFR) does not require employers to implement or enforce either rest or meal breaks (U.S. Department of Labor, 1961a, 1961b). Federal law views employer-offered rest breaks of between 15 and 20 minutes as paid time (U.S. Department of Labor, 1961a). As such, the time spent on rest breaks should be included in total working time for the purposes of determining whether an employee has worked overtime during a specified pay period. Meal breaks are generally viewed as non-working time (e.g., unpaid time; U.S Department of Labor, 1961b). As of January 2021, twenty-one states, Guam, and Puerto Rico have enacted legislation providing legally-mandated meal breaks for adult employees in the private sector, and nine states have enacted legislation mandating minimum paid rest breaks (U.S. Department of Labor, 2021).

The small but growing body of within-work recovery literature has initially focused on defining different types of recovery opportunities at work, and the specific activities individuals most commonly engage in during recovery opportunities. Researchers have studied formal lunch breaks (Bosch, Sonnentag, & Pinck, 2018; Krajewski et al., 2010; Trougakos, Hideg, Cheng, & Beal, 2014), short rest and exercise breaks (Pronk, Crouse, & Rohack, 1995; Rogers, Hwang, & Scott, 2004; Zhu, Kuykendall, & Zhang, 2019), and micro-breaks (Bennett, Gabriel, & Caulderwood, 2019;

Kinnunen, Feldt, & de Bloom, 2015; Zacher, Brailsford, & Parker, 2014). These investigations have successfully linked within-work recovery with lower levels of emotional strain, mental strain, and end-of-workday fatigue, as well as increased self-rated positive affect and other-rated positive affective display (Krajewski et al., 2010; Trougakos et al., 2008; Trougakos et al., 2014; Zacher et al., 2015),

At present, the majority of within-work recovery studies have been conducted with participants in industries and organizations that keep standard work hours (e.g., weekdays between 8:00 AM and 5:00 PM), during which employees may reasonably expect to be relieved of work responsibilities for rest and meal breaks (e.g., office workers, administrative employees at a university). Given the rise in non-traditional work schedules and arrangements in the United States, in relation to "shelter in place" orders during the COVID-19 pandemic, a subsequent rise in the gig economy, and pre-existing trends in the changing nature of work (e.g., telecommuting; Hammer & Zimmerman, 2011), this study contributes to the literature by providing novel insights into the recovery processes of employees in essential industries operating under nonstandard work schedules, specifically registered nurses (RNs).

Nearly 58% of the more than 3.8 million RNs in the United States work in hospital settings, and are responsible for providing the majority of round-the-clock patient care (BLS, 2019). As such, hospital staff nurses encounter job stress related to adverse scheduling practices, including the growing practice extending the majority of RN hospital shifts from 8 hours in length to 12 hours in length. These adverse scheduling practices have been associated with negative employee health and performance

outcomes, specifically fatigue and exhaustion (Griffiths, Dall'Ora, Sinden, & Jones, 2019; Joint Commission, 2012), sleep deprivation (de Jonge, J. D., Shimazu, A., & Dollard, 2018; Scott et al., 2010), occupational injuries (Halbesleben, 2010), lack of attention to detail (Lockley et al., 2007; ANA, 2006), and increased incidence of errors (Rogers et al., 2010). Heightened levels of fatigue have been associated with cognitive, psychomotor, and behavioral impairment (Blasche, Blaubok, & Haluza, 2017; Witkoski-Stimpfel & Dickson, 2010), and over extended periods of time, chronic fatigue can adversely impact nervous, cardiovascular, metabolic, and immune functioning (TJC, 2012).

A resurgence of interest and concern regarding our nation's healthcare system in the wake of the first wave of COVID-19 has resulted in the dedication of federal-level resources to improving the care system infrastructure in the U.S. The application of sound recommendations based on empirical research regarding the social, temporal, and built environments of the national healthcare system realistically should include improvements aimed towards health care providers' ability to care for themselves during within-work opportunities for recovery (Rus, Vâjâean, Oţoiu, & Băban, 2020; Trougakos et al., 2014). Rus and colleagues created the first synthesis of the literature focused on recovery from work within healthcare settings, specifically to improve the well-being of health care providers and "hence reduce human errors that negatively impact patient safety" (2020, p. 167). The authors emphasized that few studies to date have investigated outcome variables related to recovery and job performance with health care providers. A second contribution of this dissertation study to the occupational health literature was to

examine work engagement, a constructive performance-related aspect of occupational health. Work engagement refers to a positive, fulfilling motivational state characterized by high vigor, dedication, and absorption in pursuing work-related goals (Schaufeli et al., 2006). To the best of my knowledge, this study is the first in the within-work recovery literature to examine the relationship between the four recovery experiences during within-work breaks and work engagement in a shiftwork population.

Currently, no federal-level restrictions limit nurses' shift length or number of shifts that a nurse may work, though some states—including Oregon—have legislated mandatory overtime restrictions for nurses (American Nurses Association, 2019). Due to growing concern over the relationship between 12-hour shifts and nurses' risk of occupational illness, injury, and accidents, several prominent organizations have promoted occupational fatigue countermeasures, with the emphasis placed on nurses' responsibility to maintain sleep hygiene routines, exercise regularly, and strategically use caffeine to counteract the effects of job stress (Caruso et al., 2019). If divorced from larger organizational culture shifts, this point of view places the onus of responsibility upon individuals to cope with strain associated with work demands outside of work time. For U.S. hospital systems, the lens of occupational health psychology offers an alternative point of view, in that the organization of work *itself* is malleable, is subject to shifts in culture and climate, and may be modified to allow employees sufficient recovery time within the bounds of scheduling norms.

Previous research has demonstrated that work environments characterized by high job demands (e.g., role ambiguity, time pressure) and low resources (e.g., control), such as hospital nursing environments, may foster a greater need for within-work recovery as well as recovery after the workday (Demerouti et al., 2009; Geurts, Beckers, & Tucker, 2014). Building on this finding, I proposed that specific job characteristics (adverse scheduling practices; i.e., time pressure, extended shift length [10+ hours], and mandatory overtime) would negatively impact nurses' work-related fatigue, and that the strategic use of within-work recovery experiences would function directly as a resource, as well as buffer the relationship between adverse scheduling practices and decrements to occupational well-being See Figure 1 for a model of the relationships between the focal study variables.

As detailed in the following chapters, I synthesized literature from the fields of organizational psychology, occupational health psychology, occupational medicine, and ergonomics to provide a review of scholarship related to recovery from work, as well as intervention studies addressing the physical health protection and promotion potential of frequent short breaks throughout the workday (Montasem, 2017; Tement, Zorjan, Lavrič, Poštuvan, & Plohl, 2020; Tucker, 2003; Tucker, Lombardi, Smith, & Folkard, 2006). My review of the literature was guided by the following overarching research questions:

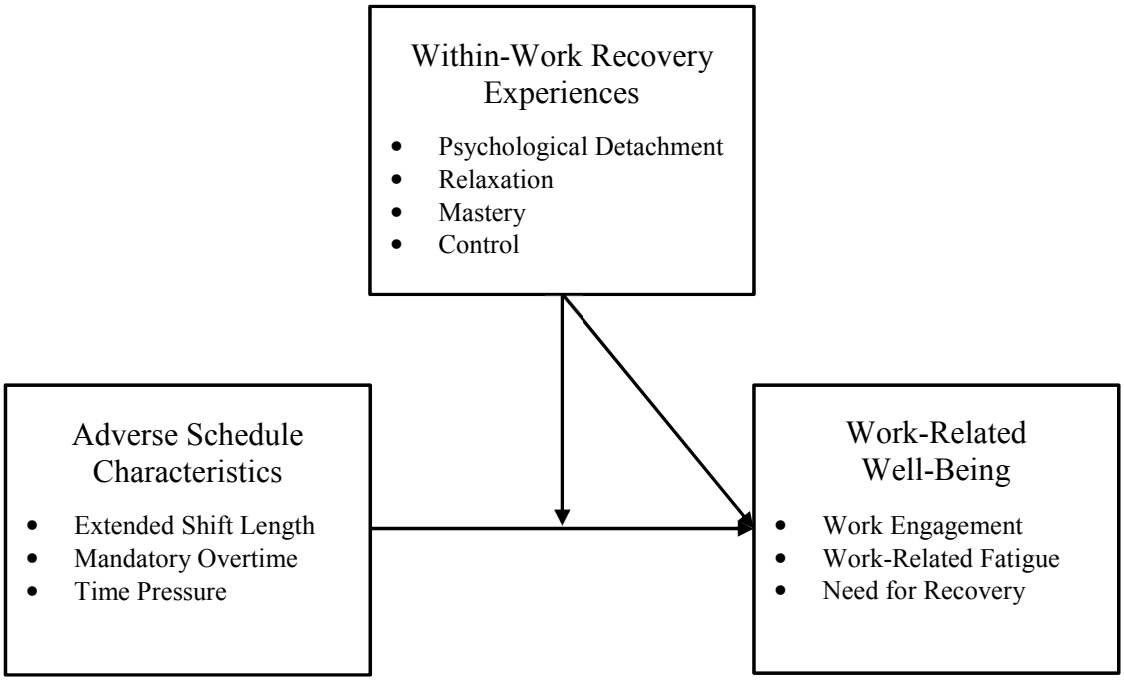
1) What are the scheduling characteristics associated with hospital staff nurses' shifts and how do they impact nurses' well-being?

2) Is there an association between within-work recovery experiences and nurses' well-being?

3) Can recovery experiences within mid-shift rest and meal breaks mitigate the demands of nurses' shifts on well-being?

Chapter three provides the details of my organizational partnership and methodology in which I adapted and clarified the structure of commonly-used data collection instruments for use in non-standard organizational settings. I present the study findings in Chapter four, expanding on previous work that has largely focused research efforts on white-collar sectors of the economy and office-based knowledge workers (Rus et al., 2020). To conclude, I summarize the study findings in Chapter five and discuss the contributions, limitations, and practical implications of this dissertation study.

Figure 1. Model of the Study



Chapter 2: Theoretical Framework and Literature Review

In this chapter, I present the theoretical frameworks that scaffolded this study and an overview of the conceptualization of recovery from work demands. Included is a summary of the empirical evidence regarding within-work recovery opportunities and experiences, supplemented by findings related to recovery outside of work hours. I integrate the work schedule characteristics of U.S. hospital nurses and the role of recovery opportunities in the relationship between nurses' work schedule characteristics and well-being outcomes with specific study hypotheses. In line with the multidisciplinary nature of occupational health psychology (Quick & Tetrick, 2011), I incorporate empirical research by scholars in the fields of organizational psychology, occupational medicine, and ergonomics in this review to provide findings regarding length and timing of within-work breaks. From an OHP perspective, the study of recovery resulting from within-work breaks has great potential to contribute to workplace health protection and promotion efforts. An emerging body of research demonstrates the role that within-work recovery can play in supporting health care providers' physical and mental well-being, and regulation of energy throughout the work shift (Blasche et al., 2017; Nitzsche, Neumann, Groß, Ansmann, Pfaff, Baumann, et al., 2016; Poulsen, Sharpley, Baumann, Henderson, & Poulsen, 2015).

Theoretical Framework

For this study, I draw on the effort-recovery model (Meijman & Mulder, 1998) and the conservation of resources theory (Hobfoll, 1989) to support the hypothesized relationships between work schedule characteristics, within-work recovery opportunities

and experiences, and well-being outcomes. These theories generally posit that individuals have a finite supply of personal resources—innate energies and personal traits—that are instrumental in goal attainment throughout the day (Hobfoll, 2002). Personal resources include cognitive resources (e.g., directed attention), physical energy (e.g., positive affect, health), and emotional energy (e.g., emotional resilience; ten Brummelhuis & Bakker, 2012).

Effort-Recovery Model

The effort-recovery model (ERM; Meijman & Mulder, 1998) proposes that effort expenditure throughout the workday leads to a variety of subjective physiological and psychological load responses (e.g., accelerated heart rate, elevated blood pressure levels, and fatigue). This process poses no harm to the individual if given the opportunity to recover, and allow psychophysiological systems to return to normal levels of functioning following the removal of the job demand. However, if individuals are continually exposed to job demands without the opportunity to return to a lower level of activation, adequate recovery cannot take place. Over time, a chronic lack of recovery may impair health and well-being (Meijman & Mulder, 1998).

Recovery researchers have proposed that employees should engage in activities during off-work hours that utilize different psychophysiological systems than those used at work, so that stress-related acute load reactions may return to pre-stressor levels. However, previous research has shown that it is not necessary to engage solely in passive leisure or recreational activities to recover from work stress. Recovery and resource replenishment can occur when individuals engage in tasks that employ a set of skills and

abilities distinct from the skills and abilities utilized during their regular work hours. In a trailblazing example of this tenet of ERM, Etzion, Eden, and Lapidot (1998) found that military reservists experienced a sort of respite from their typical work routines while deployed for intermittent military service. The study participants reported lower levels of work-related burnout symptoms for a period after they returned to their regular positions, while paired control study participants reported no difference in work-related burnout symptoms for the same period. Through the lens of ERM, the change of scenery and particular responsibility would alleviate the reservists' psychophysiological response to the demands of their normal environment, and moreover may present the opportunity to gain additional social resources, and return home in possession of a greater stockpile of energetic reserves than their counterparts who had remained behind. This concept of a "resource gain spiral" has been supported by the external (outside of work hours) recovery literature, and provides an entry point to the internal (within-work hours) recovery literature through a key aspect of the conservation of resources theory.

Conservation of Resources Theory

The central tenet of the conservation of resources theory (COR) states that individuals strive to retain, protect, and build their resources. Potential (or actual) loss of these resources threatens the individual, causing stress (Hobfoll, 1989; Hobfoll & Shirom, 1993). Thus, COR is known as a theory of stress and motivation (Hobfoll, 2011). Resources can be objects (e.g., a car or house), personal characteristics (self-efficacy), conditions (tenure), or energies (e.g., time or knowledge) that an individual values, or that serve as a means of attaining resources. Psychological stress is thought to occur as a

reaction to environments that present a) the threat of resource loss, b) resource loss, or c) a lack of resource gain following resource investment. Job demands have been conceptualized as stressors to the degree that they threaten or consume an individual's valued resources (Hobfoll, 1989).

Particularly relevant to the discussion of within-work breaks and recovery is COR's principle of resource reinvestment, which suggests that people must invest resources to protect against resource loss, recover from resource loss, and gain further resources. Initial resource investment is generally thought to result in further gains (Hobfoll, 2001), leading over time to the resource gain spiral phenomenon previously mentioned. As such, individuals who possess relatively larger amounts of resources have more resources available to invest, are less vulnerable to resource loss, and more likely to acquire additional resources. Conversely, individuals who possess relatively few resources may be less able to invest sufficient resources to protect those they have, recover quickly from loss, or acquire additional resources. This supposition represents a largely untested tenet of COR (Hobfoll, 2011), though gain spirals have received a fair amount of research attention in recent years (Halbesleben, Neveu, Paustian-Underdahl, & Westman, 2014). For this study, I framed within-work breaks as the minute catalyst of a resource gain spiral. Even a short break might offer the opportunity to step away from work stressors, and allow for resource recovery, investment, and acquisition.

Conceptualization of Recovery

Recovery generally refers to the process in which individuals' functional systems return to a baseline level following activation **(**Meijman & Mulder, 1998). Recovery is

conceptualized as a psychophysiological process (Geurts & Sonnentag, 2006), wherein both physiological and psychological aspects of an individual's functional systems require periods of decreased activity to repair and restore personal resources, such as positive mood and energy (Sonnentag & Zijlstra, 2006). Previous research has distinguished internal recovery (e.g., that which takes place during lunch or rest breaks at work) from external recovery, which takes place during non-work time, such as weekends or vacations. Scholars have theorized that recovery during non-work hours becomes necessary when within-work recovery is insufficient (Geurts & Sonnentag, 2006).

Measuring Recovery

Researchers have developed several means of empirically capturing recovery processes over the last few decades. The first method asks respondents to indicate their level of recovery in relation to specific activities engaged in during a period away from work. For example, recovery has been operationalized with items such as, "because of leisure activities pursued yesterday, I feel relaxed/in a good mood/recovered" (Demerouti et al., 2009; Sonnentag, 2003). The next section of this manuscript contains a discussion of specific activities and the activity categorization systems typically applied by recovery researchers. Alternately, recovery (or lack thereof) has been measured by proxy through self-report measures of vigor or vitality on one hand, and fatigue on the other hand (Rook & Zijlstra, 2006). However, the utility of this method may be limited in measuring the unwinding process and resource replenishment. Sonnentag and Ziljstra (2006) argued that recovery refers to a *process*, while fatigue is a state resulting from energy expenditure.

Thus, fatigue is more so an outcome of inadequate recovery, while vigor and vitality may be the result of successful recovery (Demerouti et al., 2009). Finally, recovery researchers have theorized *recovery experiences* (i.e., psychological detachment, relaxation, mastery experiences, and control; Sonnentag & Fritz, 2007) to be the underlying mechanism of the psychophysiological process that takes place during recovery, as detailed later in this chapter.

Recovery Potential of Off-Work Activities

In this section, I briefly introduce the categories of off-job activities commonly found in the non-work time recovery literature. Off-job activities are often characterized as either inhibiting or promoting recovery (Sonnentag, 2001; Sonnentag & Bayer, 2005). In general, the literature suggests that engaging in work-related activities, household task-related activities, or child-care responsibilities inhibit recovery, while low-effort activities, relaxing activities, socializing, and physical activities promote recovery (Demerouti et al., 2009). Foremost among activities thought to inhibit recovery are, of course, *work-related activities* during off-work hours. Prolonged activation of the functional systems called upon during work hours has been shown to result in chronic fatigue, sleep disturbance, and psychosomatic complaints (Rook & Ziljstra, 2006). A similar logic applies to *household tasks* that draw on a similar set of resources to those employed during work, to the degree that the tasks are highly obligatory and require attention regardless of work-related level of fatigue. *Child-care activities* likewise cannot be skipped or postponed; however, unless one is employed in the education sector, the personal resources employed while attending to the needs of dependent children likely

differ from work-related resources. Although researchers have theorized that child-care activities inhibit recovery (e.g., ten Brummelhuis, Haar, & Van der Lippe, 2010), recovery researchers have yet to find empirical evidence of the suggested detrimental effects of childcare on recovery (Demerouti et al., 2009).

Regarding recovery-promoting off-work activities, *low-effort activities* during off-work hours are passive activities that require little exertion, such as watching television or listening to music. These activities are thought to enable recovery in that they do not use mental or physical resources occupied during work. As such, psychophysiological systems may return to their pre-stressor state (Meijman & Mulder, 1998). *Relaxing activities* are distinguished from the state of relaxation, which is characterized by low activation and positive affect. On average, relaxing activities are pleasurable and do not require much effort. Examples include meditation, progressive muscle relaxation, and yoga. Relaxing activities promote recovery by reducing psycho-physiological activation and increasing positive affect (Sonnentag & Fritz, 2007). *Social activities* may promote recovery as a way to relax and psychologically detach from work with friends or family **(**Sonnentag, Mojza, Demerouti, & Bakker, 2012). Two mechanisms have been proposed through which socializing facilitates recovery, a) socializing with partners of one's choice generally draws on different resources than those used for work tasks, and b) socializing may lead to greater opportunity to acquire social support, which has been shown to have a positive relationship with well-being (Viswesvaran, Sanchez, & Fisher, 1999). *Physical activities* denote high-energy activities that are physically strenuous, yet pleasurable. Examples include physical training and participation in sports. Beyond the related

physiological benefits, physical activity is thought to aid recovery through psychological detachment and a sense of achievement and enhanced well-being (Sonnentag, 2001).

Recovery Experiences

Previous recovery research has distinguished *recovery experiences* from the specific activities that employees engage in during time away from work. Recovery experiences refer to the underlying psychological attributes of specific activities that aid in recovery. A number of recovery experiences have been identified in the literature, including psychological detachment, relaxation, mastery experiences, and control (Sonnentag & Fritz, 2007). As such, recovery experiences may also be conceptualized as strategies employed by individuals to facilitate recovery (Sonnentag & Natter, 2004).

Psychological detachment occurs when an individual mentally disengages from work-related thoughts; this allows replenishment of resources depleted during the workday (Meijman & Mulder, 1998). Relaxation refers to a state of increased positive affect and low activation, often associated with low-effort activities. Engaging in simple and low-stress activities, such as progressive muscle relaxation or meditation, may induce a state of relaxation. Mastery experiences arise through engaging in challenging and pleasurable activities during non-work time, such as playing a sport or learning an instrument. Finally, control of one's free time is considered an important component of the recovery experience; according to COR, the freedom to choose a preferred activity is considered a valuable external resource (Hobfoll, 1998).

Thus far, the majority of recovery research has focused on specific activities, categories of activities, or recovery experiences that take place during substantial periods of separation from the workplace, such as evenings after work (Sonnentag, 2001), weekends (Fritz & Sonnentag, 2005), vacations (Fritz & Sonnentag, 2006; Westman & Eden, 1997), and sabbaticals (Davidson et al., 2010). Recovery outside of work hours has been associated with a wide number of outcomes, including aspects of motivation, employee health and well-being, and non-work outcomes (Sonnentag et al., 2017; Steed et al., 2021). Examples include increased work engagement (Sonnentag, 2003), increased vigor (ten Brummelhuis & Bakker, 2012), increased positive affect and decreased negative affect (Sonnentag & Binnewies, 2013; Sonnentag, Mojza, Binnewies, & Scholl, 2008), and decreased exhaustion (Demerouti et al., 2012). Based on emerging evidence that the beneficial effects of recovery obtained from longer periods of time away from work (e.g., vacations) fade quickly upon return to work (de Bloom, Geurts, Taris, Sonnentag, de Weerth, & Kompier, 2010), daily recovery processes—including recovery during work breaks—may be salient to the maintenance of employee health (Tement et al., 2020). As discussed in the next section, employees' ability to take advantage of rest break or other recovery opportunities is subject to specific characteristics of their work.

Recovery During Work Hours

Formal lunch and rest breaks have attracted scholarly attention from recovery researchers (e.g., Bosch et al., 2018), as well as from researchers in the OHP-related fields of ergonomics and occupational medicine. Other types of breaks that have been studied include informal work-related breaks (e.g., checking email, or having a

conversation with a coworker; Kim, Park, & Headrick, 2018) and micro-breaks (e.g., brief pauses between work tasks; Bennett et al. 2019; Conlin, Hu, & Barber, 2021; de Bloom et al., 2015; Fritz et al., 2011; Kinnunen et al., 2015; Zacher et al., 2014). As detailed in previous sections, most empirical studies of within-work recovery have not examined recovery experiences or mechanisms per se, but have focused on specific break activities or categories of activities. A number of studies have examined the relationship between lunch break activities and short-term proxy measures of recovery, such as decreases in afternoon strain reactions (Krajewski et al., 2010; Trougakos et al., 2008, Trougakos et al., 2014; Tucker, 2003). Other studies have considered the utility of micro-breaks in employees' overall "energy management" strategies. In this way, common work-related activities (Bosch & Sonnentag, 2018; Fritz et al., 2011; Kinnunen et al., 2015; Zacher et al., 2015) and non-work-related activities have been linked to short-term indicators of energetic resources, such as vigor, vitality, and exhaustion. Researchers in the OHP-related fields have investigated various patterns of work break timing, length, and activity, as described in the next section.

Recovery Opportunities: An Occupational Health and Safety View of Within-Work Breaks

The majority of empirical research regarding breaks during the workday stems from the fields of ergonomics and occupational medicine; research in these fields has commonly focused on the frequency and timing of breaks, and the effects of different work-rest cycles on physical strain, discomfort, and musculoskeletal fatigue (Boucsein & Thum, 1997; Dababneh, Swanson, & Shell, 2001; Taylor, 2005). An examination of

robust findings from related occupational health and safety fields may benefit occupational health psychologists seeking to understand the process of recovery during work hours, and collaboration may prove valuable to scholars, practitioners, and employees. For example, Henning, Jacques, Kissel, Sullivan, and Alteras-Webb (1997) brought to light a potentially interesting intervention point that spans the distance between occupational medicine and occupational health psychology. Henning et al. found that short, frequent stretching breaks improved eye, leg, and foot comfort for computer operators. However, it was also noted that the study participants were disinclined to take rest breaks when they were most needed (i.e., periods of increased demand at work). These findings suggest that while short stretching breaks may alleviate physical fatigue and discomfort, employees' sense of mental fatigue, emotional fatigue, and psychological measures of well-being are likely related to other individual and organizational factors.

Along the same vein, Dababneh et al. (2001) investigated the impact of two experimental break schedules in a study of the musculoskeletal discomfort experienced by processing plant workers. Significant decreases in lower extremity discomfort were found for the schedule in which workers took a 9-minute break for every 51 minutes of work. Similar results were found in the alternate experimental schedule, which included twelve three-minute breaks over the course of the workday. Notably, no declines in level of productivity were detected in either group—however, participants reported a preference for the first schedule due to their own perceptions of productivity. Likewise, Galinksky, Swanson, Sauter, Hurrell, and Schleifer (2000) found supplementary rest breaks reduced levels of physical discomfort and strain in a sample of data-entry workers.

Participants in the experimental condition were allotted 20 extra minutes of rest break time over the course of the workday, in addition to two 15-minute rest breaks and a longer meal break. Compared to the participants in the conventional work schedule group, those receiving supplementary breaks experienced a decrease in eyestrain, and reduced levels of forearm, wrist, and hand discomfort.

In sum, researchers in the fields of ergonomics and occupational medicine have studied work break frequency, timing, and duration to alleviate employee discomfort and physical strain. A review of the literature on within-work breaks from industrial and transport settings reported that on average, the addition of short supplemental work breaks to a conventional 8-hour work schedule improved job performance, and showed no negative impact on employees' productivity (Tucker, 2003). Regular rest breaks were found to effectively aid management of work-related physical fatigue and discomfort.

The Role of Work Characteristics

In this section, I review the role of work design and work characteristics in the within-work recovery process. Work design—the content and organization of work tasks, activities, relationships, and responsibilities—plays an integral role in the attainment of organizational goals (e.g., innovation, performance, and safety) as well influencing employees' professional development and health (Morgeson & Campion, 2003; Parker, 2014). Recovery researchers have argued that healthy work design is the primary way to promote within-work recovery (Geurts et al., 2014). Well-designed work provides resources such as job autonomy, task variety, and social support to employees, allowing them greater control over when and how to meet job requirements, including

management of energy depletion and replenishment through recovery within the workday (Geurts & Sonnentag, 2006; Meijman & Mulder, 1998). At present, little is known about specific work characteristics and their role in employees' within-work recovery.

Through the lens of the Job Demands-Resources model (JDR; Demerouti et al., 2001), work characteristics are demarcated into two broad categories rather than a "laundry list" of specific antecedents of job stress: job demands and job resources (Bakker & Demerouti, 2007). Job demands are "physical, psychological, social, or organizational aspects of the job that require sustained physical and/or psychological (i.e., cognitive or emotional) effort, and are therefore associated with certain physiological and/or psychological costs" (Schaufeli & Bakker, 2004, p. 296). To meet job demands, employees must invest resources, which can lead to greater energy depletion. Job resources are activating aspects of the job that promote development, learning and personal growth such as social support, constructive job feedback, and autonomy. Job resources have been theorized to catalyze a motivational process leading to increased work engagement along with other positive indicators of employee well-being. (Bakker & Demerouti, 2007). Furthermore, job resources may reduce the physiological and psychological costs associated with job demands.

Recovery researchers have examined the impact of job demands and resources on employees' recovery outside of work hours (e.g., Sonnentag & Ziljstra, 2006); generally, job demands have been shown to negatively relate to recovery during non-work hours, and job resources positively relate to non-work time recovery (Demerouti et al., 2009).

The job demands-resources-recovery model (Kinnunen, Feldt, Siltaloppi, & Sonnentag, 2011) extended JDR (Bakker & Demerouti, 2007); Kinnunen et al. proposed that specific job characteristics effect employee well-being via the recovery process. That is, the design of work influences worksite environmental and psychosocial conditions that, in turn, facilitate or hinder employee recovery (Kinnunen & Feldt, 2013; Kinnunen et al., 2011). The need for within-work recovery is thought be connected to specific job characteristics to the degree that effort is needed to meet the job requirements. For example, jobs that include high time pressure, cognitive demands, or heavy workload consume more resources and make recovery more difficult than jobs that allow employees to work at a slower pace and alternate between complex and simple tasks (Demerouti et al., 2009).

Kinnunen et al. (2015) identified a connection between unhealthy work design—as characterized by work environments that have low levels of autonomy, social support, and task/skill variety (Geurts et al., 2014)—and negative employee recovery and well-being outcomes. Taking a person-centered approach, Kinnunen et al. used latent profile analysis to identify homogeneous subpopulations within a sample of employees working in organizations from seven different employment sectors. The findings indicated that employees within subgroups typified by the combination of low levels of job autonomy and social support reported lower levels of vigor, and vitality, and higher levels of emotional exhaustion relative to employees within more resourceful conditions. Furthermore, employees in the low-autonomy/low social support condition made infrequent use of within-work recovery strategies (such as within-work breaks), perhaps

due to employees' inability to adjust their work strategy to their current need for recovery. Taken together, these reports point to an opportunity to examine work characteristics that predict recovery, or the lack thereof.

Work Characteristics of U.S. Hospital Staff Nurses

The purpose of this section is to provide an overview of factors related to U.S. hospital staff nurses' work and schedule characteristics (i.e., work hours and the timing of rest and meal breaks). First, I discuss predominant hospital scheduling practices and the impact of current scheduling practices on nurses' health and organizational outcomes. I summarize the literature on challenges and supports for nurses regarding rest and meal breaks during extended shifts, and the recovery potential therein.

Extended Work Schedules in U.S. Hospitals

According to the Bureau of Labor Statistics (2020), over 58% of registered nurses in the U.S. work in state, local, or private hospitals. To meet the demands of patient care requirements, hospital staff nurses provide continuous care to patients in the hospital setting 24 hours a day, seven days a week (Trinkoff, Johantgen, & Storr, 2011). Therefore, many nurses work extended or alternate shifts (Yumang-Ross & Burns, 2014). Extended shifts are those that last beyond nine hours, or more than 40 hours per week. Alternate shifts are those that require work on the weekends, evenings, and nights, or rotate; that is, two or more shifts in a row. Nurses have traditionally provided 24-hour coverage by working one of three 8-hour shifts: typically, 7:00 a.m. to 3:00 p.m., 3:00 p.m. to 11: 00 p.m., and 11:00 p.m. to 7:00 a.m.

Economic pressures, including a nursing shortage in the late 1970s and the early 1980s, influenced trends in hospital scheduling practices for decades (Josten, Ng-A-Tham, & Thierry, 2003). As a result, direct-care nurses' typical shift length in the hospital setting has increased from 8 hours to 12 hours (Lucero, Lake, & Aiken, 2009). Twelve-hour hospital shifts are generally scheduled between the hours of 7:00 (a.m. or p.m.) and 7:00 (a.m. or p.m.). According to a national poll of over 14,000 nurses by the American Nurses Association, the 12-hour shift is now the most common shift length—59.4% of nurses indicated they work 12-hour shifts (ANA, 2019).

Many nurses report working overtime in addition to working a 12-hour shift. For example, Rogers et al. (2004) reported that over the course of a four-week logbook study, nurses often worked past scheduled hours, and nearly 40% of the shifts logged exceeded 12 hours. Furthermore, Scott, Rogers, Hwang, and Zhang (2006) found that 60.8% of respondents ($N = 506$) worked beyond their scheduled shift 10 or more times during a 28-day period; on average, the nurses worked 49 minutes longer than originally scheduled. Together, these findings underscore that nurses commonly contend with extended work shifts that exceed 12 hours.

Extended Work Schedules and Nurses' Organizational Behaviors

In a national survey of registered nurses, 45% of RNs who maintain their license but no longer practice cited burnout or stressful work as the primary reason they left the field; an additional 41% cited scheduling issues or too many hours (Health Resources and Services Administration, 2006). Extended work shifts have likewise been linked to nurses' organizational withdrawal behaviors, including higher rates of absenteeism,

burnout, job dissatisfaction, and intent to leave the organization (de Castro, Fujishiro, Rue, Tagalog, Samaco- Paquiz, & Gee, 2010; Rajbhandary & Basu, 2010; Stimpfel et al., 2012; Stone et al., 2006).

With regards to nurses' job performance, meta-analytic evidence has linked extended work shifts with a variety of negative patient outcomes (Bae & Fabry, 2014; Clendon & Gibbons, 2015; Estabrooks, Cummings, Olivo, Squires, Giblin, & Simpson, 2009). For example, Stimpfel, Lake, and Barton (2013) found that direct-care nurses working 12-hour shifts on pediatric units were more likely to report central-line-associated bloodstream infections than nurses working 8-hour shifts. Increases in nurses' work hours have also been associated with higher rates of medication errors and patient injuries as a result of falls (Olds & Clarke, 2010; Stimpfel & Aiken, 2013), increased odds of patient error risk (Roger et al., 2004; Scott et al., 2006), and patient dissatisfaction with nursing care, including nurse response time and communication (Stimpfel et al., 2012). Clendon and Gibbons (2015) reviewed 13 studies of the association between extended working hours and rates of error among nurses working 12 or more hours on a single shift in an acute care hospital setting; the collected evidence indeed linked shifts in excess of 12 hours with increased rate of error.

Extended Work Schedules and Nurses' Health and Well-being Outcomes

Research findings have begun to coalesce regarding the effects of extended shifts on nurses' well-being. Recent studies indicate that extended work shifts may have negative effects on nurses' health behaviors and outcomes, including increased use of alcohol during off-hours (Schluter, Turner, & Benefer, 2012), inadequate and restless

sleep (Geiger-Brown, Trinkoff, & Rogers, 2011), and increased rates of obesity (Han, Trinkoff, Storr, & Geiger-Brown, 2011). In addition, extended shifts are associated with increased risk of nurse injury (e.g., musculoskeletal disorders and accidental needle sticks (Trinkoff, Le, Geiger-Brown, Lipscomb, & Lang, 2006; Trinkoff et al., 2007), need for recovery (Josten et al., 2003), and fatigue (Barker & Nussbaum, 2011).

Fatigue-recovery cycles may differ as a function of work and schedule characteristics. Changes in workload, scheduled and unscheduled employee absences, and imbalance between staffing levels and workload are organizational factors that affect workers' level of acute fatigue (Lerman et al., 2012). Acute fatigue generally develops in response to temporary activity, but is relieved by regular rest. Acute fatigue symptoms commonly associated with extended nursing shifts include physical, cognitive, and emotional elements resulting from prolonged exposure to heavy work demands and insufficient recovery opportunities (Smith-Miller, Curro, Shaw-Kokot, & Jones, 2014). However, chronic fatigue—defined as unrelieved physical and mental exhaustion—may develop when individuals experience acute fatigue repeatedly over an extended period of time without adequate recovery opportunities (Winwood, Winefield, Dawson, & Lushington, 2005).

Extended Schedules, Workload, and Within-work Recovery Opportunities

Trougakos and Hideg (2009) proposed that high job demands (such as adverse scheduling practices experienced by nurses) prevent sufficient within-work recovery during within-work breaks, and may indeed prevent employees from taking breaks at all. Unsurprisingly, previous research has indicated that nurses working in U.S. hospitals

often cannot take periodic rest and meal breaks (Cadiz, Folkhard & Lombardi, 2006). A review of the nursing literature revealed evidence of a widespread lack of recovery opportunities during work shifts. Evidence from a large national survey of nurses (N = 13,515) indicated that over 35% of respondents reported they rarely or never took breaks (ANA, 2009). Additionally, daily diary studies have indicated that hospital staff nurse participants had no time for rest or meal breaks during 10% of recorded shifts (Rogers et al., 2004). Another study on staff nurses found that 11% of nurses did not take a rest or meal break during their shift (Trinkoff et al., 2006).

The nursing research and occupational medicine literatures have uncovered a number of organizational and individual factors that appear to inhibit nurses' use of rest and meal breaks. Factors include logistical difficulty in transferring patient care, nurses' feelings of guilt for burdening coworkers with additional patient load, and fear of missing communication with a physician or other health care provider (Scott et al., 2010). Furthermore, nurses are often not able to relinquish patient care during breaks due to a staffing deficit (Witkoski-Stimpfel & Dickson, 2010). For example, Rogers et al. (2004) conducted an experience sampling study with 393 staff nurses over a period of 28 days, and found that nurses reported taking a meal or rest break—free from patient care responsibilities—on less than half of the shifts recorded (2,429 of 5,211 shifts). Anecdotal evidence has indicated that a cultural shift within healthcare organizations and systems may be required in order to prioritize nurses' health during the course of the work shift (Stefancyk, 2009). Together, the accumulated influence of extended shifts, excessive workload, frequent overtime, and inadequate inter-shift recovery put hospital

staff nurses at high risk for injury, occupational illness, and chronic fatigue. Upon the conclusion of my review of the recovery and occupational health literature, I argued that the combination of these specific scheduling characteristics threatens nurses' ability to maintain energy and focus throughout the shift and their ability to replenish resources outside of work hours. Therefore, I hypothesized:

> Hypothesis 1a: Adverse schedule characteristics (i.e., extended shift length, mandatory overtime, and time pressure) are negatively related to work engagement.
>
> Hypothesis 1b: Adverse schedule characteristics (i.e., extended shift length, mandatory overtime, and time pressure) are positively related to fatigue.
>
> Hypothesis 1c: Adverse schedule characteristics (i.e., extended shift length, mandatory overtime, and time pressure) are positively related to need for recovery.

Within-Work Recovery and Well-Being

Work breaks have been identified as an opportunity to halt personal resource loss by nurses during the course of an extended shift, and provide the opportunity to recover from work demands (Witkoski-Stimpfel & Dickson, 2010). I proposed that the strategic use of breaks throughout an extended shift may instrumentally support nurses that provide direct patient care in a hospital setting, and work in concert with recovery experiences outside work hours. Researchers in the field of occupational medicine and ergonomics have studied the frequency and duration of short breaks throughout the workday, as well as the effects of stretching exercises on physical fatigue and discomfort.

The study of psychological processes and outcomes in relation to within-work breaks has emerged in the last 10 years to becomes an active area of research (e.g., Krajewski et al., 2010; Trougakos et al., 2008; Trougakos et al., 2014), and provides information regarding characteristics and context of work breaks that may improve our understanding of nurses' within-work recovery processes.

Thus far, researchers have focused on the association between break activities (e.g., napping or exercising) and short-term well-being outcomes during the workday. The pattern of relationships between within-work break activities and within-work recovery indicators (e.g., decreased strain or fatigue) largely reflects that of off-job activities and recovery during non-work hours. Evidence from within-work recovery research indicates that relaxation during breaks may be particularly important for employees' occupational well-being. Trougakos et al. (2008) conducted a daily diary study during which participants reported their level of engagement in lunch break activities and experiences of positive or negative emotion during the break, supplemented by other-rated display of positive affectivity upon return to work. This early study of within-work recovery broadly grouped break activities as either "respite activities" or "chores." Activities within the former category included low-effort pursuits (e.g., napping or reading), while activities within the latter category included the continuation of work-related tasks during lunch break, running errands, and family management tasks. On average, participants who engaged in respite activities during their lunch breaks reported higher levels of positive emotions and lower levels of negative emotions during their

lunch break, and showed higher levels of display of positive affectivity following their lunch break than those who engaged in chore-related activities during their break.

In line with these findings, Krajewski et al., (2010) tested the strain-reducing potential of two forms of workday break activity in a controlled trial. Over the course of six months, 14 call center agents took part in one of two conditions during their lunch break. The first condition entailed 20 minutes of conversation with a small-talk (ST) break group; in the second condition, participants spent 20 minutes on progressive muscle relaxation exercise in a quiet room with visual and territorial privacy. Measurements were taken at baseline and every two months thereafter. At each measurement point, independent-observer and self-report ratings of emotional, mental, motivational, and physical strain were taken at 12:00 p.m., 1:00 p.m., 4:00 p.m., and 8:00 p.m.. Though no significant change in strain states was found for participants who socialized with coworkers over lunch, participants who engaged in quiet rest and progressive muscle relaxation demonstrated a decrease in strain states for the 1:00 PM and 4:00 p.m. measurement points. The strongest effects were found for the reduction of emotional and motivational strain level for the relaxation group (Krajewski et al., 2010). The lack of finding for participants in the small-talk work break group was somewhat unexpected by the authors, but may be attributed to qualitative differences in socializing with work partners versus socializing with friends or family members (Trougakos et al., 2014).

Further support for the importance of relaxing activities during work breaks was recently provided in a multi-source experience sampling study of university

administrative employees. Trougakos et al. (2014) adapted Sonnentag's (2001) measure of activities related to non-work hours recovery in order to examine the activities that employees engaged in during lunch breaks. Specifically, participants were asked to report the extent to which they engaged in social activities, work-related activities, or relaxing activities during the meal break, in addition to their perception of autonomy in choosing their lunch break activity. Each focal participant was paired with a coworker, who provided a report of the focal employee's end-of-workday fatigue over the course of a workweek. As hypothesized, engaging in work-related activities during the lunch break resulted in higher levels of end-of-workday fatigue, and relaxing activities resulted in lower levels of end-of-workday fatigue. Taken together, this body of evidence scaffolded my next set of hypotheses:

> Hypothesis 2a: Within-work recovery experiences (i.e., psychological detachment, relaxation, mastery experiences, and control) are positively related to work engagement.
>
> Hypothesis 2b: Within-work recovery experiences (i.e., psychological detachment, relaxation, mastery experiences, and control) are negatively related to fatigue.
>
> Hypothesis 2c: Within-work recovery experiences (i.e., psychological detachment, relaxation, mastery experiences, and control) are negatively related to need for recovery.

Recovery Experiences as Moderators in the Relationship Between Work Characteristics and Work-related Well-being

Trougakos et al. (2014) found a significant interaction between employees' perceptions of autonomy during their lunch break, lunch break activity, and others' report of the focal employee's end-of-day fatigue. Specifically, social activities during the lunch break predicted more fatigue when autonomy was low, and less fatigue when autonomy was high. In addition, engaging in work activities during lunch predicted higher levels of fatigue if autonomy was low, and lower levels of fatigue if autonomy was high. And finally, relaxing activities were more beneficial to recovery at low levels of autonomy, and were not found to have a significant relationship with end-of-day fatigue at high levels of autonomy. Thus, the authors determined that perceived autonomy during the lunch break may play an important role in the recovery process, though employees often may not have the liberty to spend their lunch break as they would like. Within-work break activities are positively associated with recovery experiences to the degree that they allow employees to use a different set of resources than those used during the performance of work tasks (Meijman & Mulder, 1998), or allow for the acquisition of additional resources (Hobfoll, 1989). Both the freedom to engage in preferred activities and the nature of the activities chosen are thought to influence the recovery potential (Trougakos et al., 2014). Taken together, these findings lead to my final set of hypotheses which predicted that RN's experiences of fatigue and work engagement would depend in part on their within-work recovery:

Hypothesis 3a: Within-work recovery experiences moderate the negative relationship between adverse schedule characteristics and work engagement, such that the negative relationship is stronger for nurses who experience a lower degree of within-work recovery than for those who experience a higher degree of within-work recovery.

Hypothesis 3b: Within-work recovery experiences moderate the positive relationship between adverse schedule characteristics and fatigue, such that the positive relationship is stronger for nurses who experience a lower degree of within-work recovery than for those who experience a higher degree of within-work recovery.

Hypothesis 3c: Within-work recovery experiences moderate the positive relationship between adverse schedule characteristics and need for recovery, such that the positive relationship is stronger for nurses who experience a lower degree of within-work recovery than for those who experience a higher degree of within-work recovery.

Summary

A review of the literature suggests that our understanding of the processes through which employees maintain their energetic resources throughout the workday is relatively incomplete, particularly when compared to the larger recovery literature (Dyrbye et al., 2017; Kinnunen et al., 2015; Rus et al., 2020; Trougakos et al., 2014; Zacher et al., 2015). Theoretically and practically, it is important to learn what factors might play a role in mitigating the harmful effects of work stress that frontline health care providers

experience throughout the work shift. In the following chapter, I describe the research design, procedure, and method I employed in this study to investigate within-work recovery opportunities and the experiences of nurses that provide direct-care in 24-hour healthcare organizations.

Figure 2. Summary of Hypotheses

Hypothesis 1a: Adverse schedule characteristics (i.e., extended shift length, mandatory overtime, and time pressure) are negatively related to work engagement.
Hypothesis 1b: Adverse schedule characteristics (i.e., extended shift length, mandatory overtime, and time pressure) are positively related to fatigue.
Hypothesis 1c: Adverse schedule characteristics (i.e., extended shift length, mandatory overtime, and time pressure) are positively related to need for recovery.
Hypothesis 2a: Within-work recovery experiences (i.e., psychological detachment, relaxation, mastery experiences, and control) are positively related to work engagement.
Hypothesis 2b: Within-work recovery experiences (i.e., psychological detachment, relaxation, mastery experiences, and control) are negatively related to fatigue.
Hypothesis 2c: Within-work recovery experiences (i.e., psychological detachment, relaxation, mastery experiences, and control) are negatively related to need for recovery.
Hypothesis 3a: Within-work recovery experiences moderate the negative relationship between adverse schedule characteristics and work engagement, such that the negative relationship is stronger for nurses who experience a lower degree of within-work recovery than for those who experience a higher degree of within-work recovery.
Hypothesis 3b: Within-work recovery experiences moderate the positive relationship between adverse schedule characteristics and fatigue, such that the positive relationship is stronger for nurses who experience a lower degree of within-work recovery than for those who experience a higher degree of within-work recovery.
Hypothesis 3c: Within-work recovery experiences moderate the positive relationship between adverse schedule characteristics and need for recovery, such that the positive relationship is stronger for nurses who experience a lower degree of within-work recovery than for those who experience a higher degree of within-work recovery.

Chapter 3: Method

The previous chapter provided a review of current literature regarding recovery of resources from work-related demands, characteristics of nurses' shiftwork schedule and environment in 24-hour healthcare facilities (i.e., extended shift length, mandatory overtime, time pressure), and occupational well-being (i.e., work engagement, work-related fatigue, and need for recovery). This chapter describes in detail the research methods employed in this study, beginning with the design of the research project, followed by a description of the population from which the study sample was drawn, study oversight, setting, data collection procedures, data management, and analysis plan. The chapter concludes with a summary of the essential points of the research methodology.

Research Design

The purpose of this quantitative study was to gain a better understanding of nurses' experience of shiftwork scheduling practices in relation to occupational well-being, and opportunities for recovery from the work demands presented by round-the-clock direct patient care, drawing on the effort recovery model (ERM; Meijman & Mulder, 1998) and the job demands-resources model (JD-R; Bakker & Demerouti, 2007). Within-work recovery experiences are conceptualized as potential resources, underpinned by the conservation of resources theory (Hobfoll, 1989). This study has three specific research aims:

1. Examine hospital staff nurses' shift schedule characteristics, as well as the association between adverse scheduling practices and nurses' occupational well-

being. In this study, adverse scheduling practices include the following independent variables: extended shift length (>10 hours per shift); mandatory overtime; and time pressure. Nurses' occupational well-being indicators include the following dependent variables: work engagement, work-related fatigue, and need for recovery.

2. Explore the association between within-work recovery experiences and nurses' occupational well-being. As depicted in the study model (see Figure 1), the recovery experiences included in this study are psychological detachment, relaxation, mastery experiences, and control.

3. Investigate the role of recovery experiences within mid-shift rest and meal breaks as potential moderators of the relationship between adverse scheduling practices and occupational well-being.

This study employed a cross-sectional design with data collected via online survey to address the three research aims detailed above. In 2015, I approached the Oregon Nurses Association (ONA), a large professional association for nurses, with the intention of recruiting a study sample that reflected the demographic characteristics of Oregon nurses from among their affiliates (see Appendix A for institutional review board notice of approval to conduct original research with human subjects). ONA is a non-profit association founded in 1904 and headquartered in Tigard, Oregon. ONA offers advocacy, continuing education, and research opportunities to members and affiliates, as a constituent member of the American Nurses Association. I supported a variety of

research projects for ONA between 2012 and 2016[1], and proposed a project partnership to extend qualitative findings of inadequate shiftwork staffing and scheduling practices, the impact on patient safety, and ONA members' frequent inability to take rest/meal breaks during a normal shift to recover energy spent providing direct care to patients. This dissertation study was designed to deploy a systematic inquiry into these topics and was carried out with the support of senior leadership, and members of the

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[1] I have been associated with ONA since August 2012, when I began work as a research consultant for an internal team tasked with analyzing critical incident reports from ONA members working at 60 hospitals in Oregon. These reports documented the conditions in which unsafe nurse staffing levels led to detrimental outcomes for patients and/or care providers, including frequent reports of nurses' inability to leave their duty post for meal or rest breaks for the duration of 12-hour shifts. This work provided foundational support to ONA efforts to strengthen Oregon's Hospital Nurse Staffing Law. Towards the end of my tenure consulting for ONA, I sought and received verbal permission to recruit participants for my dissertation research via the ONA membership listserv, and then proceeded to develop a dissertation proposal including ONA as my partner organization. Following my dissertation proposal colloquium in January 2016, I revised my proposal document as recommended by my committee members. Once I received approval of the aforementioned changes from the chair of my dissertation committee and permission to proceed, I submitted an application to the Portland State University HSRRC in May 2016. While awaiting notification from HSRRC to begin study activity, I learned of changes within the ONA leadership that would affect my ability to initiate recruitment for this dissertation study. I paused study activity while a new Associate Director of Member Services was recruited, hired, and completed organizational onboarding at ONA. I was able to meet remotely with the new leadership in July 2016 to provide a detailed description of my dissertation study, and received permission to proceed.

information technology department and administrative teams at ONA. Please see Appendix B to view the letter of organizational support supplied by Dr. Carlton Brown, the Associate Director of Member Services at ONA during the developmental stages of this dissertation project. As recommended by Podsakoff, MacKenzie, Lee, and Podsakoff (2003), I chose to collect anonymous data to reduce method bias due to potential participants' evaluative apprehension, as well as to increase response level. In the following two sections, I describe the characteristics of the target population, and then provide a description of the study procedures.

Study Population

The population for this study includes registered nurses that work full- or part-time providing direct patient care in 24-hour healthcare facilities in Oregon. According to a report produced by the Oregon Health Authority and the Oregon Board of Nursing (2017), the majority of the estimated 44,436 licensed and practicing registered nurses in Oregon in 2016 worked in a hospital setting (57.9%). Of those, nearly seventy percent worked as direct-care providers (67.8%). Women made up 88.0% of the estimated population, and 88.7% identified their race and ethnicity as White and non-Hispanic.

Sampling Strategy

I used a non-probability form of sampling (convenience sampling) that provided an opportunity for ONA members to volunteer to fill out the online survey. This strategy was chosen for two reasons. First, due to the nature of my organizational partnership, I recruited participants in the manner to which they were accustomed. It is typical for ONA to request information and participation from their members via online questionnaires,

and the technical advisor at ONA recommended I use this approach[2]. Second, I anticipated that response rates for a one-time online survey would be higher than more time-intensive methods of data collection. Without substantial incentive, it is challenging to recruit health care professionals and collect high-quality data. To optimize the opportunity to recruit participants through my partner organization and their affiliates, I chose to proceed with a relatively straightforward data collection instrument to reduce survey burden on the participants and ensure data quality.

Power Analysis

In addition to recruitment technique, adequacy of sample size was an important consideration in designing the online survey for this study. I conducted a series of analyses to determine the sample sizes needed to provide sufficient power (e.g., the probability of detecting a "true" effect when it exists) for tests of the main effects of the independent variables (IV) on the dependent variables (DV). I used G*Power (Faul & Erdfelder, 2007) to estimate the sample sizes necessary to achieve a power of .80 at conventional small (.02), medium (.15) and large (.30) effect sizes (Cohen, 1988, p.412).

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[2] Prior to proposing this study, I was advised by the ONA IT department that a 10% response rate was typical for surveys distributed to the general membership listserv through which I recruited participants. It follows that a study advertised to the listserv membership of over 8,000 affiliates would have yielded a sample of over 800 participants. When it became clear that the current study sample would comprise less than 25% of the estimated sample, I consulted the ONA IT department. At that time, the IT department representative clarified that the estimate of 10% response rate pertained to emails that addressed a single contentious issue, as opposed to newsletter announcements that include multiple topics.

The corresponding number of participants needed equaled approximately 387, 55, 31, respectively.

Monte-Carlo simulations have shown that a minimum sample size of 120 is required to detect a small effect size in moderated multiple regression analysis (MMR; Stone-Romero & Anderson, 1994), and indicated that an MMR based on the product term of two continuous variables is substantially more powerful than a dichotomized moderator. As one of the focal study variables is essentially a dichotomous variable (shift length = 8 hours vs. 12 hours), several potential threats to MMR statistical power required consideration. First is the issue of unequal sample size in the dichotomous groupings. The total possible power level cannot exceed the possible power level of the smaller of two subsamples (Stone-Romero, Alliger, & Aguinis, 1994). Though shift length is technically a predictor variable in my model, in practice the interaction term X*Z is one of three terms entered into the multiple regression equation, along with predictor X and moderator Z. Therefore, the presence of a dichotomous predictor variable will have largely the same effect on the regression equation as a dichotomous moderator variable, including diminished statistical power.

Procedure

Study oversight was provided by the Portland State University Human Subjects Research Review Committee (PSU HSRRC). I obtained an expedited review by the PSU HSRRC as the study presented no more than minimal risk to the research participants and comprised anonymous data from individuals over the age of 18. See Appendix A for PSU HSRRC Approval Memo #163826.

Consent Process

Because the survey instrument did not collect personal information that could be used to identify the participants, the HSRRC granted my request to waive the requirement to attain signed consent from each participant. Under these conditions, it is still necessary to conduct informed consent processes throughout the course of participants' engagement with the study. Upon arrival at the online survey portal, prospective participants were asked to carefully read the informed consent material on the landing page of the survey, wherein I presented information regarding my role as a graduate student and ONA associate, as well as the aims of the study (see Appendix C). Respondents were asked to fill out an anonymous online survey, which would take approximately 20 minutes to complete. I assured the respondents that their participation was entirely voluntary, and that they were free to withdraw from the study at any point with no repercussions to their relationship with ONA or PSU. Any resulting research reports provided to ONA members or stakeholders would be presented in aggregate form only. Additionally, I clarified the role that the PSU HSRRC played in providing oversight for the duration of the project, including the means to directly contact the PSU HSRRC with any questions. The next step in the online informed consent process required respondents to indicate whether they consented to participate in the main survey study via a single forced response item. The item text read, "I have read, understood, and had the opportunity to print a copy of the above consent form, and desire of my own free will to participate in this study." To convey consent, participants were instructed to click a radio button (1 =

yes, 2 = *no*) to indicate that they agreed to participate in the study. See Appendix D for the complete informed consent statement.

Survey Administration

I used Qualtrics—a web-based survey platform provided by PSU's Office of Information and Technology—to create and distribute the online survey (accessed at https://portlandstate.qualtrics.com). Several factors contributed to my decision to collect cross-sectional electronic data. First, this is a format typically used by my study partner Oregon Nurses Association (ONA) to solicit feedback from their members, and thus likely familiar and acceptable to prospective participants. Second, I sought to limit the time burden placed on participants already working in demanding healthcare settings. The survey could be accessed from either a work or home computer—an accessible, convenient, and time-efficient way to survey nurses employed at over 60 healthcare organizations in Oregon. Third, compatibility with the statistical software package SPSS and the reduced chance of data entry error were additional assets of Qualtrics. Typical response rates for online surveys are less than optimal, but in this case were counteracted by the benefits.

The study recruitment window opened on Friday, September 30th, 2016 and closed on Thursday, October 27th, 2016. As previously mentioned, ONA communication department and information technology staff members regularly create and distribute a weekly electronic newsletter to ONA-affiliated RNs. The electronic newsletter is distributed via email each Friday. During the four-week recruitment period for this dissertation study, a brief announcement containing the title of this project and a web link

was included in each Friday mailing. Nurses who clicked on the link were directed to the study invitation letter, which was housed on the ONA server (see Appendix C). Those nurses who wished to learn more about the study were directed to click on a web link embedded at the bottom of the study invitation letter, which guided prospective participants to the online survey portal. As a token of appreciation for their time and effort, respondents were offered the opportunity to enroll in a drawing for one of ten $10 gift cards to an online retailer. Upon completion of the main survey, participants could follow a final web link to a separate Qualtrics survey to supply their name and email address for entry into the gift card drawing (see Appendix E for a detailed description of the survey collection instrument components, Appendix F for the main survey closing remarks along with a link to the gift card survey, and Appendix G for the details of the gift card survey).

Response Rate

The ONA information technology (IT) advisor provided me with the most precise metrics I could obtain regarding the percentage of prospective participants that participated in this study. ONA IT does not track how many of the approximately 8,000 email addresses in ONA's newsletter email bank are current and valid. An ONA IT colleague estimated that 15% of recipients open the email link to the e-newsletter, approximately 1,200 individuals. An estimated 2% of recipients click on any of the links contained therein, approximately 160 individuals (C. Campbell, personal communication, October 16th, 2016). ONA tracks how many individuals click on each embedded link distributed via the newsletter. The newsletters each contained 12 links that readers could

follow for more information on a given topic. Over 50% of the newsletter traffic, as measured by total clicked links, directed to my study. In other words, the link to my study received more clicks than all other links combined over the 4-week recruitment period. Of those 166 individuals that followed the link to my study introduction page, 160 (97.0%) continued to the informed consent material and entered the study.

Inclusion/Exclusion Criteria

Participants selected met the following inclusion criteria:

1. Registered nurse licensure in Oregon
2. Current part- or full-time employment at a 24-hour healthcare facility
3. Direct-care provider

Individuals with the following characteristics were excluded from the study:

1. Nurse administrators and nursing educators
2. Agency nurses

Data Collection Instrument

The following measures were administered to participants via the online survey. Participants reported on their own work shift characteristics, experiences of time pressure within shifts, recovery experiences, fatigue, and work engagement. For detailed information on the study measures, see Appendix E.

Shift Length. Participants were directed to consider their work schedule on average, and then provide the start and end times of their average shift with two items. The instructions for the items were adapted from the Standard Shiftwork Index (SSI), which has been widely used to standardize self-report measures of shiftwork within the

healthcare field (Barton, Spelten, Totterdell, Smith, & Folkard, 1995; Folkard, Spelten, Totterdell, Barton, & Smith, 1995; Trinkoff, Le, et al., 2006; Trinkoff et al., 2011). Participants were prompted to report the hours they actually work, including overtime, not just the hours they are scheduled to work. Shift length was assessed by determining the difference between the shift start and end times. In addition to the two items regarding the "start time" and "end time" for participants' average shift, I included a single survey item that asked the length (in hours and minutes) of the average shift in order to increase the likelihood of obtaining information regarding this focal variable from respondents.

Mandatory Overtime. Once a nurse accepts a patient load assignment upon the start of their work shift, they may not be able to leave their duty post before handing the patient assignment off to a qualified member of nursing personnel. The alternative risks the disciplinary, professional, and personal consequences of *patient abandonment,* as documented in the Oregon State Board of Nursing interpretive statement on patient abandonment (2020). The instructions for the single survey item that assessed the frequency with which the participant's encountered mandatory overtime were adapted from the Standard Shiftwork Index (SSI; Barton et al., 1995), frequently used in the nursing shiftwork literature (Trinkoff et al., 2006). Participants were directed to consider their typical work schedule, then select the response option on a 6-point scale (1 = *never*, 6 = *more than once a week*) that most accurately reflects how often they must work beyond their scheduled shift to ensure continuous patient care. A higher score indicates more frequent mandatory overtime.

Time Pressure. Time pressure refers to an individual's perceived amount of work and work pace. Time pressure was assessed using the five-item Quantitative Workload Inventory (QWI) scale developed by Spector and colleagues (Spector, Dwyer, & Jex, 1988). Participants responded to each item using a 5-point frequency scale ranging from (1 = *very rarely or never*, 5 = *very often*). Higher scores indicate a greater degree of within-shift time pressure. The total score for the scale was calculated by taking the mean score of the five items. An example item is "How often do you have more work than you can do well?" Cronbach's alpha for this sample = .88.

Within-Work Recovery Experiences. Recovery experiences refer to the underlying psychological experiences associated with recovery from work stress (Sonnentag & Fritz, 2007). While activity preference during within-work breaks is highly individualized, the processes through which recovery from work stress take place have been conceptualized in broader categories. Recovery experiences during within-work breaks were assessed with the Recovery Experience Questionnaire (Sonnentag & Fritz, 2007), made up of four subscales: psychological detachment, relaxation, mastery experiences, and control. Each subscale contains four items, which are rated on a 5□point agreement scale (1 = *I fully disagree*, 5 = *I fully agree)*. Participants were asked to respond to each item of the four subscales with respect to their within-shift breaks. The total score for each subscale was calculated by taking the mean score of the four items. Higher scores indicate a greater degree of within-work recovery experience. Psychological detachment refers to a sense of "being away from the work situation" first introduced by Etzion, Eden, and Lapidot (1998). This entails mentally and physically

disengaging from work tasks. An example item for psychological detachment is, "I detach from my responsibilities." Cronbach's alpha for this sample = .79. Relaxation refers to a state of increased positive affect and low activation (Stone, Kennedy-Moore, & Neal, 1995). A sample item for relaxation is, "I sit back and relax." Cronbach's alpha for this sample = .89. Mastery experiences refer to activities or learning opportunities in domains separate from one's work demands (Fritz & Sonnentag, 2006). A sample item for mastery experiences is, "I do something to broaden my horizons." Cronbach's alpha for this sample = .86. Control refers to the ability to determine one's own course of action. A sample item for control is, "I decide my own schedule." Cronbach's alpha for this sample = .84.

Work Engagement. Work engagement was assessed with the nine-item short-form Utrecht Work Engagement Scale (UWES; Schaufeli et al., 2006). Participants responded to each item using a 7□point frequency scale (1 = *never*, 7 = *always)*. The nine items of the UWES have been conceptualized in previous research as reflecting a unidimensional construct, and alternately as three subscales representing theorized sub-dimensions of work engagement: vigor, dedication, and absorption. A sample item from the vigor subscale is, "At work, I feel bursting with energy." A sample item from the dedication subscale was, "I am proud of what I do," and a sample item from the absorption subscale was, "I am immersed in my work." The score was calculated by taking the mean score of the nine items. Cronbach's alpha for this sample = .90.

Work-Related Fatigue. Participants' experience of work-related fatigue was assessed using the four-item *lack of energy* subscale of the Swedish Occupational Fatigue

Inventory (SOFI 20), developed by Ahsberg and colleagues (Ahsberg et al., 1997; Ahsberg, 2000). Participants were asked to indicate the degree to which each item describes how they feel during and/or towards the end of their shift. Items were rated on a scale from 1 (*not at all*) to 7 (*to a very high degree*). The four expressions of the *lack of energy* subscale include "worn out," "spent," "drained," and "overworked." The total score for the scale was calculated by taking the mean score of the four items, and higher scores indicate greater perceived work-related fatigue. Cronbach's alpha for this sample = .90.

Need for Recovery. Need for recovery refers to the extent to which effort expended while meeting job demands leaves one feeling drained and withdrawn at the end of the work shift, and was assessed with the 11-item Need for Recovery Scale (NFR; van Veldhoven & Broersen, 2003). I adapted the instructions with phrasing appropriate for use in the context of 24-hour shiftwork, in line with recent research on within-work recovery (Bosch & Sonnentag, 2019). Participants were instructed to consider their typical work schedule, then select the response option that best reflected their experience using a 5-point frequency scale (1 = *never*, 5 = *always*). A sample item was, "Generally, I need more than an hour before I feel completely recuperated after work." The total score for the scale was calculated by taking the mean score of the 11 items. Higher scores indicate greater perceived need for recovery. Cronbach's alpha for this sample = .86.

Post-Break Recovery. For potential post-hoc exploratory analyses, I included an additional measure in the survey regarding participants' perceived level of recovery as a result of formal work breaks. Adapted from the Recovery After Breaks Scale (Demerouti

et al., 2012), participants were asked to answer two items on a 5-point response scale (1 = *very rarely or never,* 5 = *very often or always*). The first item read, "During my rest breaks, I recuperate from work," and the second item read, "During my meal break, I recuperate from work." The total score was calculated by taking the mean score of the two items. Higher scores indicated more frequent experience of recuperation during breaks. Cronbach's alpha for this sample = .78.

Work Characteristics and Demographics. Regarding professional licensure and work characteristics, participants indicated the year they completed their nursing training and highest level of education attained, tenure in the field of healthcare, tenure in current position, shift worked, average number of hours worked per week, practice environment, unit type, and collective bargaining unit representation status. Demographic information collected included gender, age, race and ethnicity, relationship status, childcare responsibility, and eldercare responsibility. Race and ethnicity, relationship status, shift worked, practice environment, and unit type were collected as categorical data, while nursing education level and nursing experience were collected as ordinal data.

Data Preparation and Screening

I undertook a series of steps to clean and screen the survey data, beginning with an inspection of missing data. I determined a priori to retain only cases that completed the survey with responses to 66% or more of the total items. From the 161 responses, I removed eighteen cases with partial responses from further consideration. I next applied the inclusion and exclusion criteria to the data set. Per the exclusion criteria, I removed two cases with the job title "administrator" and one case with the job title "educator"

from the sample after confirming that each case indicated no responsibility for direct patient care, resulting in 140 retained cases. I removed an additional five cases that specified "outpatient clinic with regular business hours" as their unit type, to align with the inclusion criteria specifying participants work in 24-hour healthcare facilities. Lastly, I removed one case that omitted all work characteristic items.

I imported the data for the remaining 134 cases into Microsoft Excel Version 16.44 to identify cases missing a significant number of items on the study focal variables. I used the Excel command "COUNTblank" to highlight missing data within cases. Twenty-one cases were observed with one to four survey items left incomplete. As such, the respondents completed a minimum of 92% of data for the focal variables, and all cases were retained in the sample. To screen for patterns of unengaged survey responses (e.g., B-liners, patterns across measure items), I calculated the standard deviation of the ordinal scales for each case with the function "=STDEV.S(spreadsheet range)," then highlighted each case with a standard deviation of less than 0.50 for follow-up. I then created adjacent columns for each measure so I could investigate patterns across measures. I visually inspected each highlighted case, and determined that no cases in this data set appeared to provide unengaged responses in any single measure, nor across measures. Taken together, none of the cases evidenced cause for concern. Thus, the following analyses are based on a sample of 134 participants.

I inspected the variable properties in IBM SPSS Version 27 to confirm that the data had retained the correct structure regarding item response options and order, and reverse-scored items when necessary. I screened the item-level data by confirming the

possible range, observed minimum and maximum scores, frequencies, and histograms of individual items. All variables but one (shift length) were on ordinal scales with seven or fewer intervals, limiting the possibility of extreme outliers.

To clean the values respondents entered for shift length, I compared the values for "start time" and "end time" (both in HH:MM 24-hour format) for each case with a single survey item, "How many hours do you work per shift?" In three instances, the respondent did not enter a value for hours worked per shift, but had entered start time and end time values. In each instance I calculated the difference and entered the result for shift length. Taken together, I did not identify any unusual values for shift length during the cleaning process. I evaluated the normality of each study variable distribution (e.g., skew, kurtosis) and found no unexpected or problematic values (i.e., absolute values larger than 2.00; George & Mallery, 2010). I computed a new variable for each composite measure of the focal variables (e.g., time pressure, recovery experiences, work engagement, work-related fatigue, and need for recovery), then inspected each item individually, as well as the inter-item correlations, reliability (scale alpha) and established an initial solution for the data structure with exploratory factor analysis (EFA).

Analyses

Data were analyzed using IBM SPSS and AMOS (Version 27). Statistical significance was set at $p < .05$ unless otherwise noted. In order to test the hypothesized relationships in this sample with the highest possible degree of confidence, I conducted a series of confirmatory factor analyses to bolster the findings of the EFAs regarding the factor structure of the multi-dimensional focal measures. Incorporating recommendations

regarding acceptable fit indices from Hu and Bentler (1999), I gauged the degree of fit from several sources, including the chi-square test of model fit, and additional indices of absolute fit and relative fit. Generally, absolute fit indices estimate how well the data fit the theorized model. The goodness of fit index (GFI) reflects the level of fit between the hypothesized model and the observed covariance matrix, but can be unduly influenced by sample size and the number of indicators for latent constructs. Possible values range from 0 to 1 with values greater than .90 indicating an acceptable fit. Relative fit indices compare the chi-square for a "null" model to the chi-square of the theorized model. The comparative fit index (CFI) ranges from 0 to 1 with values greater than .95 indicating an adequate fit. The root mean square error of approximation (RMSEA) likewise analyzes the divergence of the hypothesized model and the population covariance matrix, but is more robust than the GFI with regard to sample size. This relative fit index ranges from 0 to 1 and a value less than .10 indicates an adequate model fit.

Descriptive statistics were calculated for the demographic variables and to convey the characteristics of nurses' shiftwork schedules. I calculated Pearson's correlational coefficients to assess the relationships of nurses' work schedule characteristics with the recovery experiences and outcome variables at the bivariate level. I also evaluated several demographic and work schedule variables in the survey instrument for use as potential control variables. The variables considered included age, gender, relationship status, childcare status, eldercare status and hours worked per week. I examined the zero-order correlations between the potential control variables and the focal study variables and selected those that shared significant variance with a focal variable for further testing. I

tested each regression model with and without the selected control variables, and retained for the final models those control variables that contributed to the regression equation.

Multiple regression analyses in IBM SPSS were utilized to test Hypotheses 1a-c and 2a-c, To test for moderation (i.e., Hypotheses 3a-c), I calculated each series of hierarchical moderated regression analyses with the following steps: I first mean-centered the independent and moderator variables as appropriate; I next computed a new variable in SPSS from the product of the independent and moderator variables; and finally, I entered the interaction term into the hierarchical multiple regression model after controlling for the applicable demographic variables and the main effects.

Summary

This chapter detailed the characteristics of the people, processes, and instruments I engaged to conduct a cross-sectional online survey to examine nurses' adverse schedule characteristics and within-work recovery experiences in relation to occupational well-being indicators. The survey was composed of well-established valid and reliable scales, and healthcare-specific work characteristics and demographic items. Recruitment took place via the listserv of Oregon Nurses Association to enroll for the anonymous survey, which took approximately 20 minutes to complete. Upon completion of the survey, respondents had the opportunity to enter a drawing for one of ten $10.00 amazon.com gift cards. Data were cleaned, screened, and prepared for hypothesis testing, which consisted of a series of hierarchical moderated regression analyses. The results of the analyses are covered in depth in the following chapter.

Chapter 4: Results

In this chapter, the study findings are presented in the following order. First, the characteristics of the study sample and of the work environment are summarized for descriptive purposes. Details of the participants' demographic characteristics are presented in Table 1, and aspects of within-work respite opportunities are presented in Tables 2-4. I next provide an overview of the series of preliminary analyses undertaken in preparation for hypothesis testing. I examined variable distributions for patterns of missing data, variance, and normality. Descriptive statistics were calculated for the study variables, which included means and standard deviations, observed range, and scale reliability. I then discuss the bivariate relationships between the focal variables, and the selection of control variables prior to testing the study hypotheses via hierarchical moderated regression analysis (Aiken & West, 1991).

Participant Characteristics

The registered nurses (N = 134) in this sample ranged in age from 23 to 68 years, with an average age of 45.35 years (SD = 12.22). Ninety-one percent of the sample self-identified as female, aligned with the state-level data for the nursing population (as described in the previous chapter). The majority of participants (85%) identified their race and ethnicity as White /non-Hispanic, reflecting the demographics of the nursing population in that specific locale in the Northwestern United States (Oregon Board of Nursing, 2017). In terms of family responsibilities, 70% of participants lived with a spouse or significant other, and 35% of participants cared for at least one child under the age of 18 in the home. Twenty-three percent of participants provided at least 3 hours of

eldercare per month. Regarding the highest level of education completed, over half of the study participants had earned a Bachelor of Science degree in nursing, and over a third had earned an Associate degree in nursing. The average job tenure was 8.63 years (*SD* = 9.2).

Table 1. Participant Characteristics

Variable	Category	*N*	%
Gender	Female	122	91.0%
	Male	10	7.5%
	Transgender	0	-
Racial/Ethnic Identity	African American	0	-
	Asian	6	4.5%
	Asian Indian	0	-
	White	115	85.8%
	Hispanic	2	1.5%
	Multiracial	2	1.5%
	Native American/Alaskan Native	2	1.5%
	Native Hawaiian/Pacific Islander	1	.7%
Household Status	Living with a spouse or partner	94	70.1%
	Not living with a spouse or partner	38	28.4%
Parental Status	Provides care for child(ren) under 18 at home	48	35.8%
	Does not provide care for child(ren) under 18 at home	86	64.2%
Eldercare Status	Provides at least 3 hours of eldercare per week	31	23.1%
	Does not provide at least 3 hours of eldercare per week	101	75.4%
Education	Associate degree in nursing (AD)	47	35.1%
	Diploma in nursing	10	7.5%
	Bachelor of Science in nursing (BSN)	68	50.7%
	Master of Science in nursing (MSN)	9	6.7%

	M	*SD*	*N*	Range
Age in Years	45.35	12.22	130	23 – 68
Job Tenure in Years	8.63	9.20	134	.08 – 40

Within-Work Respite

Oregon Nurses Association serves as a repository for critical incident reports submitted by ONA members to document insufficient staffing at the nursing unit level, and nurses' frequent inability to take formal rest and meal breaks during a typical shift. To address this concern as a part of my dissertation research, I included items in the survey instrument to assess if, when, and how study participants were able to take respite during a typical work shift. I detail responses related to within-work recovery opportunities below, delineated by shift length. Data for nurses employed in healthcare settings that typically operate via three 8-hour shifts ($n = 41$) is presented adjacent to the corresponding data for nurses that work in settings that typically operate in two 12-hour shifts ($n = 93$). As shown in Table 2, a substantial segment of the study sample in each of the schedule arrangements reported that they did not take rest breaks within a typical shift (19.5% and 24.7% of those who work 8-hour and 12-hour shifts respectively).

Table 2. Rest Breaks Per Shift

Rest Breaks: 8-hour	*n*	%	Rest Breaks: 12-hour	*n*	%
0	8	19.5	0	23	24.7
1	16	39.0	1	25	26.9
2	17	41.5	2	29	31.2
			3	15	16.1
			4	1	1.1
Total	41	100.0	Total	93	100.0

In this sample, 14.5% of participants that work 8-hour shifts and 8.6% of participants that work 12-hour shifts reported that they do not typically take a mid-shift meal break (see Table 3). The comparison of the two formally recognized types of

within-work breaks demonstrates that participants in both schedule arrangements commonly miss the opportunity for recovery throughout their regular work shift.

Table 3. Meal Breaks Per Shift

Meal Breaks: 8-hour	*n*	%	Meal Breaks: 12-hour	*n*	%
0	6	14.6	0	8	8.6
1	35	85.4	1	82	88.2
			2	3	3.2
Total	41	100.0	Total	93	100.0

The Built Environment

Previous analysis of qualitative data from ONA members indicated that many nurses may lack access to a physical space in which to take rest and meal breaks (Cadiz, Drown, Van Dyck, & Davidson, 2013). Grounded in the occupational medicine literature (Witkoski-Stimpfel & Dickson, 2010; Blasche et al., 2017), I included several items in the data collection instrument for this study regarding the availability of physical space, separated from the patient care environment (Rogers et al., 2006). The survey item text and responses are shown in Table 4. Skip logic was enacted in the online survey to redirect participants ($n = 24$) who responded in the negative to the initial item regarding access to a breakroom away from the patient care environment.

As seen in Table 4, approximately 18% of participants do not have a dedicated physical space removed from the patient care environment in which to take respite during a typical work shift. Of those who do have access to a dedicated space, 13% of participants must travel from their unit to another physical location. Just over 43% of

respondents that have access to a breakroom reported that the space allows for quiet relaxation. When able to take rest or meal breaks, approximately 44% of respondents

Table 4. Breakroom Access and Usage

		N	%
Do you have access to a dedicated space for employee rest and meal breaks away from the patient care environment?	Yes	110	82.1
	No	24	17.9
	Total	134	100.0
Is the dedicated space for employee rest and meal breaks on your unit?	Yes	92	68.7
	No	17	12.7
(Skip logic enacted)	Missing	25	18.7
	Total	134	100.0
Does the dedicated space for employee rest and meal breaks allow for quiet relaxation?	Yes	58	43.3
	No	51	38.1
(Skip logic enacted)	Missing	25	18.7
	Total	134	100.00
How often do you use the dedicated space during your rest and meal breaks?			
	Every shift	62	46.3
	More than once a week	15	11.2
	Once a week	6	4.5
	Every other week	2	1.5
	Once a month	5	3.7
	Few times a year	11	8.2
	Never	8	6.0
	Missing	25	18.7
	Total	134	100.0
When you take rest breaks, what percentage of time do you estimate you completely relieved of patient care duties?			
	0	19	14.2
	25%	16	12.0
	50%	24	17.9
	75%	23	17.1
	100%	50	37.3
	Missing	2	1.5
	Total	134	100

reported they were completely relieved of patient care responsibility during less than half of those recovery opportunities. These results provide insight into nurses' experiences with the built environment of 24-hour healthcare organizations and factors beyond work schedule characteristics that impact nurses' ability to take within-work recovery opportunities.

Preliminary Analyses

Missing Data

Although there was very little missing data in the scale items used in this study, I established the following criteria for cases in which one or more items was left blank by the participant. For scales with three items, the case was retained for the final data set if 66% of the items had responses; for scales that consist of four or more items, the case was retained if 75% of the items had responses. See Appendix E for a complete account of the contents of each scale used in this study.

Listwise deletion (removal of all data for cases with one or more missing values) and pairwise deletion (removal of a case for just the portion of analyses in which a value is missing) are two common methods of dealing with missing data that I used in preparing the survey response data for hypothesis testing. Due to my modest sample size, I made the decision to proceed with pairwise deletion on a case-by-case basis to limit the loss of data, and retain statistical power in the analyses. Of the 134 participants that met the inclusion criteria, 15 cases were missing data for one or more items in a focal variable composite measure. Thirteen cases were missing just one item, and were retained for the final sample. The remaining two participants were missing three and four items

respectively, but no more than one item missing per measure and were thus retained for the final sample. Based on my inspection of the missing data within the final sample of 134 cases, I proceeded using pairwise deletion for confirmatory factor analyses, descriptive statistics, validity and reliability analyses, and hypothesis testing.

CFA of Recovery Experiences

I conducted a series of confirmatory factor analyses in IBM AMOS Version 27 to determine whether the structure of the composite variable components conformed to the theorized dimensions. I tested one- and four-factor confirmatory factor analysis models to determine whether it was more appropriate in this sample to collapse the recovery experience items into a single-factor scale, or separate the items into the four theorized subscales (i.e., psychological detachment, relaxation, mastery experiences, and control; Sonnentag & Fritz, 2007). I first tested the single-factor model which views the 16 items as indicators of a single recovery experience factor. The chi-square test was significant, $x^2(104) = 510.57$, $p < .001$, indicating poor fit to the data. This initial index of model fit is commonly supplemented by additional contemporary fit statistics. In this study, the initial single-factor model of recovery experiences demonstrated a x^2/df ratio of 4.91, a GFI value of .66, a CFI value of .69, and an RMSEA value of .17, all indicating a poor fit and reinforcing the result of the chi-square test of the single-factor model of recovery experiences in this data set.

Next, I tested the four-factor model of recovery experiences consisting of the four correlated sub-dimensions. The chi-square was again significant, $x^2(98) = 221.12$, $p < .001$, with x^2/df ratio = 2.26, a GFI value of .84, a CFI value of .91, and a RMSEA value

of = .10. The model fit statistics suggest that the four-factor model yielded a marginal fit, an improvement over the single-factor model. I concluded that it was appropriate to retain the four theorized sub-scales for hypothesis testing.

CFA of Work Engagement

I tested one- and three-factor models to determine whether it was more appropriate in this sample to collapse the work engagement items into a single factor, or separate the items into the three. The Utrecht Work Engagement Scale-Short Form (UWES-SF; Schaufeli et al., 2006) has been utilized in previous recovery research as both an overall measure of work engagement, or alternately divided into three correlated subscales (i.e., vigor, dedication, and absorption; Schaufeli et al., 2002). I first tested the single-factor model which views the nine items as indicators of a single work engagement factor. The chi-square test was significant, $x^2(27) = 141.77$, $p < .001$, indicating poor fit to the data. In this sample, the initial single-factor model of work engagement demonstrated a x^2/df ratio of 5.25, a GFI value of .81, a CFI value of .86, and an RMSEA value of .18, demonstrating inadequate fit.

Next, I tested the three-factor model of work engagement consisting of three correlated dimensions. The chi-square was again significant, $x^2(24) = 90.61$, $p < .001$, with x^2/df ratio = 3.78, a GFI value of .88, a CFI value of .91, and a RMSEA value of .14. The model fit statistics suggest that the three-factor model yielded a marginal improvement over the single-factor model. However, the previous EFAs did not result in a clear factor structure, and the correlation between the dedication and absorption subscales was quite large (.79), calling into question the validity of the three

conceptualized dimensions in this sample (see Appendix I for an extended examination of the convergent and divergent validity of the factor structure for the work engagement sub-dimensions). Based on my research questions and the collected evidence presented here, I decided to retain the single-factor model of work engagement for hypothesis testing, and to conduct post-hoc exploratory analyses for the three-factor model.

Descriptive Statistics of Focal Variables

Descriptive statistics were calculated for the study focal variables prior to hypothesis testing, which included scale means and standard deviations, observed range, and scale reliability. As shown in Table 5, the composite measures all demonstrated adequate levels of internal consistency. Assessed via Cronbach's alpha coefficient, the scale reliability estimates ranged from the lowest alpha coefficient of .79 for the psychological detachment scale to the highest alpha of .90 for the fatigue and work engagement scales. Most participants typically worked shifts that were 12.50 hours, with a range of 8.00 hours to 13.00 hours. The mean score for how often nurses worked mandatory overtime was 1.41 on a 6-point scale (SD = .94), which corresponded with a value on the response scale between "never" and "few times a year." Nurses scored rather high on time pressure with less variability than typical (M = 4.01, SD = .76), with the mean score corresponding with "fairly often." On average, participants indicated lower levels of agreement regarding specific recovery experiences during rest and meal breaks, with psychological detachment (M = 2.29, SD = .76), relaxation (M = 2.88, SD = 1.06), and mastery experiences (M = 1.93, SD = .84) all falling below the midpoint, and control just above the neutral point (M = 3.15, SD = 1.01). The mean score for work engagement

Table 5. Descriptive Statistics of Scale Variables

Variable	*N*	*M*	*SD*	α	No. Items	Range	
						Potential	Actual
Shift Length	134	11.21	1.84	-	1	-	8.00-13.00
Overtime	134	1.41	.94	-	1	1-6	1.00-6.00
Time Pressure	134	4.01	.78	.89	5	1-5	1.80-5.00
Psychological Detachment	134	2.29	.87	.79	4	1-5	1.00-4.50
Relaxation	134	2.88	1.06	.89	4	1-5	1.00-4.75
Mastery Experiences	134	1.93	.84	.86	4	1-5	1.00-4.25
Control	134	3.16	1.01	.84	4	1-5	1.00-5.00
Fatigue	134	4.99	1.31	.90	4	1-7	1.25-7.00
Need for Recovery	134	3.51	.56	.86	11	1-5	2.09-4.73
Work Engagement	134	4.64	.91	.90	9	1-7	1.56-6.33
Post-Break Recovery	134	2.56	1.01	.78	2	1-5	1.00-5.00

fell above the midrange on a 7-point scale (M =4.64, SD = .91), closer to "often" than "sometimes." On average, nurses scored in the midrange for work-related fatigue (M = 4.99, SD = 1.31) and need for recovery during non-work hours, with the mean score of 3.51 (SD = .56) between "sometimes" and "often."

Bivariate Correlations

Intercorrelations for all study variables are presented in Table 6. The three adverse scheduling characteristics demonstrated small negative relationships with work engagement, with nonsignificant correlations ranging from -.03 to -.15. The bivariate correlations indicated positive relationships between the adverse scheduling characteristics and work-related fatigue. Significant correlations were observed between

extended shift length and fatigue ($r = .18$, $p < .05$), mandatory overtime and fatigue ($r = .18$, $p < .05$), and time pressure and fatigue ($r = .40$, $p < .01$). Likewise, significant correlations were observed in the expected direction between the adverse scheduling characteristics and need for recovery, ranging from the smallest to the largest correlations for shift length ($r = .19$, $p < .05$), mandatory overtime ($r = .24$, $p < .01$), to time pressure ($r = .47$, $p < .01$).

Though positive correlations were indicated between psychological detachment, relaxation, and control on one hand and work engagement on the other (ranging from .01 to .14), all three were nonsignificant. However, the bivariate correlation between mastery experiences and work engagement demonstrated a positive significant correlation ($r = .22$, $p < .05$). The four recovery experiences demonstrated negative correlations with work-related fatigue, but only psychological detachment exhibited a statistically significant relationship ($r = -.19$, $p < .05$). Psychological detachment was significantly correlated with need for recovery ($r = -.32$, $p < .01$), as were relaxation ($r = -.18$, $p < .05$), and control ($r = -.21$, $p < .05$), but the correlation between mastery experiences and need for recovery was non-significant ($r = -.09$). Of note, three of the recovery experiences subscales were strongly related to another (psychological detachment with relaxation, $r = .78$, $p < .01$ and relaxation with control, $r = .71$, $p < .01$). See Appendix I for a detailed investigation of the factor structure of the multidimensional measures. Regarding the demographic variables examined as potential controls, the only significant bivariate correlation was observed between hours worked per week and psychological detachment

Table 6. Correlation Table

	Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Age															
2	Gender	-.10														
3	RS	.04	-.11													
4	PS	-.30**	.01	-.14												
5	HW	-.19*	-.06	-.02	.18*											
6	SL	-.14	.06	.09	.11	.14										
7	MO	.06	-.14	.05	-.09	.14	-.18*									
8	TP	-.06	.03	.04	-.12	.05	.15	.10								
9	PD	-.06	-.05	.01	-.08	-.18*	-.05	-.18*	-.27**							
10	RX	-.12	-.01	.01	.03	-.16	.03	-.17	-.19*	.78**						
11	ME	.01	.04	.09	.16	.00	-.14	.01	-.03	.18*	.20*					
12	CN	-.16	.06	-.07	.02	-.07	-.02	-.16	-.25**	.66**	.71**	.24**				
13	PBR	-.04	-.06	-.05	.11	-.13	-.02	-.09	-.33**	.57**	.66**	.10	.50**			
14	WE	.08	-.03	-.03	.16	.06	-.13	-.07	-.08	.09	.12	.22*	.09	.15		
15	FA	-.17	-.03	.03	-.04	.15	.18*	.18*	.40**	-.19*	-.10	-.14	-.07	-.10	-.33**	
16	NFR	-.10	.02	.09	-.01	.08	.19*	.24**	.47**	-.32**	-.18*	-.09	-.21*	-.16	-.28**	.58**

Note. “RS” = relationship status. “PS” = parental status. “HW” = hours per week. “SL” = shift length. “MO” = mandatory overtime. “TP” = time pressure. “PD” = psychological detachment. “RX” = relaxation. “ME” = mastery experiences. “CN” = control. “PBR” = post-break recovery. “WE” = work engagement. “FA” = fatigue. “NFR” = need for recovery. * $p < 0.05$. ** $p < 0.01$. *** $p < 0.001$.

and was consequently advanced to the next stage of preliminary analyses. To preserve statistical power in the hypothesized models, the remaining demographic variables (age, gender, relationship status, and parental status) were omitted from the ensuing analyses. Hypotheses 1-3 were tested with and without hours worked per week. Due to the limited sample size, I did not include this variable in the final models as no significant associations were observed with the focal outcomes.

Hypothesis Testing

I conducted a series of regression analyses to assess the qualities of the relationships between the independent variables (IVs) and the dependent variables (DVs) in this study, to understand the direction and magnitude of the relationships, and to determine how much variation in the dependent variables was explained by the independent variables. Simple linear regression estimates the population model from the study sample using the equation:

$$Y = b_0 + b_1X + e$$

where b_0 represents the sample intercept (constant), b_1 represents the sample slope parameter, and e represents the residual (error term). The null hypothesis, in which the coefficient of the slope equals zero, is expressed as follows:

$$H_0: b_1 = 0$$

The alternative hypothesis, in which the coefficient of the slope does not equal zero, is expressed as follows:

$$H_A: b_1 \neq 0$$

Multiple regression extends simple linear regression to predict a single DV from two or more IVs. Along with overall model fit (the total variance explained in the DV by the combination of IVs), the relative contribution of each predictor to the overall model fit was determined. I tested for the presence of the hypothesized interaction effects via hierarchical moderated regression analyses that compared two least squares regression equations (Aguinis, 1995; Cohen & Cohen, 1983). The first equation found below expresses the ordinary least squares (OLS) regression of the dependent variable *Y* on the predictors *X* and *Z* (a second predictor theorized to be a moderator) in an additive main effects model:

$$Y = b_0 + b_1X + b_2Z + e$$

Where b_0 represents the sample intercept (constant), b_1 represents the sample slope parameter for X, b_2 represents the sample slope parameter for Z, and *e* represents the residual (error term). This equation is compared to a second equation that includes the product of *X* and *Z* as a third regression term:

$$Y = b_0 + b_1X + b_2Z + b_3X*Z + e$$

The significance of the moderator is determined via the change in the squared multiple correlation coefficient, R^2 (Aguinis, 1995).

I attended to the requisite tests of assumptions for linear regression prior to conducting regression analyses, including a variety of tests for multivariate normality. Regarding the initial study design and measurement choice, the independent variable (or predictor variable) and the dependent variable (or outcome variable) need to be measured at a continuous level. Six of my seven focal variables (mandatory overtime, time

pressure, recovery experiences, work engagement, fatigue, and need for recovery) used Likert-type scales, which are not strictly continuous, but an acceptable format. Shift length was technically measured as a continuous variable, but ultimately was found to be strongly bi-modal. Of the 134 participants in my final sample, 41 individuals (30.6%) work between 8.0 and 9.0 hours per shift, and 6 individuals (4.5%) work between 9.5 and 10 hours per shift. The remaining 87 individuals (64.9%) work between 12.0 and 13.0 hours per shift. The distribution of hours per shift across participant responses aligned with my operational definition of "extended work hours" as those that exceed 10 continuous hours. I discuss the operationalization of shift length and that of the other focal variables in the following section.

As mentioned in the previous chapter regarding univariate normality, extreme outliers in a data set can bias the results of the linear regression by exacerbating the variability of the residuals. As most of the data for this study was gathered with Likert-type scales, the range of possible values that the data can take is limited, and extreme outliers were not observed in the linear regression casewise diagnostics available in SPSS. I inspected the correlation table to determine if any of the predictor variables were highly correlated (i.e., over .70) as well as the tolerance and Variance Inflation Factor values to assess potential issues with multicollinearity.

This type of regression analysis rests on the assumption that there is a linear relationship between the predictor variable(s) and the outcome variable. The assumption can be tested with a scatterplot of the outcome variable plotted against the predictor variable for each combination of variables to be analyzed. I created a series of

scatterplots and observed a roughly linear relationship between each of the construct pairings included in my data set. In this scenario, error in the regression model is referred to as "residual," which reflect the degree to which the observed values of the dependent variable differ from the predicted value (the fitted regression line). The residuals of the fitted regression line should be normally distributed. This assumption was assessed via the P-P plot of expected/observed values for each regression analysis, which should roughly fall on a diagonal line.

Linear regression assumes independence of observations, and it is important that the residuals are not correlated, (i.e., that the residuals do not supply information about each other). Due to the design and data collection method for this study, it was unlikely that my sample violated the independence of observations. To gauge the independence of observations in my sample, I used the Durbin-Watson statistic available in SPSS, which ranges in value from 0 to 4 with a score of 2.00 indicating no correlation between residuals. For each combination of predictor variables there was independence of residuals. Homoscedasticity refers to the pattern of distribution the residuals take in the data set. Ideally, the variance of the residuals is constant across all levels of the data, which was assessed for this study with a visual scan of a plot of the standardized residuals and standardized predicted residuals. There did not appear to be a distinctive pattern (which would indicate problematic heteroscedasticity) in any of the regression analyses. Twelve sets of independent and moderator variables were then regressed on each dependent variable, and the relative contribution of each predictor to the overall model fit was determined (i.e., the total variance explained in the DV by the combination

of IVs). To test for the presence of the hypothesized interaction effects, I used the moderated multiple regression (MMR) technique via hierarchical multiple regression procedure (Aiken & West, 1991).

Hypothesis 1

Hypothesis 1a stated that adverse schedule characteristics (i.e., extended shift length, and mandatory overtime, and time pressure) are negatively related to work engagement. The analyses did not indicate support for a statistically significant relationship for H1a.1., extended shift length and work engagement ($\beta = -.12$, $p = .17$), H1a.2., mandatory overtime and work engagement ($\beta = -.07$, $p = .43$), or H1a.3., time pressure and work engagement ($\beta = -.08$, $p = .35$). The relationships between the adverse schedule characteristics and work engagement aligned with the expected direction, indicating there may be a negative relationship. However, none of the models that used the outcome of work engagement were statistically significant, and H1a was not supported.

Hypothesis 1b stated that adverse schedule characteristics (i.e., extended shift length, and mandatory overtime, and time pressure) are positively related to fatigue. The analyses indicated support for a statistically significant relationship for H1b.1., extended shift length and fatigue ($\beta = .21$, $p = .02$), H1b.2., mandatory overtime and fatigue ($\beta = .18$, $p = .04$), and H1b.3., time pressure and fatigue ($\beta = .40$, $p < .001$), and H1b was fully supported.

Hypothesis 1c stated that adverse schedule characteristics (i.e., extended shift length, and mandatory overtime, and time pressure) are positively related to need for

recovery. The analyses indicated support for a statistically significant relationship for H1c.1., extended shift length and need for recovery (β = .21, *p* = .02), H1c.2., mandatory overtime and need for recovery (β = .24, *p* = .01), and H1c.3., time pressure and need for recovery (β = .47, *p* < .001), and H1c was fully supported. Overall, Hypothesis 1 received partial support.

Hypothesis 2

Hypothesis 2a stated that within-work recovery experiences (i.e., psychological detachment, relaxation, mastery experiences, and control) are positively related to work engagement. The analyses did not indicate support for a statistically significant relationship for H2a.1., psychological detachment and work engagement (β = .09, *p* = .33), H2a.2., relaxation and work engagement (β = .12, *p* = .16), or H2a.4., control and work engagement (β = .09, *p* = .32), but work engagement did align with the three analyses in the expected direction. The analyses indicated support for H2a.3., mastery experiences and work engagement (β = .22, *p* = .01), and the main effect of mastery experiences on work engagement was significantly positive. Overall, H2a received limited support.

Hypothesis 2b stated that within- work recovery experiences (i.e., psychological detachment, relaxation, mastery experiences, and control) are negatively related to fatigue. The analyses indicated support for a statistically significant relationship for H2b.1., psychological detachment and fatigue (β = -.19, *p* = .03), but not for H2b.2., relaxation and fatigue (β = -.10, *p* = .23), H2b.3., mastery experiences and fatigue (β =

-.14, p = .11) or H2b.4., control and fatigue (β = -.07, p = .44), though the latter three did align in the expected direction. Overall, H2b received limited support.

Hypothesis 2c stated that within-work recovery experiences (i.e., psychological detachment, relaxation, mastery experiences, and control) are negatively related to need for recovery. The analyses did indicate support for a statistically significant relationship for H2c.1., psychological detachment and need for recovery (β = -.32, p < .001), H2c.2., relaxation and need for recovery (β = -.18, p = .04), and H2c.4., control and need for recovery (β = -.21, p = .02). Support was not indicated for H2c.3., mastery experiences and need for recovery (β = -.09, p = .28), though the latter did align in the expected direction. Overall, H2b received partial support.

Table 7. Summary of Main Effects

Hypothesis	Proposed Relationship	Evidence	Supported?
	Direct Effect Hypotheses		
H1a	*Main Effects of Adverse Schedule Characteristics on Work Engagement*		
	Shift length → Work Engagement	β = -.12, p = .17	No
	Mandatory Overtime → Work Engagement	β = -.07, p = .43	No
	Time Pressure → Work Engagement	β = -.08, p = .35	No
H1b	*Main Effects of Adverse Schedule Characteristics on Fatigue*		
	Shift length → Fatigue	β = .21, p = .02	Yes
	Mandatory Overtime → Fatigue	β = .18, p = .04	Yes
	Time Pressure → Fatigue	β = .40, p < .001	Yes
H1c	*Main Effects of Adverse Schedule Characteristics on Need for Recovery*		
	Shift length → Need for Recovery	β = .21, p = .02	Yes
	Mandatory Overtime → Need for Recovery	β = .24, p = .01	Yes
	Time Pressure → Need for Recovery	β = .47, p < .001	Yes

Hypothesis	Proposed Relationship	Evidence	Supported?
	Direct Effect Hypotheses		
H2a	*Main Effects of Within-Work Recovery Experiences on Work Engagement*		
	Psychological Detachment → Work Engagement	β = .09, *p* = .33	No
	Relaxation → Work Engagement	β = .12, *p* = .16	No
	Mastery Experiences → Work Engagement	β = .22, *p* = .01	Yes
	Control → Work Engagement	β = .09, *p* = .32	No
H2b	*Main Effects of Within-Work Recovery Experiences on Fatigue*		
	Psychological Detachment →Fatigue	β = -.19, *p* = .03	Yes
	Relaxation → Fatigue	β = -.10, *p* = .23	No
	Mastery Experiences → Fatigue	β = -.14, *p* = .11	No
	Control → Fatigue	β = -.07, *p* = .44	No
H2c	*Main Effects of Within-Work Recovery Experiences on Need for Recovery*		
	Psychological Detachment → Need for Recovery	β = -.32, *p* < .001	Yes
	Relaxation → Need for Recovery	β = -.18, *p* = .04	Yes
	Mastery Experiences → Need for Recovery	β = -.09, *p* = .28	No
	Control → Need for Recovery	β = -.21, *p* = .02	Yes

Hypothesis 3

I hypothesized that the negative effects of adverse scheduling characteristics on well-being outcomes would be related to nurses' ability to step away from the demands of direct patient care and recover energy periodically throughout their shift. I conducted a series of hierarchical moderated regression analyses to gauge the likelihood of observing the relationships in my data set. The first step of the analyses tests the main effects of the independent variable and the moderator on the dependent variable, as described in the preceding paragraphs and shown in Appendix H. To test the interaction effect, I first

centered the IVs and moderators as appropriate, and then created product variables from the 12 iterations that were entered into the final step of the regression analyses.

H3a stated that within-work recovery experiences (i.e., psychological detachment, relaxation, mastery experiences, and control) would moderate the negative relationship between adverse schedule characteristics (i.e., extended shift length, mandatory overtime, and time pressure) and work engagement, such that the negative relationship would be stronger for nurses who experience a lower degree of within-work recovery than for those who experience a higher degree of within-work recovery. As seen in Models 1 through 12 in Appendix H, and summarized in Table 8, the analyses detected no significant interaction effects within proposed relationships between adverse schedule characteristics and recovery experiences when regressed on work engagement. Therefore, Hypothesis 3a was not supported.

Table 8. Hypothesis 3a Summary

Hypothesis	Proposed Relationship	Evidence	Supported?
	Moderation Hypotheses		
H3a	*Interaction of Adverse Schedule Characteristics and Recovery Experiences on Work Engagement*	*Interaction Effect:*	
	M1: Shift Length X Psychological Detachment → Work Engagement	β = -.32 (ns)	No
	M2: Shift Length X Relaxation → Work Engagement	β = -.23 (ns)	No
	M3: Shift Length X Mastery Experiences → Work Engagement	β = .31 (ns)	No
	M4: Shift Length X Control → Work Engagement	β = -.35 (ns)	No

Hypothesis	Proposed Relationship	Evidence	Supported?
	Moderation Hypotheses		
H3a	*Interaction of Adverse Schedule Characteristics and Recovery Experiences on Work Engagement*	*Interaction Effect:*	
	M5: $_{\text{Mandatory}}$ Overtime X Psychological Detachment → Work Engagement	β = -.10 (ns)	No
	M6: Mandatory Overtime X Relaxation → Work Engagement	β = -.10 (ns)	No
	M7: Mandatory Overtime X Mastery Experiences → Work Engagement	β = .06 (ns)	No
	M8: Mandatory Overtime X Control → Work Engagement	β = -.01 (ns)	No
	M9: Time Pressure X Psychological Detachment → Work Engagement	β = -.07 (ns)	No
	M10: Time Pressure X Relaxation → Work Engagement	β = -.03 (ns)	No
	M11: Time Pressure X Mastery Experiences → Work Engagement	β = -.05 (ns)	No
	M12: Time Pressure X Control → Work Engagement	β = -.07 (ns)	No

Hypothesis 3b stated that within-work recovery experiences (i.e., psychological detachment, relaxation, mastery experiences, and control) moderate the positive relationship between adverse schedule characteristics (i.e., extended shift length, mandatory overtime, and time pressure) and fatigue, such that the positive relationship would be stronger for nurses who experience a lower degree of within-work recovery than for those who experience a higher degree of within-work recovery. As shown in Models 1 through 12 in Appendix H, and summarized in Table 9, the analyses detected no significant interaction effects within the proposed relationships between adverse schedule characteristics and recovery experiences when regressed on fatigue (H3b).

Table 9. Hypothesis 3b Summary

Hypothesis	Proposed Relationship	Evidence	Supported?
	Moderation Hypotheses		
H3b	*Interaction of Adverse Schedule Characteristics and Recovery Experiences on* Fatigue	*Interaction Effect:*	
	M1: Shift Length X Psychological Detachment → Fatigue	β = -.11 (ns)	No
	M2: Shift Length X Relaxation → Fatigue	β = -.18 (ns)	No
	M3: Shift Length X Mastery Experiences → Fatigue	β = .02 (ns)	No
	M4: Shift Length X Control → Fatigue	β = -.09 (ns)	No
	M5: Mandatory Overtime X Psychological Detachment → Fatigue	β = .08 (ns)	No
	M6: Mandatory Overtime X Relaxation → Fatigue	β = .09 (ns)	No
	M7: Mandatory Overtime X Mastery Experiences → Fatigue	β = .04 (ns)	No
	M8: Mandatory Overtime X Control → Fatigue	β = .11 (ns)	No
	M9: Time Pressure X Psychological Detachment → Fatigue	β = .02 (ns)	No
	M10: Time Pressure X Relaxation → Fatigue	β = .03 (ns)	No
	M11: Time Pressure X Mastery Experiences → Fatigue	β = .02 (ns)	No
	M12: Time Pressure X Control → Fatigue	β = .01 (ns)	No

Hypothesis 3c stated that within-work recovery experiences (i.e., psychological detachment, relaxation, mastery experiences, and control) moderate the positive relationship between adverse schedule characteristics (i.e., extended shift length, mandatory overtime, and time pressure) and need for recovery, such that the positive relationship would be stronger for nurses who experience a lower degree of within-work recovery than for those who experience a higher degree of within-work recovery. As

shown in Models 1 through 12 in Appendix H, and summarized in Table 10, the analyses detected no significant interaction effects within the proposed relationships between adverse schedule characteristics and recovery experiences when regressed on need for recovery (H3c).

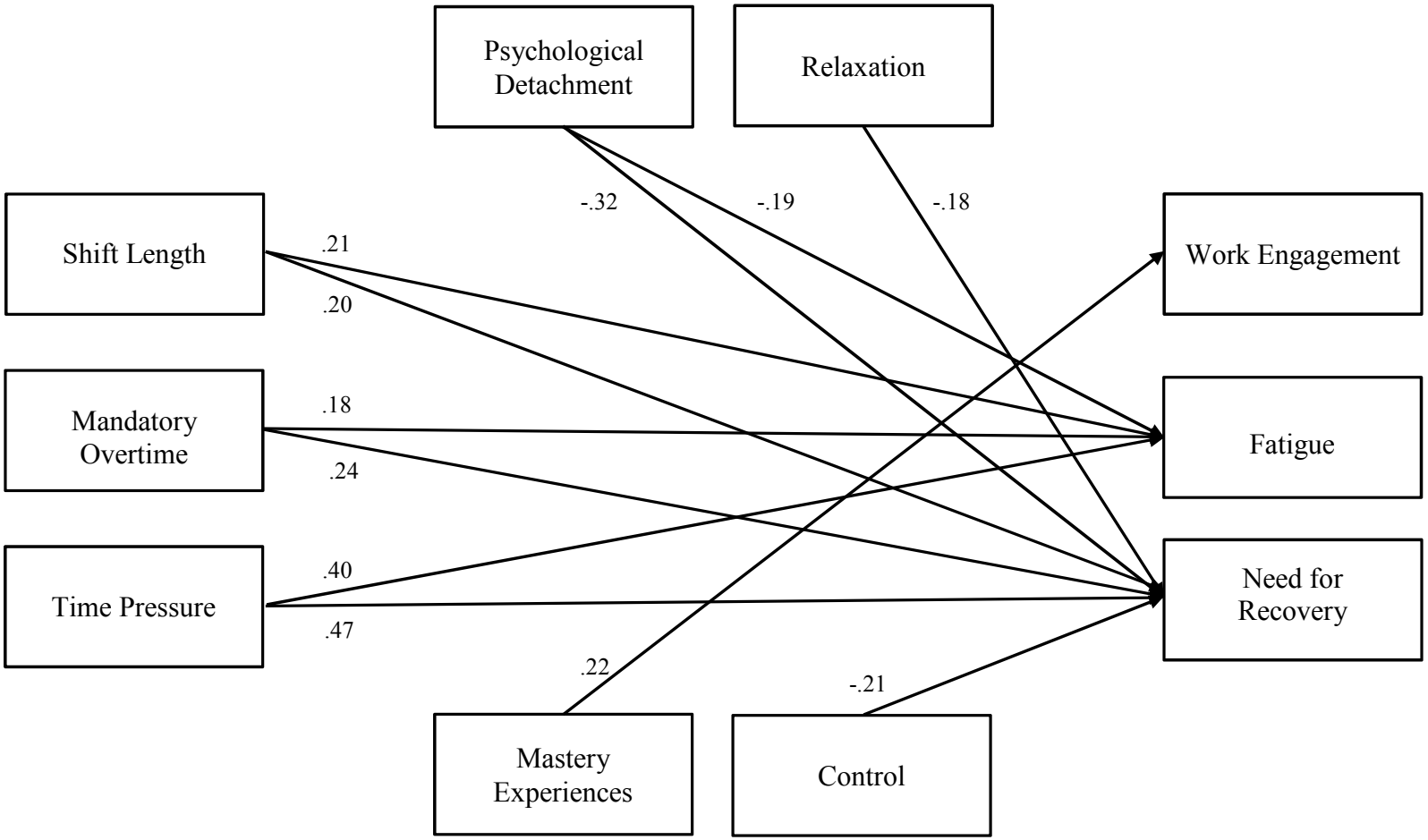
Table 10. Hypothesis 3c Summary

Hypothesis	Proposed Relationship	Evidence	Supported?
	Moderation Hypotheses		
H3c	*Interaction of Adverse Schedule Characteristics and Recovery Experiences on Need for Recovery*	*Interaction Effect:*	
	M1: Shift Length X Psychological Detachment → *Need for Recovery*	β = -.13 (ns)	No
	M2: Shift Length X Relaxation → *Need for Recovery*	β = -.01(ns)	No
	M3: Shift Length X Mastery Experiences → *Need for Recovery*	β = -.30 (ns)	No
	M4: Shift Length X Control → *Need for Recovery*	β = -.07 (ns)	No
	M5: Mandatory Overtime X Psychological Detachment → *Need for Recovery*	β = .14 (ns)	No
	M6: Mandatory Overtime X Relaxation → *Need for Recovery*	β = .09 (ns)	No
	M7: Mandatory Overtime X Mastery Experiences → *Need for Recovery*	β = .06 (ns)	No
	M8: Mandatory Overtime X Control → Fatigue	β = .09 (ns)	No
	M9: Time Pressure X Psychological Detachment → *Need for Recovery*	β = .08 (ns)	No
	M10: Time Pressure X Relaxation → *Need for Recovery*	β = .05 (ns)	No
	M11: Time Pressure X Mastery Experiences → *Need for Recovery*	β = -.04 (ns)	No
	M12: Time Pressure X Control → *Need for Recovery*	β = .08 (ns)	No

Summary of Results

In this chapter, I highlighted the ways in which this study sample is representative along demographic and nurse practice environment lines to the larger population of registered nurses in Oregon. The scales used to collect data for this study are reliable and valid measures of the focal variables, sufficient to collect and compare data with national and international samples. For this study, I examined the association between adverse scheduling characteristics and with nurses' well-being indicators. Specifically, I focused on three indicators of nurses' well-being: work engagement, fatigue, and need for recovery. I also examined specific within-work recovery experiences (i.e., psychological detachment, relaxation, mastery experiences, and control) as antecedents of nurses' well-being indicators, and moderators of the relationship between adverse scheduling characteristics and nurses' well-being indicators. In the next chapter, I discuss the significance of the findings within the context of the larger body of literature, and the possibilities that each set suggests for next steps with this line of research.

Figure 3. Hypothesized Model Depicting Significant Relationships



Chapter 5: Discussion

This study examined the schedule characteristics of health care providers in 24-hour healthcare settings and associations between adverse scheduling practices, within-work recovery, and well-being. The study focused on recovery experiences during meal and rest breaks rather than specific recovery activities. I hypothesized that standard scheduling practices used to staff patient care environments adversely affect individual nurses' health and job performance (i.e., work engagement, fatigue, and need for recovery), and that recovery during within-work breaks is positively associated with work engagement and negatively associated with fatigue and need for recovery at the end of a work shift. In addition, I hypothesized that recovery experiences during lunch and rest breaks would moderate the effects of adverse scheduling practices on health care providers' well-being. I supplemented the findings from the primary analyses with an examination of culture- and context-related formal and informal job characteristics.

Main Findings and Theoretical Implications

The goal of this study was to learn how typical aspects of work/rest cycles in the 24-hour healthcare environment affect health care providers' ability to recover resources depleted while meeting patient-care demands. Descriptive data was collected and analyzed to contextualize the survey findings regarding within-work recovery opportunities and experiences (details provided in Table 2 through Table 4). The analyses indicated that approximately 23% of participants do not take a rest break during an average work shift, and approximately 10% of participants do not take a meal break during an average work shift. I included survey items that posed questions regarding

whether the participants have access to a dedicated space away from the patient care environment for rest breaks (18% do not). Of the 82% of participants that do have access to a physical space for respite, 12% must travel outside their unit to reach the dedicated respite space; 38% of participants indicated that quiet relaxation is not possible in the respite space; and 44% of participants are completely relieved of patient care duties (e.g., able to hand off a beeper to a colleague while on break) during less than half of their within-work breaks. Viewed together, these descriptive characteristics underscore the differences in work culture between this sample and typical participants in the majority of prior within-work recovery research (i.e., white collar workers, standard workweek schedules, dependable lunch and rest breaks).

Hypothesis 1a stated that adverse scheduling characteristics would be negatively related to work engagement. Though the associations are oriented the hypothesized direction, the analyses detected no significant main effect for extended shift length, mandatory overtime, or time pressure on work engagement. In this study, work engagement was originally conceptualized as a relatively persistent work-related motivational state, characterized by vigor, dedication, and absorption (Xanthopoulou & Bakker, 2020). Alternately, many recovery researchers choose to use the 3-item *vigor* subscale of the full nine-item work engagement scale (Schaufeli et al., 2006; Blanco-Donoso, Moreno-Jiménez, Amutio, Dos Santos, & Garrosa, 2021). Vigor has been defined as an energetically high and mentally resilient state, in which the individual is willing to invest resources and to persist in a course of action even under heavy job demands (Bakker & Demerouti, 2007). The vigor subscale may be thought of as a

measure of an individual's energetic stockpile, and is commonly used in the recovery literature as a day-level indicator of well-being in experience sampling methodologies.

I conducted a series of post-hoc analyses with the 3-subscale version of work engagement regressed on the adverse scheduling characteristics (H1a.1-3). The finer-grain inspection allowed me to compare the subscales by outcome measure. Surprisingly, the *dedication* subscale was significantly negatively associated with time pressure, and neither vigor nor absorption contributed significantly to the solution. This finding hints that health care providers may draw energy and motivation from a different source (perhaps dedication to one's profession) to complete to meet patient-care demands, which perhaps a buffer between job demands and ensuing strain. I will return to this point later in the chapter to discuss alternate means of recuperation that may for those in a "calling" profession.

Following in step with JD-R, Hypothesis 1b stated that adverse schedule characteristics (i.e., extended work hours, mandatory overtime, and time pressure) would be positively related to fatigue. The analyses found that all three schedule characteristics were significantly and positively related to fatigue, in support of H1b. Hypothesis 1c stated that adverse schedule characteristics (i.e., extended work hours, mandatory overtime, and time pressure) would be positively related to need for recovery. The analyses found that all three schedule characteristics were significantly and positively related to need for recovery, in support of H1c.

As hypothesized in H1, study participants who typically work extended shifts of twelve or more hours experienced significantly higher levels of work-related fatigue than

participants who work standard eight-hour shifts, as expected based on the E-R model (Meijman & Mulder, 1998). In a cumulative manner, extended shift length lead to a higher level of exposure to work demands, less time to unwind after a shift, and less time to recover between shifts. In line with previous studies that found significant levels of acute fatigue were associated with 12-hour shifts (Barker & Nussbaum, 2011; Chen, Davis, Daraiseh, Pan, & Davis, 2014; Cochran, 2021), this finding demonstrates that formal aspects of nurses' shift work characteristics (i.e., shift length) influence the ability to recover from job demands within the work shift.

While study participants indicated that mandatory overtime is an infrequent occurrence with an average score of 1.41 (*SD* = .94) on a 7-point scale, it was nonetheless positively and significantly associated with higher levels of work-related fatigue. Additionally, nurses in the study sample scored 4.99 on a 7-point agreement scale when asked about their experience of within-shift time pressure. Time pressure was significantly and positively associated with work-related fatigue.

A key aspect of the E-R model has utility in interpreting these findings. Individuals with a higher degree of the salient work resource decision latitude may be able to leverage a measure of control to shift energies and resources to meet work demands without accumulating negative work load effects under conditions of continuous exposure and insufficient recovery (Karasek, 1979; Meijman & Mulder, 1998). Mandatory overtime and time pressure each involve a relative lack of choice for the individual regarding when and how to shift resources. In turn, this limits socially

acceptable options for short-term adaptive responses at a physiological and behavioral level and culminates in impairment of well-being and health (e.g., work-related fatigue).

Hypothesis 2a stated that within-work recovery experiences (i.e., psychological detachment, relaxation, mastery experiences, and control) would be positively related to work engagement. In line with the job demands-resources model (Bakker & Demerouti, 2007), job resources theoretically contribute to a motivational process that leads to increased levels of work engagement. Of the four recovery experiences, mastery experiences was the only underlying psychological mechanism that was significantly and positively related to work engagement in this sample.

Hypothesis 2b stated that within-work recovery experiences (i.e., psychological detachment, relaxation, mastery experiences, and control) would be negatively related to fatigue. The analyses detected a significant main effect for psychological detachment on fatigue, but no significant effects for relaxation, mastery experiences, or control. Hypothesis 2c stated that within-work recovery experiences (i.e., psychological detachment, relaxation, mastery experiences, and control) would be negatively related to need for recovery. The analyses detected a significant main effect for control on need for recovery, but no significant effects for psychological detachment, relaxation, or mastery experiences.

In their widely-used early framework, Sonnentag and Fritz (2007) proposed the four recovery experiences included in the present dissertation study: psychological detachment from work, relaxation, mastery experiences, and control. The theoretical basis for the underlying psychological process that transmutes work stress into recovery

differs for psychological detachment and relaxation on one hand, and mastery experiences and control during work breaks on the other hand. Psychological detachment and relaxation are closely associated with the discontinuation of mental and physical involvement with work-related concerns or activities, as opposed to active interference to direct the course of one's actions during periods of rest. Viewed in this light, the conceptualization of the prior two recovery experiences aligns closely with the effort-recovery model (Meijman & Mulder, 1998), which proposes that to restore personal energy, an individual must disengage from work-related activity to allow their physiological system to return to pre-activation stasis. As such, within-work breaks are a way to renew energy by ceasing self-regulatory or effortful activities.

Hypothesis 3a stated that within-work recovery experiences would moderate the negative relationship between adverse schedule characteristics and work engagement, such that the positive relationship would be stronger for nurses who experience a lower degree of within-work recovery than for those who experience a higher degree of within-work recovery. I conducted a series of moderated multiple regression analyses to test H3a, and found no evidence of support in any of the models. Hypothesis 3b stated that within-work recovery experiences would moderate the positive relationship between adverse schedule characteristics and fatigue, such that the positive relationship would be stronger for nurses who experience a lower degree of within-work recovery than for those who experience a higher degree of within-work recovery. No evidence was found in any of the moderated multiple regression models, and H3b was not supported. Hypothesis 3c stated that within-work recovery experiences would moderate the positive relationship

between adverse schedule characteristics and need for recovery, such that the positive relationship would be stronger for nurses who experience a lower degree of within-work recovery than for those who experience a higher degree of within-work recovery. No evidence was found in any of the moderated multiple regression models, and H3c was not supported.

I followed recommendations to optimize statistical power in each set of analyses, including testing just one moderator and just one independent on one dependent variable (Aguinis, 1995). The schedule characteristics and recovery experiences combinations were each entered into two-step hierarchical regression models, with the IV and moderator variables entered in the first step, and the interaction term added to the model in the second step. Relaxation as a recovery experience was hypothesized to significantly influence the relationship between the study IVs and DVs, but was found not to moderate the relationship between any combination of adverse schedule characteristics on the one hand, or occupational well-being indicators on the other. Likewise, "mastery" as a recovery experience was hypothesized to significantly influence the relationship between the study IVs and DVs, but was found not to moderate the relationship between any combination of adverse schedule characteristics on the one hand, or occupational well-being on the other.

Practical Implications

Prior research has indicated that a change in organizational culture is needed to support increased utilization of rest break and meal break opportunities (Scott et al., 2006; Stefancyk, 2009). In healthcare environments that implicitly condone (perhaps

even expect) nurses to skip rest breaks or remain on call during meal breaks, employees may need explicit support and encouragement from colleagues and nurse managers to step away from work responsibilities several times during an extended shift. This topic was alluded to in the end-of-survey comment field by many study participants, and expressed clearly by an anonymous respondent:

> "I work in a patient care area with excellent teamwork among direct care staff where staff help each other as much as possible. Sometimes everyone is very busy and there is no one available to help. I feel that our management staff is kept so busy attending meetings and reviewing "metrics" that there is little awareness of the needs and problems of direct care staff. Although management tells us to make sure we get our breaks there is no provision made for extra staff to "cover" and make sure patients are safe if we leave the unit and it is hard to get the work done if breaks are taken as recommended."

Studies have shown that specific supervisor support (e.g., family-supportive instrumental support or role modeling behaviors) is a resource especially relevant to professions high in work-life stress such as nurses specifically, and shift workers in general (Hammer, Kossek, Yragui, Bodner, Hanson, 2009). Meta-analytic evidence suggests that specific supervisor support may be more effective than general supervisor support in eliciting desired behaviors from their employees (Kossek, Pichler, Bodner, & Hammer, 2011).

Determining the boundary conditions of site-specific physical and social organizational tools that enable nurses to take respite and improve within-work recovery opportunities may provide nurse managers with concrete recommendations regarding behavior they should model and support for their staff nurses. As promoted by the

NIOSH Total Worker Health® initiative, intervention efforts at both the individual-level and organizational-level may synergistically improve efforts to protect and promote employee health and well-being (Pronk et al., 2021; Sorensen & Barbeau, 2012). For example, organizational efforts to promote stress-reducing mindfulness exercises to health care providers may benefit from a simultaneous organizational program for hospital ward managers to themselves demonstrate the recovery-related behaviors to their teams, and or provide instrumental support around a low- to no-cost "break buddy" program on their unit.

Occupational health psychologists have adapted the concept of micro-breaks to denote an informal, momentary pause in work activity; the amount of recovery research directed towards micro-breaks has increased substantially over the past decade (Fritz et al., 2011; Kim, Park, & Niu, 2017; Zacher et al., 2014). Micro-breaks as a concept originated in the field of ergonomics as a momentary, intentional physical adjustment to alleviate physical discomfort (McLean et al., 2001). For example, intraoperative micro-breaks have been utilized in ergonomic intervention studies at timed intervals to prevent pain and enhance surgeon's mental focus during performing prolonged surgery (Abdelall et al., 2018). It is important to clarify here that micro-breaks in the organizational psychology context have been framed as a purposeful respite to maintain mental acuity, theoretically separated from formal meal and rest breaks by the intentionality prescribed to micro-breaks as primarily intended to maintain energetic resources. Empirical research has linked micro-breaks to decreased strain and improved work outcomes (Conlin et al., 2021; Kim et al., 2018; Kühnel, Zacher, de Bloom, & Bledow, 2017; Zacher et al., 2014;

Zhu et al., 2019) as well as to mentally- and affectively-resourced states such as high concentration and motivation (Hunter & Wu, 2016; Zhu et al., 2019). The instructions that accompanied the online data collection instrument study did not direct participants to consider micro-breaks with the same specificity as participants were instructed to consider within-work meal and rest breaks. Consequently, I cannot make recommendations regarding breaks based on the results of this study past recognizing that momentary breaks may be a more feasible way for nurses in busy 24-hour healthcare environments to maintain energy and focus than formal rest or meal breaks.

The purpose of OHP is to develop, maintain, and promote the health of employees and the health of their families (Tetrick & Quick, 2011). As such, there are three primary dimensions within the study of OHP: the organization and work environment, the individual, and the work-family interface (Quick, 1999). Recovery from work plays an important role in not only promoting individual workers' health and well-being; OHP researchers have theorized that insufficient within-work recovery increases employees' need for recovery outside of work hours, which may negatively impact the individual as well as their wider familial and social network (Geurts et al., 2014). The present dissertation underscores the role of the physical organization and temporal characteristics of 24-hour healthcare systems in determining the adequacy of the built environment and recovery opportunities for nurses and reiterates that how much context matters.

Limitations and Future Research

This dissertation study naturally has several limitations, and the following section delineates those issues and incorporates suggestions regarding possible next steps to

move past these limitations. The type of data gathered for this study and the characteristics of the sample that provided the data establish an important starting point. This study relies on self-report survey data, which poses risk related to common method bias. However, it is appropriate to employ self-report measures to ascertain individuals' perceptions of private experiences (i.e., recovery experiences), which would be difficult for others to rate (Conway & Lance, 2010). Accordingly, I incorporated recommendations from Podsakoff et al. (2003) to acknowledge and limit method bias when I designed the survey instrument: a) I chose to collect anonymous data to attempt to reduce evaluation apprehension and social desirability bias, and b) I created a methodological separation via varied response formats for the predictor variables and outcome variables.

Second, an important factor that limits the generalizability of the present dissertation study is the unknown (but presumed to be low) response rate. Prior to the application of inclusion and exclusion criteria, the total number of respondents included 160 nurses (approximately 2% of 8,000 RNs contacted via e-newsletter distributed by ONA). During the preparatory work with my research partner, I conducted pilot studies on the survey components, but did not pilot the method for recruiting participants. I followed recommendations from the leadership and IT department at ONA to recruit study participants from the organization's listserv in the manner to which the ONA members were accustomed. Likewise, I based my a priori power analysis calculations on the response rate to previous ONA member surveys. Although this resulted in a far smaller sample than anticipated, the response to the method was favorable from the ONA

members who followed the link to my online study material. Over 95% of individuals who opened the newsletter and clicked on my recruitment material chose to enter the study.

I designed the survey instrument and method of collection to reduce the burden placed on participants, but due to the cross-sectional study design, I cannot draw conclusions on causal any relationships found in the analysis. Moreover, selection bias is a concern with any convenience sample. It is possible that nurses most in need of recovery from work stress may not have had the time or energy to participate in the study. The research findings I reviewed from the field of ergonomics and recent research in the fields of organizational and occupational health psychology have demonstrated that short within-work breaks can be systematically employed to decrease mental fatigue and physical discomfort (e.g., musculoskeletal), potentially aiding in the long-term maintenance of RNs' health, well-being, and job performance. However, the findings from this study indicate that a significant portion of the study sample is typically not able to remove themselves from patient care environments, much less take the time to participate in more demanding data collection methods. Future studies focused on the identification of organizational antecedents and physical work characteristics that aid or hinder direct care providers in taking breaks from direct patient care within a work shift, (e.g., specific improvements of the built environment in 24-hour healthcare organizations) would be a useful next step in this line of research.

As detailed above, study was carried out with a partner organization, and the methods employed reflect the tension in the dual nature of applied research. On one hand,

the research questions were informed by concerns shared by the population and were consequently constructed to provide value back to the participants. On the other hand, the survey data were therefore collected from a convenience sample drawn from a single profession in a state wherein over 75% of the population identifies as white, which limits the generalizability of the results to a broader U.S. population. However, as noted in the description of the sample characteristics in Chapter 3, the study sample largely maps onto the state-level demographics for RNs across several dimensions including age, practice site, education, racial/ethnic identity, and gender identity and thus may have localized utility.

This ties into a research agenda suggestion from a forthcoming annual review of the recovery from work stress literature by Sonnentag, Cheng, and Parker (2021). The authors recommend that researchers should investigate what specific combinations of activities and experiences are particularly effective, in specific contexts, cultures, and for certain groups. In this study, I tested hypotheses with an under-researched population of shift workers buttressed by established scales and undergirded by well-developed theory. I extended this project towards lesser-known domain with research questions aimed at elements of the U.S. hospital system that are specific to the setting, are widely utilized, and demonstrably harmful to those individuals that *provide* the health care services. Based on the findings of this study, the recovery activities and experiences developed by researcher for office workers and other non-shift workers may lie outside the realm of possibility for 24-hour healthcare settings. I agree with Sonnentag and colleagues that

future research might draw on qualitative studies to guide theory development in specific occupational groups.

Conclusion

A national survey of nursing leadership found that evidence-based fatigue management systems (common in other highly-regulated industries) are not widely implemented for nurses in U.S. healthcare organizations. (Caruso et al., 2019). Though the nurse leaders attested to the importance of the issue, social norms predispose nurses to think of fatigue as an intrinsic part of the job (Steege, Pinekenstein, Rainbow, & Knudsen, 2017). Trends in scheduling characteristics towards 12-hour shifts and the impact of overtime, in addition to the time pressure that prevents nurses from taking breaks, might contribute to this perception, but the findings of this study suggest that effective intervention is possible when tailored appropriately for 24-hour healthcare settings. Through the lens of OHP research and practice, the nature and design of work *itself* can and should be changed to fit the individual, as opposed to the other way around. This study identified adverse schedule characteristics (i.e., extended work hours, mandatory overtime, and time pressure) as positively and significantly related to fatigue and need for recovery. These findings offer new insight regarding a specific cultural context for a uniquely demanding and critical occupational group. Based on these results and a possible mismatch of quantitative survey measures to realities of the U.S. healthcare system, qualitative research to guide theory development and site-specific recovery intervention are two areas for potential organizational change.

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Appendix A: HSRRC Approval Memo

Post Office Box 751 503-725-2227 tel
Portland, Oregon 97207-0751 503-725-8170 fax
Human Subjects Research Review Committee
hsrrc@pdx.edu

Date: May 19, 2016

To: Leslie Hammer / Sarah Van Dyck

From: Karen Cellarius, HSRRC Chair

Re: HSRRC approval for your project titled, "An Examination of Nurses' Schedule Characteristics, Recovery from Work, and Well-Being"
HSRRC Proposal # 163826

Review Type: Exempt, Category 2

In accordance with your request, the Human Subjects Research Review Committee has reviewed your proposal referenced above for compliance with PSU and DHHS policies and regulations covering the protection of human subjects. The Committee is satisfied that your provisions for protecting the rights and welfare of all subjects participating in the research are adequate, and your project is approved. Please note the following requirements:

Approval: You are approved to conduct this research study after receipt of this approval letter; and the research must be conducted according to the plans and protocol submitted (approved copy enclosed).

Consent: Signed consent is waived from all participants in this study. A written consent statement is required.

Changes to Protocol: Any changes in the proposed study, whether to procedures, survey instruments, consent forms or cover letters, must be outlined and submitted to the Committee immediately. The proposed changes cannot be implemented before they have been reviewed and approved by the Committee.

Adverse Reactions and/or Unanticipated Problems: If any adverse reactions or unanticipated problems occur as a result of this study, you are required to notify the Committee within 5 days. If the issue is serious, approval may be withdrawn pending an investigation by the Committee.

Completion of Study: Please notify the Committee as soon as your research has been completed. Study records, including protocols and signed consent forms for each participant, must be kept by the investigator in a secure location for three years following completion of the study (or per any requirements specified by the project's funding agency).

If you have questions or concerns, please contact the Office of Research Integrity in the PSU RSP at 503-725-2227, 1600 SW 4th Ave., Market Center Building, Suite 620.

Appendix B: ONA Letter of Organizational Support

May 5, 2016

Leslie B. Hammer, PhD
Sarah Van Dyck
P.O. Box 751
Portland State University
Portland, OR 97201

Dear Dr. Hammer and Ms. Van Dyck,

I am pleased to submit this letter in support of your application to the Portland State University Institutional Review Board for the project "An Examination of Nurses' Schedule Characteristics, Recovery from Work, and Well-Being," and I look forward to our potential future collaborations.

Oregon Nurses Association (ONA) is very supportive of efforts to improve the work life and well-being of its members by successfully meeting the demands of work and family. Participation in your research project would be a way for ONA to better understand the impact of work schedule characteristics on nurses and thus, we are happy to support your efforts. As a part of our participation, we agree to allow Portland State University researchers to distribute an invitation to participate in your research study to our members through the ONA email listserv.

We wish you success in the application process and look forward to hearing from you.

Sincerely,

Carlton G. Brown

Carlton G. Brown, PhD, RN, AOCN, NEA-BC, FAAN

18765 SW Boones Ferry Road, Suite 200 · Tualatin, OR 97062 · Phone: 503-293-0011 · Fax: 503-293-0013
Email: ona@oregonrn.org · Web: www.OregonRN.org

Appendix C: Study Invitation

Survey of RN Work Schedule Characteristics, Rest and Meal Breaks, and Well-being

My name is Sarah Van Dyck, and I'm a doctoral student in Applied Industrial and Organizational Psychology at Portland State University. I've been working with Oregon Nurses Association on various research projects since 2012.

I am currently conducting my dissertation research under the supervision of Dr. Leslie Hammer, with a focus on **RN work schedule characteristics, recovery opportunities, and work-related health outcomes.**

I am contacting you because I would like you to consider participating in my research study. You were selected as a possible participant because of your relationship with Oregon Nurses Association. Participation in the study involves an **anonymous online survey, which will take approximately 15-20 minutes** to complete.

It is important to note that your participation is entirely voluntary and you may discontinue participation at any point in time. All survey information provided to ONA by PSU researchers will be presented in aggregate form and no identifying information will be released.

Your participation in this study is extremely important and will contribute to a better understanding of the work life of ONA members. Though you may not receive any direct benefit from taking part in this study, the information you share may help you or other ONA members in the future. In addition, participants may enter into a drawing for one of ten $10 gift cards to Amazon.com. The survey responses are anonymous, and will not be linked to information provided to award the gift cards.

If you are interested in participating, please click on the link below to learn more!

Click here to learn more and to TAKE THE SURVEY

Thank you.
Sincerely,

Sarah Van Dyck, MS
Doctoral Student
Applied Industrial and Organizational Psychology
Portland State University, Portland, Oregon

For further questions or comments on this survey please email me at
vandyck@pdx.edu

Appendix D: Informed Consent Document

An Examination of Nurses' Schedule Characteristics, Recovery from Work, and Well-Being

You are invited to participate in a research study conducted by graduate student researcher Sarah Van Dyck at Portland State University (PSU). You were selected as a possible participant in this study because of your relationship with Oregon Nurses Association (ONA).

Purpose of the Study

The researcher hopes to learn more about how nurses' work schedules and access to rest breaks and meal breaks impact their health and well-being. This study is being conducted in partial fulfillment for a doctoral degree and is under the supervision of Dr. Leslie Hammer.

Procedures

If you decide to participate, you will be asked to take a short web-based survey, which will take approximately 15-20 minutes to complete. The research survey will be anonymous—you will not be asked to provide identifying information, required to enter a login ID, or a password. Your personal information will be kept confidential by PSU researchers, and will be housed on a secure server at PSU. Information gathered through the survey will be presented in aggregate only, and will not be used for any purposes outside of the study.

Possible Risks/Discomforts

Although it is unlikely, it is possible that you may experience discomfort in response to thinking about your work experience. You may choose to not answer any questions and you can decide to stop at any time. If you decide to withdraw from the study, there will be no negative repercussions.

Possible Benefits

The information we collect in this study may contribute to a better understanding of the work life of ONA members. You may not receive any direct benefit from taking part in this study, but the information you share may help you or other ONA members in the future. The information will also be the basis of a graduate student dissertation project, reports distributed to ONA members and potentially, papers published through academic journals.

Participation

Your participation is completely voluntary. You are not obligated to take part in this study, and it will not affect your relationship with the Oregon Nurses Association or Portland State University. You may also withdraw from this study at any time without affecting your relationship with Oregon Nurses Association or PSU.

Appendix D: Informed Consent Document (Continued)

Questions about the Research

If you have questions about the study, you may contact the graduate student researcher, Sarah Van Dyck by calling her at (971) 322-4754, emailing her at vandyck@pdx.edu, or writing to her at Psychology Department, 317 Cramer Hall, Portland State University, P. O. Box 751, Portland State University, Portland, OR 97207.

If you have questions for Sarah Van Dyck's adviser, you may contact Leslie Hammer, PhD at (503) 725-3923, by mail at Psychology Department, 317 Cramer Hall, Portland State University, P.O. Box 751, Portland, OR 97207-0751, or by email at hammerl@pdx.edu.

Questions about Your Rights as a Research Participant

If you have questions about your rights as a research participant, you may contact the Portland State University Human Subjects Research Review Committee at (503) 725-4288, (877) 480-4400, by mail at Portland State University, Market Center Building, 6th Floor, P.O. Box 751, Portland, OR 97207-0751, or by email at hsrrc@pdx.edu.

Print

I have read, understood, and had the opportunity to print a copy of the above consent form, and desire of my own free will to participate in this study.

○ Yes

○ No

→ Qualtrics Condition: No Is Selected. Skip To: End of Survey.

Appendix E. List of Items from Data Collection Instrument

SHIFT LENGTH
(Barton et al., 1995; Folkhard et al., 1995; Stimpfel & Aiken, 2013)

Directions: Please consider your work schedule on average, and then indicate the start and end time of your shift. Note: Please report the hours you *actually* worked, including overtime.

1. Start time: __:__ (AM/PM)
2. End time: __:__ (AM/PM)

MANDATORY OVERTIME
(Barton et al., 1995; Trinkoff et al., 2006)

Directions: Please consider your work schedule, and then select the option that most accurately reflects how often you work beyond your scheduled shift under the following circumstance.

Response Format
6 = More than once a week
5 = Once a week
4 = Every other week
3 = Once a month
2 = Few times a year
1 = Never/NA

1. How often do you work mandatory overtime?

TIME PRESSURE
Quantitative Workload Inventory (Spector & Jex, 1998)

Directions: Please consider your job and select the response that best describes the extent to which the following statements apply.

Response Format
5 = Very often
4 = Fairly often
3 = Sometimes
2 = Occasionally
1 = Very rarely or never

Appendix E: List of Items from Data Collection Instrument (Continued)

1. How often does your job require you to work very fast?
2. How often does your job require you to work very hard?
3. How often does your job leave you with little time to get things done?
4. How often is there a great deal to be done?
5. How often do you have to do more work than you can do well?

WITHIN-WORK RECOVERY EXPERIENCES
Recovery Experience Questionnaire (Sonnentag & Fritz, 2007).

Directions: Please respond to the following items with respect to how you spend your time during within-shift breaks.

***Response Format*:**
5 = I fully agree
4 = I agree
3 = I neither agree nor disagree
2 = I disagree
1 = I fully disagree

Psychological Detachment
1. During within-shift breaks, I forget about work.
2. During within-shift breaks, I don't think about work at all.
3. During within-shift breaks, I distance myself from work.
4. During within-shift breaks, I get a break from the demands of work.

Relaxation
1. During within-shift breaks, I kick back and relax.
2. During within-shift breaks, I do relaxing things.
3. During within-shift breaks, I take time for leisure.
4. During within-shift breaks, I use the time to do relaxing things.

Mastery
1. During within-shift breaks, I learn new things.
2. During within-shift breaks, I seek out intellectual challenges.
3. During within-shift breaks, I do things that challenge me.
4. During within-shift breaks, I do something to broaden my horizons.

Appendix E: List of Items from Data Collection Instrument (Continued)

Control
1. During within-shift breaks, I feel like I can decide for myself what to do.
2. During within-shift breaks, I decide my own schedule.
3. During within-shift breaks, I determine for myself how I will spend my time.
4. During within-shift breaks, I take care of things the way I want them done.

WORK ENGAGEMENT
Utrecht Work Engagement Scale-Short (Schaufeli et al., 2006)

Directions: The following statements are about how you feel at work. Please read each statement and select the response that best describes how frequently you feel that way.

Response Format:
7 = Always
6 = Very often
5 = Often
4 = Sometimes
3 = Rarely
2 = Almost never
1 = Never

Vigor Subscale
1. At work, I feel bursting with energy.
2. At work, I feel strong and vigorous.
3. In the morning, I feel like going to work.

Dedication Subscale
4. I am enthusiastic about my job.
5. My job inspires me.
6. I am proud of the work that I do.

Absorption Subscale
7. I get carried away when I am working.
8. I feel happy when I am working intensely.
9. I am immersed in my work.

Appendix E: List of Items from Data Collection Instrument (Continued)

WORK-RELATED FATIGUE
Swedish Occupational Fatigue Inventory (SOFI 20; Ahsberg, 2000)

Directions: During and/or towards the end of a shift, many people experience extreme tiredness, which may also be referred to as work-related fatigue and can affect mental, physical, and motivational resources. Think of how it feels when you are most tired—to what extent do the following expressions describe how you feel?

Response Format:
7 = To a very high degree
6 = To a high degree
5 = Somewhat
4 = Neither/nor
3 = To a low degree
2 = To a very low degree
1 = Not at all

Lack of Energy Subscale
1. Worn out
2. Spent
3. Drained
4. Overworked

NEED FOR RECOVERY
Need for Recovery Scale (Van Veldhoven and Broersen, 2003)

Directions: Please consider your typical work schedule and select the response that best describes how frequently you experience each of the following circumstances.

Response Format:
5 = Always
4 = Often
3 = Sometimes
2 = Rarely
1 = Never

1. I find it difficult to relax at the end of a working day.
2. By the end of the working day, I feel really worn out.
3. Because of my job, at the end of the working day I feel rather exhausted.
4. After the evening meal, I generally feel in good shape.
5. In general, I only start to feel relaxed on the second non-working day.

Appendix E: List of Items from Data Collection Instrument (Continued)

6. I find it difficult to concentrate in my free time after work.
7. I cannot really show any interest in other people when I have just come home myself.
8. Generally, I need more than an hour before I feel completely recuperated after work.
9. When I get home from work, I need to be left in peace for a while.
10. Often, after a day's work I feel so tired that I cannot get involved in other activities.
11. A feeling of tiredness prevents me from doing my work as well as I normally would during the last part of the working day.

POST-BREAK RECOVERY
Recovery After Breaks Scale (Demerouti et al., 2012)

Directions: When answering the following questions, please consider your typical shift and select the response that best describes how frequently you feel that way.

Response Format:
5 = Very often or always
4 = Fairly often
3 = Sometimes
2 = Occasionally
1 = Very rarely or never

1. During my meal break, I recuperate from work.
2. During my rest breaks, I recuperate from work.

Appendix E: List of Items from Data Collection Instrument (Continued)

WORK SCHEDULE CHARACTERISTICS
Standard Shiftwork Index (Barton et al. 1995; Folkard et al., 1995)

Directions: The following set of questions relate to your work schedule characteristics. Your answers will be anonymous.

Please consider your typical work schedule, and then respond to the following questions. ***Note***: Please report the hours you actually work, including overtime, not the hours you are scheduled to work.

How many hours do you work per shift? _____Hours/Minutes

How many hours do you work per week? _____Hours/Minutes

How many shifts do you work per week? _____

How many rest breaks do you have during a shift? _____

What is they typical duration of your rest break(s)? _____ Minutes

How many meal breaks do you have during a shift? _____

What is they typical duration of your meal break(s)? _____ Minutes

WORK BREAK CHARACTERISTICS
(Rogers et al., 2004)

Do you have access to a dedicated space for employee rest and meal breaks away from the patient care environment?

___ Yes
___ No

Skip logic → If Yes selected

Is the dedicated space for employee rest and meal breaks on your unit?
___ Yes
___ No

Appendix E: List of Items from Data Collection Instrument (Continued)

Does the dedicated space for employee rest and meal breaks allow space for quiet relaxation?
___ Yes
___ No

How often do you use the dedicated space during your rest and meal breaks?
5 = Every shift
4 = At least once a week
3 = At least once a month
2 = Less than once a month
1 = Never

2. When you take rest breaks, what percentage of time do you estimate you completely relieved of patient care duties?
___ %

DEMOGRAPHICS

Directions: The following questions are about you, your education, and your work history. Your answers will be anonymous.

What is your age? _____

What is your gender?
1 = Female
2 = Male
3 = Transgender

Which racial/ethnic categories do you identify with? Choose all that apply.
1 = African American
2 = American Indian or Alaskan native
3 = Asian
4 = Asian Indian
5 = Caucasian (non-Hispanic)
6 = Hispanic
7 = Multiracial
8 = Native Hawaiian/Pacific Islander
9 = Write in: _____

Appendix E: List of Items from Data Collection Instrument (Continued)

Were you born in the United States?
1 = Yes
2 = No

Are you currently married or do you have a permanent romantic partner that lives with you?
1 = Yes, currently married
2 = Yes, currently living with romantic partner
3 = No

How many dependents under the age of 18 do you care for at home? _____

During the past 6 months have you provided at least 3 hours of care per week to an adult relative inside or outside your home? This could include help with shopping, medical care, or assistance in financial/ budget planning.
1 = Yes
2 = No

What is the highest level of nursing education you have completed?
1 = AD
2 = Diploma
3 = BSN
4 = MSN
5 = Doctorate

How many years have you worked in your current position? _____ Years/Months

Does your role include patient care?
1 = Yes
2 = No
In your current position, what percentage of time do you estimate is spent providing direct patient care? _____%

Are you represented by a collective bargaining unit?
1 = Yes
2 = No

Appendix E: List of Items from Data Collection Instrument (Continued)

How interested are you in issues related to ONA members' mid-shift rest and meal breaks?
1 = Not at all interested
2 = Slightly interested
3 = Somewhat interested
4 = Moderately interested
5 = Extremely interested

Appendix F: Main Survey Closing Remarks

Do you have any questions or comments? If so, enter them in the open response box below—however, please do not reveal any identifying information you would not like to be published in the course of disseminating the results of this research.

If you have further questions or comments in regards to this survey that you would like to keep confidential, please contact Sarah Van Dyck at vandyck@pdx.edu.

Thank you for participating in the survey!

The research survey responses you provided are anonymous and will not be connected to any personal information.

Please use the link below if you would like to be entered in our drawing to win an Amazon.com gift card. By clicking on the link below you will leave this anonymous survey, and be redirected to a separate page to provide your contact information for the purposes of the gift card drawing.

Link to Gift Card Drawing Survey

Appendix G: Gift Card Survey

GIFT CARD DRAWING SURVEY

Any identifying information you provide below will not be linked to your previous survey answers and will be kept strictly confidential.

If you would like to be entered in our drawing to win an Amazon.com gift card, please fill out the following information:

Name: _____
Email: _____

I am willing to be contacted for further follow-up (this will not affect your gift card eligibility):
Yes ___
No ___

If you have additional comments or questions, please email Sarah Van Dyck at vandyck@pdx.edu.

Thank you for your participation!

Appendix H. Hierarchical Moderated Regression Results

Model 1. Results of Hierarchical Moderated Regression Analyses for Well-Being Outcomes: Shift Length and Psychological Detachment

	Work Engagement β	Fatigue β	Need for Recovery β
Step 1. SL	-.12	.21*	.19*
Δ R^2	.01	.04	.04
R^2	.01	.04	.04
Step 2. PD	.40	-.08	-.20
Δ R^2	.01	.03	.10
R^2	.02	.08	.14
Step 3. SLxPD	-.32	-.11	-.13
Δ R^2	.01	.01	.00
R^2	.03	.09	.14
F(3,130)	1.17	3.65*	7.25***

Note: β = standardized beta-coefficient from the final step, ΔR^2 = change in explanation rate in each step. R^2 = explanation rate. F = model fit from the final step. * $p < .05$, ** $p < .01$, *** $p < .001$.

Model 2. Results of Hierarchical Moderated Regression Analyses for Well-Being Outcomes: Shift Length and Relaxing Recovery Experience

	Work Engagement β	Fatigue β	Need for Recovery β
Step 1. SL	-.13	-.22*	.21*
Δ R^2	.01	.04	.04*
R^2	.01	.04	.04*
Step 2. RX	.35	.05	-.18
Δ R^2	.02	.01	.04*
R^2	.03	.06	.08*
Step 3. SLxRX	-.23	-.18	-.01
Δ R^2	.01	.00	.00
R^2	.04	.06	.08
F(3,130)	1.57	2.77*	3.63*

Note: β = standardized beta-coefficient from the final step, ΔR^2 = change in explanation rate in each step. R^2 = explanation rate. F = model fit from the final step. * $p < .05$, ** $p < .01$, *** $p < .001$.

Appendix H. Hierarchical Moderated Regression Results (Continued)

Model 3. Results of Hierarchical Moderated Regression Analyses for Well-Being Outcomes: Shift Length and Mastery Experiences

	Work Engagement β	Fatigue β	Need for Recovery β
Step 1. SL	-.10	.20*	.20*
Δ R^2	.01	.04	.04
R^2	.01	.04	.04*
Step 2. ME	-.10	-.14	.21
Δ R^2	.04	.01	.01
R^2	.06	.06	.04
Step 3. SLxME	.31	.02	-.30
Δ R^2	.01	.00	.01
R^2	.06	.06	.05
F(3,130)	3.00*	2.63	2.31

Note: β = standardized beta-coefficient from the final step, ΔR^2 = change in explanation rate in each step. R^2 = explanation rate. F = model fit from the final step. * $p < .05$, ** $p < .01$, *** $p < .001$.

Model 4. Results of Hierarchical Moderated Regression Analyses for Well-Being Outcomes: Shift Length and Control

	Work Engagement β	Fatigue β	Need for Recovery β
Step 1. SL	-.12	.21*	.20*
Δ R^2	.01	.04	.04*
R^2	.01	.04	.04*
Step 2. CN	.42	-.15	-.14
Δ R^2	.01	.00	.04*
R^2	.02	.05	.08*
Step 3. SLxCN	-.35	.09	-.07
Δ R^2	.01	.00	.00
R^2	.03	.05	.08
F(3,130)	1.35	2.12	3.84**

Note: β = standardized beta-coefficient from the final step. ΔR^2 = change in explanation rate in each step. R^2 = explanation rate. F = model fit from the final step. * $p < .05$, ** $p < .01$, *** $p < .001$.

Appendix H. Hierarchical Moderated Regression Results (Continued)

Model 5. Results of Hierarchical Moderated Regression Analyses for Well-Being Outcomes: Mandatory Overtime and Psychological Detachment

	Work Engagement β	Fatigue β	Need for Recovery β
Step 1. MO	-.10	.18	.25*
Δ R^2	.01	.03	.06**
R^2	.01	.03	.06**
Step 2. PD	.07	-.15	-.28*
Δ R^2	.01	.02	.08***
R^2	.01	.06	.14***
Step 3. MOxPD	-.10	.08	.14
Δ R^2	.01	.01	.02
R^2	.02	.06	.15
F(3,130)	.78	2.78*	7.84***

Note: β = standardized beta-coefficient from the final step, ΔR^2 = change in explanation rate in each step. R^2 = explanation rate. F = model fit from the final step. * $p < .05$, ** $p < .01$, *** $p < .001$.

Model 6. Results of Hierarchical Moderated Regression Analyses for Well-Being Outcomes: Mandatory Overtime and Relaxing Recovery Experience

	Work Engagement β	Fatigue β	Need for Recovery β
Step 1. MO	-.09	.20*	.24*
Δ R^2	.01	.03	.06**
R^2	.01	.03	.06**
Step 2. RX	.11	-.07	-.14
Δ R^2	.01	.01	.02
R^2	.02	.04	.08
Step 3. MOxRX	-.10	.09	.09
Δ R^2	.01	.01	.01
R^2	.03	.04	.08
F(3,130)	1.14	1.92	3.93**

Note: β = standardized beta-coefficient from the final step, ΔR^2 = change in explanation rate in each step. R^2 = explanation rate. F = model fit from the final step. * $p < .05$, ** $p < .01$, *** $p < .001$.

Appendix H. Hierarchical Moderated Regression Results (Continued)

Model 7. Results of Hierarchical Moderated Regression Analyses for Well-Being Outcomes: Mandatory Overtime and Mastery Experiences

	Work Engagement β	Fatigue β	Need for Recovery β
Step 1. MO	-.05	.19*	.22*
Δ R^2	.01	.03	.06*
R^2	.01	.03	.06*
Step 2. ME	.22**	-.14	-.10
Δ R^2	.05	.02	.01
R^2	.05	.05	.06
Step 3. MOxME	.06	.04	-.06
Δ R^2	.01	.00	.00
R^2	.06	.05	.07
F(3,130)	2.58	2.34	3.12*

Note: β = standardized beta-coefficient from the final step, ΔR^2 = change in explanation rate in each step. R^2 = explanation rate. F = model fit from the final step. * $p < .05$, ** $p < .01$, *** $p < .001$.

Model 8. Results of Hierarchical Moderated Regression Analyses for Well-Being Outcomes: Mandatory Overtime and Control

	Work Engagement β	Fatigue β	Need for Recovery β
Step 1. MO	-.06	.22*	.25**
Δ R^2	.01	.03	.06**
R^2	.01	.03	.06**
Step 2. CN	.08	-.04	-.17*
Δ R^2	.01	.00	.03*
R^2	.01	.03	.09**
Step 3. MOxCN	-.01	.11	.09
Δ R^2	.00	.01	.01
R^2	.01	.04	.09
F(3,130)	.47	1.88	4.34**

Note: β = standardized beta-coefficient from the final step, ΔR^2 = change in explanation rate in each step. R^2 = explanation rate. F = model fit from the final step. * $p < .05$, ** $p < .01$, *** $p < .001$.

Appendix H. Hierarchical Moderated Regression Results (Continued)

Model 9. Results of Hierarchical Moderated Regression Analyses for Well-Being Outcomes: Time Pressure and Psychological Detachment

	Work Engagement β	Fatigue β	Need for Recovery β
Step 1. TP	-.04	.37***	.39***
Δ R^2	.01	.16	.22***
R^2	.01	.16	.22***
Step 2. PD	.07	-.08	-.21**
Δ R^2	.00	.01	.04***
R^2	.01	.17	.26**
Step 3. TPxPD	-.07	.02	.08
Δ R^2	.00	.00	.01
R^2	.01	.17	.27
F	.62	8.77***	15.77***

Note: β = standardized beta-coefficient from the final step, ΔR^2 = change in explanation rate in each step. R^2 = explanation rate. F = model fit from the final step. * $p < .05$, ** $p < .01$, *** $p < .001$.

Model 10. Results of Hierarchical Moderated Regression Analyses for Well-Being Outcomes: Time Pressure and Relaxing Recovery Experience

	Work Engagement β	Fatigue β	Need for Recovery β
Step 1. TP	-.05	.39***	.44***
Δ R^2	.01	.16	.22***
R^2	.01	.16	.22***
Step 2. RX	.11	-.03	-.10
Δ R^2	.01	.00	.01
R^2	.02	.16	.23
Step 3. TPxRX	-.03	.03	.05
Δ R^2	.00	.00	.00
R^2	.02	.16	.23
F(3,130)	.85	8.44***	12.92***

Note: β = standardized beta-coefficient from the final step, ΔR^2 = change in explanation rate in each step. R^2 = explanation rate. F = model fit from the final step. * $p < .05$, ** $p < .01$, *** $p < .001$.

Appendix H. Hierarchical Moderated Regression Results (Continued)

Model 11. Results of Hierarchical Moderated Regression Analyses for Well-Being Outcomes: Time Pressure and Mastery Experiences

	Work Engagement β	Fatigue β	Need for Recovery β
Step 1. TP	-.07	.40***	.47***
Δ R^2	.07	.16	.22
R^2	.07	.16	.22***
Step 2. ME	.22**	-.13	-.08
Δ R^2	.05	.02	.01
R^2	.05	.18	.23
Step 3. TPxME	-.05	.02	-.04
Δ R^2	.01	.00	.00
R^2	.06	.18	.23
F(3,130)	2.56	9.37***	12.65***

Note: β = standardized beta-coefficient from the final step, ΔR^2 = change in explanation rate in each step. R^2 = explanation rate. F = model fit from the final step. * $p < .05$, ** $p < .01$, *** $p < .001$.

Model 12. Results of Hierarchical Moderated Regression Analyses for Well-Being Outcomes: Time Pressure and Control

	Work Engagement β	Fatigue β	Need for Recovery β
Step 1. TP	-.04	.41***	.42***
Δ R^2	.07	.16	.22***
R^2	.07	.16	.22***
Step 2. CN	.08	.03	-.11
Δ R^2	.01	.00	.01
R^2	.01	16	.23
Step 3. TPxCN	-.07	.01	.08
Δ R^2	.00	.00	.01
R^2	.02	.16	.23
F(3,130)	.68	8.41***	13.21***

Note: β = standardized beta-coefficient from the final step, ΔR^2 = change in explanation rate in each step. R^2 = explanation rate. F = model fit from the final step. * $p < .05$, ** $p < .01$, *** $p < .001$.

Appendix I: Expanded Factor Analysis of Focal Variables

I conducted a series of two types of factor analysis to further explore patterns among the inter-item relationships, Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA). This iterative process was taken on to increase confidence in the structure of the scales in the measurement model. EFA lends itself to investigation into the number of factors (or dimensions) that are needed to explain the relationships in a set of items. Specifically, I conducted Principal Axis Factoring, a method for extracting underlying factors from a set of variables (e.g., survey items) that attempts to delineate the total item variance into (a) common variance (true correlations between the items); and (b) error variance. *Communality* is the term used to name the amount of true variance that each item shares with the underlying factor, and *unique variance* is the term used for measurement error. There are several methods commonly used to extract the communality estimates from a data set and to rotate the underlying factors (e.g., orthogonal rotation, in which factors are forced to be uncorrelated for ease of interpretation, and oblique rotation in which the underlying factors are allowed to correlate; Tabachnick & Fidell, 2007), but the essential results remain similar regarding the direction and strength of the factor loadings for each item. Ultimately, EFA is a tool for refining the measurement model (Hair et al., 2010) and must be followed up with CFA to bolster the findings.

Exploratory Factor Analysis

I conducted EFAs with the composite measure variables to determine whether the observed variables factor-loaded together as expected, were sufficiently correlated, and

met reliability and validity criteria standards. In this study, I first utilized EFA for each measure separately to clarify dimensionality, then examined all measures together in one model to assess the factor correlations and item factor loadings across the other focal measures. I conducted the EFAs using Principal Axis Factoring with direct oblimin (i.e., oblique) rotation to inspect the properties of the observed variables theorized to comprise time pressure, recovery experiences, fatigue, and work engagement. EFA options available in IBM SPSS 27 allow for interpretation of the number of factors present in the data (e.g., the "factor solution" equals the number of extracted factors with eigenvalues above 1.00), total variance explained in the data set by the underlying factors, factor loadings for each item, and correlations between factors.

The Kaiser-Meyer-Olkin measure of sampling adequacy (KMO), and Bartlett's Test of Sphericity are tests of the basic assumptions underlying EFA. The KMO statistic varies from 0 to 1 and indicates whether the data support the use of factor analysis (e.g., may be grouped into a smaller number of factors). If the KMO statistic is less than 0.50, the data does not factor well (Kaiser & Rice, 1974). Bartlett's Test of Sphericity compares the inter-item correlation matrix to an identity matrix that has 1.00 on the principal diagonal and .00 for all other correlations in the matrix. A significant x^2 difference score between the correlation matrix and identity matrix is expected for a group of items that make up a reflective measure, indicating there is sufficient relationship between the items to collapse into a common factor.

In this exploratory phase, I followed the recommendation from Tabachnick and Fidell (2007) to examine the coefficients in the pattern matrix for the relationships

between items and underlying factors. An absolute value greater than 0.30 is the minimum threshold for an item factor loading to be considered *salient* with the primary factor. However, for this sample size (N = 134), Hair et al. (2010) recommends the minimum threshold of ± 0.50 for factor loadings for each item on its primary factor, and a factor loading average of 0.70 within each composite measure. Additionally, a *clean factor solution* should not display significant cross-loading (i.e., complex loading on more than one factor, with less than 2.00-point difference between the item factor loadings). Evidence supporting convergent validity for each composite measure (high factor loadings for items within the same measure), and discriminate validity (no or very low cross-loadings between items from separate measures) can be gleaned from the item factor loadings when examined together.

I initiated the EFA process with the conceptually unidimensional measures of time pressure (Spector & Jex, 1998) and fatigue (Ahsberg, 2000). For both scales, the statistics for KMO and Bartlett's test fell within acceptable ranges. No cause for concern regarding multidimensionality was detected—the EFAs for time pressure and fatigue each resulted in a one-factor solution, as expected. The factor loadings for the items in each measure were salient, though the time pressure item TmPrs5 "How often do you have to do more work than you can do well?" was flagged for follow up due to a relatively low item loading of 0.54. The other four of the five items in the time pressure scale refer to the pace and amount of work to be done during a shift, while the fifth item may tap into an individual's sense of the quality of their work. In the highly regulated yet under-resourced U.S. hospital system, attribution of error to one's self—the quality of

one's work—might not seem cogent to the participants. In the following section I describe the results of the time pressure CFA in response to this concern.

I next conducted a series of EFAs to examine the theoretically distinct dimensions of recovery experiences: psychological detachment, relaxation, mastery experiences, and control (Sonnentag & Fritz, 2007). Regarding dimensionality, the 16 recovery experience items were found to load onto just three factors when no restraints were imposed during the EFA specification, rather than the hypothesized four-factor structure. Two items from psychological detachment scale, "During within-shift breaks, I forget about work" (PD1) and, "During within-shift breaks, I don't think about work at all" (PD2) loaded onto the first factor with the four relaxation items and four control items. All four of the items from the mastery experiences scale loaded onto a second factor. The two remaining psychological detachment items "During within-shift breaks, I distance myself from work," (PD3) and, "During within-shift breaks, I get a break from the demands of work," (PD4) loaded onto the third factor, which may have been construed by nurses as physical distance or separation from the work environment, rather than mental distancing from the work demands.

I continued testing the recovery experience data with a forced four-factor EFA, which resulted in a factor solution with two psychological detachment items (PD1 and PD2) and all four relaxation items loading onto the first factor, while the four mastery experiences items loaded cleanly on the second factor, and the four control items loaded cleanly on the third factor. The fourth factor contained the two psychological detachment items noted above that may have physical separation connotations (PD3 and PD4).

Together, these findings suggested that a valid and reliable four-factor structure might not be feasible with this data set, though the Cronbach's alpha statistics for each of the recovery experiences scales exceeded the accepted minimum threshold (i.e., $\alpha > 0.70$). As described in the next section, I utilized confirmatory factor analysis to follow up the EFA findings.

I conducted a separate set of EFAs for the theorized work engagement dimensions (i.e., vigor, dedication, and absorption; Schaufeli et al., 2006). The items that comprise this work engagement scale have been alternately theorized by researchers to (a) reflect one latent construct (Sonnentag, 2003); or (b) reflect three subscales. In this study sample, acceptable KMO and Bartlett's test of sphericity statistics were found in addition to adequate total variance explained in the model, but the items did not load cleanly onto the three subscales conceptualized by the authors of the measure. Two items from the vigor subscale ("At work I feel bursting with energy," and "At work, I feel strong and vigorous") loaded onto the first factor, and the remaining seven items loaded onto a second factor. When I ran a forced three-factor solution, the items in the dedication and absorption subscales aligned as theorized, but one vigor item ("Before my shift begins, I feel like going to work") collapsed into the dedication subscale factor, and the other two vigor items loaded strongly onto a separate factor. The results of the EFAs for work engagement evidenced the need for further examination during the ensuing CFAs to verify the factor structure of the measure items and whether it is more appropriate to use all or some combination of the nine items as one latent factor, as a second-order factor, or three correlated factors.

The final series of EFAs I conducted contained the set of items that comprised the reflective focal variables in one model. I ran the analyses with the full set of items to further explore the relationships I found within the individual measure EFAs, followed by an EFA with a trimmed set of items as determined by factor cross-loadings. The results of the full model EFA using Principal Axis Factoring and direct oblimin rotation ($N = 133$) indicated the same general pattern as the individual EFAs, with the additional benefit of the ability to compare items with cross-loadings across separate variables. The initial factor solution resulted in seven factors with acceptable statistics for KMO, Bartlett's test, and variance explained, but multiple instances of cross-loading between measures. For each item with cross-loading I calculated the difference between the item loadings and targeted items in which the difference score was less than 2.00. In the next section, I describe the CFAs I used to determine the components of the final measurement model.

Confirmatory Factor Analysis

I conducted the following series of analyses in IBM AMOS 27. In order to test the hypothesized relationships in this sample with the highest possible degree of confidence, I analyzed the factor structure found in the EFAs of the individual focal measures separately, and then the measurement model as a whole to verify that the proposed model accounted for the major covariances among the variables included. Poor model fit might indicate presence of a sizable relationship that I did not account for in the structural model, or misspecification of the latent factor structure in the measurement model. Incorporating recommendations regarding acceptable model fit indices from Hu and Bentler (1999), I gauged the degree of each factor model fit from several sources,

including the chi-square test of model fit, and additional indices of absolute fit (i.e., the typically reported GFI) and relative fit (i.e., CFI, RMSEA), and the highest absolute value of standardized residual covariances, described below. Of note: the modest size of my final study sample (N = 134) is cause for skepticism regarding the results of the CFAs. Because the scale scores used in the present dissertation were adapted from well-validated measures and displayed more than adequate alpha reliability coefficients, the CFAs were utilized to corroborate the somewhat unusual EFA findings with my study sample and as additional sources of information regarding fit of the data to the theorized subscales of Work Engagement and Recovery Experiences.

Generally, absolute fit indices estimate how well the data fit the theorized model. The goodness of fit index (GFI) reflects the level of fit between the hypothesized model and the observed covariance matrix, but can be unduly influenced by sample size and the number of indicators for latent constructs. Possible values range from 0 to 1 with values greater than .90 indicating an acceptable fit. Relative fit indices compare the chi-square for a "null" model to the chi-square of the theorized model. The comparative fit index (CFI) ranges from 0 to 1 with values greater than .95 indicating an adequate fit. The root mean square error of approximation (RMSEA) likewise analyzes the divergence of the hypothesized model and the population covariance matrix, but is more robust than the GFI with regard to sample size. This relative fit index ranges from 0 to 1 and a value less than .10 indicates an adequate model fit. Please see Table 11 through Table 15 for the specific fit indices for the focal study variables.

The model estimates and fit indices of the 4-item measure of fatigue exceeded the thresholds for adequate fit, $x^2(2) = .35$, $p = .84$, with a GFI value of .99, a CFI value of 1.00, and an RMSEA value of .00. The largest standardized residual covariance value was .10 between the fatigue items FA2 and FA3. Therefore, no additional analyses were needed for this reflective measure prior to the test of the focal variables in one model.

I examined the time pressure CFA with the original five items and noted a lower factor loading for TmPrs5 (0.61), relative to the factor loadings of the other four items. The item under consideration read, "How often do you have to do more work than you can do well?" This outcome aligns with the findings of the time pressure EFA, so I conducted a second CFA with four items. As shown in Table 11, the four-item version demonstrated improved fit indices over the five-item version. However, the 5-item version was deemed acceptable and was retained for further testing due to the modest sample size.

Table 11. Time Pressure CFA Findings

Fit Statistics	Recommended	Observed Value (5 items)	Observed Value (4 items)
$x^2(df)$, *p-value,* $[x^2/df]$	Non-significant *p-value,* [1.00 – 2.00]	72.04(5), $p < .001$, [14.41]	17.73(2), $p < .001$, [8.87]
GFI	> 0.90	0.80	.94
CFI	> 0.95	0.85	.95
RMSEA	< 0.10	0.32	.23
Highest absolute value of standardized residual covariances	< ± 2.00	2.76 (TP3/TP5)	1.16

Note. "GFI" = "goodness of fit" index. "CFI" = "comparative fit index". "RMSEA" = "root mean square error of approximation" index.

I examined the recovery experience variables (i.e., psychological detachment, relaxation, mastery experiences, and control; Sonnentag & Fritz, 2007) based on the authors' hypothesized structure. I tested one- and four-factor models to determine whether it was more appropriate in this sample to collapse the recovery experience items into a single factor, or separate the items into the four theorized constructs, or the two-factor structure aligning with the clean factor solution found in the EFAs.

I first tested the single-factor model which views the 16 items as indicators of a single recovery experience factor. The chi-square test was significant, $x^2(104) = 510.57$, $p < .001$, indicating poor fit to the data. This initial index of model fit is commonly supplemented by additional contemporary fit statistics. In this study, the initial single-factor model of recovery experiences demonstrated a x^2/df ratio of 4.91, a GFI value of .66, a CFI value of .69, and an RMSEA value of .17, all indicating a poor fit and reinforcing the result of the chi-square test of the single-factor model of recovery experiences in this data set.

Next, I tested the four-factor model of recovery experiences consisting of the four correlated dimensions. The chi-square was again significant, $x^2(98) = 221.12$, $p < .001$, with x^2/df ratio = 2.26 a GFI value of .84, a CFI value of .91, and a RMSEA value of = .10. The model fit statistics suggest that the four-factor model yielded a marginal fit, an improvement over the single-factor model. However, as shown in Table 12, a few of the correlations between the four factors were exceptionally high (> .80), calling into question the validity of the four conceptualized dimensions in this sample.

I calculated the average variance extracted (AVE) for each dimension to assess the convergent and discriminant validity of the four theorized recovery experiences. Relaxation, mastery experiences, and control each exceeded the AVE minimum threshold of 0.50, which indicated sufficient convergent validity. Conversely, psychological detachment did not meet the minimum threshold of 0.50, evidencing a lack of convergent validity. To assess the discriminant validity of the four theorized recovery experiences, I computed the square root of the AVE for each dimension and compared the value to each of its inter-factor correlations. As seen in Table 12, the square root of the AVE for psychological detachment was lower than its correlation with relaxation and control. In addition to psychological detachment, the square root of the AVE for control was lower than its correlation with relaxation.

Taken together, the discriminant validity of the four dimensions was not supported. It would be inappropriate to fold the indicator variables of the psychological detachment or control dimensions together into a second-order factor, as the recovery experiences have been conceptualized as separate underlying mechanisms through which individuals can regain energetic resources and recover from work stress (Sonnentag & Fritz, 2007). Two of the recovery experiences dimensions, relaxation and mastery experiences, demonstrated adequate convergent and divergent validity.

Table 12. Recovery Experiences AVE and Inter-factor Correlations

	AVE	PD	RX	ME	CN
PD	0.47	**0.68**			
RX	0.67	0.94***	**0.82**		
ME	0.62	0.23*	0.24*	**0.79**	
CN	0.59	0.86***	0.87***	0.22*	**0.77**

Note. Values on the diagonal are the square root of the average variance extracted. "PD" = psychological detachment. "RX" = relaxation. "ME" = mastery experiences. "CN" = control. * $p < 0.05$. ** $p < 0.01$. *** $p < 0.001$.

As these findings remained in line with the results of the previously conducted EFAs, I determined that it was appropriate to test a two-factor model, retaining the relaxation and mastery experiences indicator variables only. The two-factor model chi-square was borderline significant, $x^2(19) = 34.12$, $p = .02$, with x^2/df ratio in the accepted range = 1.80. The GFI value of 0.94, a CFI value of 0.97, and an RMSEA value of = 0.08 bolstered my post-EFA assessment that the four dimensions of the recovery experiences might not demonstrate an adequate level of convergent or divergent validity. However, the four-factor solution demonstrated improved fit over the single-factor solution with marginally acceptable fit indices, and was retained for further testing out of caution due to the modest sample size.

Table 13. Recovery Experiences CFA Findings

Fit Statistics	Recommended	Observed Value (1-factor model)	Observed Value (4-factor model)	Observed Value (2-factor model)
x^2(df), p-value, [x^2/df]	Non-significant *p-value [1.00 – 2.00]*	510.57(104), $p < .001$ [4.91]	221.12(98), $p < .001$, [2.26]	34.12(19), $p < .05$ [1.80]
GFI	> 0.90	0.66	0.84	0.94
CFI	> 0.95	0.69	0.91	0.97
RMSEA	< 0.10	0.17	0.10	0.08
Highest absolute value of standardized residual covariances	No greater than ± 2.00	7.70	3.34	1.60

Note. "GFI" = "goodness of fit" index. "CFI" = "comparative fit index". "RMSEA" = "root mean square error of approximation" index.

I examined the work engagement variables (Schaufeli et al., 2006) based on the authors' theorized options. I tested one- and three-factor models to determine whether it was more appropriate in this sample to collapse the work engagement items into a single factor, or separate the items into the three correlated subscales (i.e., vigor, dedication, and absorption). I first tested the single-factor model which views the 9 items as indicators of a single work engagement factor. The chi-square test was significant, $x^2(27) = 141.77$, $p < .001$, indicating poor fit to the data. This index of model fit is commonly supplemented by additional contemporary fit statistics. In this study, the initial single-factor model of work engagement demonstrated a x^2/df ratio of 5.25, a GFI value of .81, a CFI value of .86, and an RMSEA value of .18, demonstrating inadequate fit. Next, I tested the three-

factor model of work engagement consisting of three correlated dimensions. The chi-square was again significant, $x^2(24) = 90.61$, $p < .001$, with x^2/df ratio = 3.78, a GFI value of .88, a CFI value of .91, and a RMSEA value of = .14. The model fit statistics suggest that the three-factor model yielded a marginal fit, an improvement over the single-factor model. However, as shown in Table 14, the correlation between the dedication and absorption factors was quite large (.79), calling into question the validity of the three conceptualized dimensions in this sample.

I calculated the average variance extracted (AVE) for each dimension to assess the convergent and discriminant validity of the three theorized work engagement subscales. Absorption barely met the AVE minimum threshold of 0.50, which indicated borderline sufficient convergent validity. To assess the discriminant validity of the three theorized recovery experiences, I computed the square root of the AVE for each subscale and compared the value to each of its inter-factor correlations. As seen in Table 14, the square root of the AVE for absorption was lower than its correlation with vigor and dedication. Taken together, the discriminant validity of the three subscales was not supported.

Table 14. Work Engagement AVE and Inter-factor Correlations

	AVE	VI	DE	AB
VI	0.63	**0.73**		
DE	0.73	0.77***	**0.85**	
AB	0.52	0.73***	0.79***	**0.72**

Note. Values on the diagonal are the square root of the average variance extracted. "AVE" = average variance extracted. "VI" = vigor. "DE" = dedication. "AB" = absorption. * $p < 0.05$. ** $p < 0.01$. *** $p < 0.001$.

As these findings remained in line with the results of the previously conducted EFAs, I determined that it was appropriate to test a single-factor model, retaining all items but WE7. The single-factor (minus WE7) model chi-square was borderline significant, $x^2(20) = 119.08$, $p = .02$, with $x^2/df = 5.59$, outside the accepted range. The GFI value of 0.82, a CFI value of 0.86, and the RMSEA value of = 0.19 bolstered my post-EFA assessment that the three dimensions of the work engagement scale might not demonstrate an adequate level of convergent or divergent validity with this sample, but a trimmed version of the single-factor scale might be considered for hypothesis testing.

I continued to trim one item at a time through cycles of EFAs and CFAs until I arrived at a solution with adequate fit indices and face validity for the construct of general "work engagement." The trimmed measure included items WE3, WE4, WE5, WE6, and WE8. For this single-factor model, the chi-square was non-significant, $x^2(5) = 16.48$, $p = .06$, with $x^2/df = 3.30$, just outside the accepted range. Two of the fit indices fell within range, and the last was just out of range, with a GFI value of 0.95, a CFI value of 0.97, and finally a RMSEA value of = 0.11. The three-factor solution demonstrated improved fit over the nine-item single-factor solution with marginally acceptable fit indices, and was retained along with the trimmed single-factor and 9-item single factor solutions for further consideration out of caution due to the modest sample size.

Table 15. Work Engagement CFA Findings

Fit Statistics	Recommended	Observed Value (1-factor model)	Observed Value (3-factor model)	Observed Value (1-factor model [WE3, WE 4, WE5, WE6, WE8]
x^2(df), p-value, [x^2/df]	Non-significant *p-value, [1.00 – 2.00]*	141.77(27), $p < .001$, [5.25]	90.61(24), $p < .001$, [3.76]	16.48(5), $p < .05$, [3.30]
GFI	> 0.90	0.81	0.88	0.95
CFI	> 0.95	0.84	0.91	0.97
RMSEA	< 0.10	0.18	0.14	0.11
Highest absolute value of standardized residual covariances	No greater than ± 2.00	2.13 [WE7, WE8]	2.82 [WE3/WE4]	0.82 [WE5/WE6]

Note. "GFI" = "goodness of fit" index. "CFI" = "comparative fit index. "RMSEA" = "root mean square error of approximation" index.

Key Findings of Factor Analyses

Notably, the key moderator construct recovery experiences four-factor structure did not meet accepted thresholds for convergent and divergent validity (see Table 12 and Table 13), and did not quantitatively demonstrate the theorized relationships in this sample. Also of note, the EFA/CFA process I undertook for the outcome variable work engagement did not bear up the theorized 3-factor structure. Like recovery experiences, the three subscales of work engagement—vigor, dedication, and absorption—did not display adequate convergent or divergent validity and demonstrated questionable fit indices (see Table 14 and Table 15). However, due to the relatively small study sample, I retained the four-dimension recovery experiences and the single dimension work engagement measures for hypothesis testing.