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Comparing relaxation versus mastery micro-break activity: a within-task recovery perspective

Amanda Lynn Conlin

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ABSTRACT

COMPARING RELAXATION VERSUS MASTERY MICRO-BREAK ACTIVITY: A WITHIN-TASK RECOVERY PERSPECTIVE

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Recovery from work is thought to occur outside of the workplace. However, employees may have the opportunity to recover within the work day via micro-breaks, or short momentary breaks during demanding work tasks. Two strategies for mitigating fatigue include psychological detachment and replenishing motivational incentives via positive affect. This study examined whether recovery was possible during a work task and to what extent different break content facilitated later performance. In an experimental study, 201 students were randomly assigned to receiving a relaxation micro-break (n = 63), a mastery micro-break (n = 68), or no break (n = 72) in the middle of a monotonous work task to compare their effects on subsequent work performance. Overall, these data suggest that micro-breaks indeed resulted in improved task performance and within-task recovery, but only affected psychological detachment processes. There was no effect of micro-breaks on positive affect compared to a no-break group. Also, although mastery breaks resulted in more psychological detachment than relaxation breaks, it did not translate into performance differences based on micro-break type. These results build on existing recovery theories by further demonstrating within-task recovery, and suggest future work should include mastery activities in exploring recovery during the workday.
COMPARING RELAXATION VERSUS MASTERY MICRO-BREAK ACTIVITY: A WITHIN-TASK RECOVERY PERSPECTIVE

BY
AMANDA LYNN CONLIN
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A THESIS SUBMITTED TO THE GRADUATE SCHOOL
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Thesis Director:
Larissa K. Barber, Ph.D.
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CHAPTER 1
INTRODUCTION

A recent survey showed that 84% of employees send non-job related emails during work hours, while an estimated 90% surf the internet for recreational use during work hours (Vault.com, 1999). These behaviors are often described as problematic because they are seen as a waste of work time (e.g., Lim, 2002). However, work productivity requires considerable effort (e.g., psychological, social, and physical) to meet job demands (Demerouti, Bakker, Nachreiner, & Schaufeli, 2001). From an occupational health perspective, what are often described as problematic non-work behaviors on the job can be seen as “work breaks”, which are essential for sustained performance. For example, watching a funny video can help improve performance on an effortful task (Masicampo, Martin, & Anderson, 2014). Given that American employees, on average, spend 8.9 hours a day at work (American Time Use Survey; Bureau of Labor Statistics, 2014), breaks may be vital for sustaining energy and performing well on work tasks.

Traditional respite research tends to examine work breaks in the context of how time is spent during non-work hours, such as on the weekends or over vacation (Fritz & Sonnentag, 2005; Sonnentag, Binnewies, & Mojza, 2008; Sonnentag & Fritz, 2007). These findings promote the idea that engaging in other activities (playing baseball, socializing with friends, etc.) helps people avoid thinking about work during non-work hours, which is critical for employee recovery. However, less literature examines the benefits of breaks during the work day.
Exceptions include observational research exploring how lunch breaks and other forms of within-day breaks (e.g., smoking, mingling) can relieve fatigue and recover vitality during work hours (e.g., Fritz, Lam & Sprietzer, 2011; Trougakos, Beal, Green & Weis, 2008; Zacher, Brailsford, & Parker, 2014). For example, researchers found evidence that self-reported energy management strategies (i.e., work breaks) that were not related to the work itself increased vitality and decreased fatigue on a momentary, within-person level when measured each hour throughout the work day (Zacher et al., 2014). This study extends that work by exploring how within-task work breaks—called micro-breaks (e.g., McLean et al., 2001; Trougakos & Hideg, 2009)—may affect recovery and task performance.

Research thus far suggests not all micro-breaks are equal in recovery benefits (Fritz et al., 2011). Unfortunately, there is very little experimental research investigating the content of breaks within the work day, as well as specific recovery experience outcomes. One exception is an experiment that demonstrated that a relaxing micro-break that entailed viewing nature provided a boost in subsequent task performance (Lee, Williams, Sargent, Williams, & Johnson, 2015). Another showed that humorous breaks increased task persistence due to participants feeling amusement (Cheng & Wang, 2015). In attempt to connect work stress and recovery models (e.g., Sonnentag & Fritz, 2015) to practical workplace breaks, the current study contributes to the existing literature on employee recovery and performance by answering two key research questions. First, can recovery experiences (detachment from work thoughts and positive affect) be achieved via micro-breaks? In this aim, traditional respite recovery activities are tested in a within-task break setting. Past research has shown some breaks boost vitality (Fritz et al., 2011), but it is unclear if psychological detachment and positive affect can be achieved with both mastery and relaxation breaks in a short-time. Second, does micro-break type
differentially influence subsequent work performance? Most of the recovery findings in the occupational health research use non-experimental methodologies over longer time frames (e.g., Trougakos et al., 2008, Fritz et al., 2011); thus, the current study uses an experimental design to determine if micro-breaks that facilitate different types of recovery (mastery and relaxation) have different effects on work performance outcomes.

Work Recovery and Respites

Sustaining good work performance is a demanding process. Aspects of the task and characteristics of the performer both contribute to the relative amount of attention and effort required. The Effort-Recovery Model (Meijman & Mulder, 1998) suggests tasks demand the most resources when they recruit central, attention-demanding processes in working memory and stored knowledge. Expending effort over long periods of time is physiologically draining; it is related to autonomic nervous system reactions and sympathetic nervous system “fight or flight” responses, such as accelerated heart rate, blood pressure, and breathing. This is an acute and adaptive response to effort that results in temporary fatigue. If work demands exceed an individual’s processing capacity (i.e., actual ability to store and process information), motivation and emotional control are employed to compensate (Pribram & McGuiness, 1975), and performance is sustained. However, motivational resources cannot always compensate for depleted processing capacity. When demands chronically persist, physiological reactions due to prolonged effort exertion are likely to contribute to the development of illnesses and immunity deficiency (Sonnentag & Frese, 2003). If processing resources and/or motivational resources are
not recovered, job demands become exceedingly difficult to meet in the future (Meijman & Mulder, 1998).

Without sufficient recovery due to chronic exposure to demands, the autonomic nervous system becomes depleted (Lundberg, Granquist, Hansson, Magnusson, & Wallin, 1989) resulting in “wear and tear” on the body that is referred to as allostatic load (McEwen & Stellar, 1993). In the Job-Demands (JD-R) model, this is referred to as the health impairment process, which leads to burnout (Schaufeli, Bakker, & Van Rhenen, 2009). Over time, chronically fatigued workers may develop long-term mental health outcomes associated with allostatic load (e.g., chronic exhaustion, depression; Maslach, Schafeli & Leiter, 2001; Sonnentag & Frese, 2003), as well as physical health issues (e.g., cardiovascular disease) and decreased well-being (e.g., low life satisfaction; Sonnentag & Fritz, 2015).

The recovery process is a reversal of the stress process, which helps employees return to pre-stressor levels of stability (i.e., homeostasis) via the parasympathetic nervous system. In the physiological sense, this may include a reduction in heart rate to its natural baseline or a reduction in muscle tension (Ettema, 1967). Psychological recovery is more dynamic. Employees may mentally recover in one psychological aspect (e.g., motivational replenishment) and successfully compensate for fatigue in another (e.g., actual processing resources; Pribram & McGuiness, 1975). In line with this dynamic, there are various ways to reduce feelings of being tired and sluggish (McNair, Lorr, & Droppleman, 1992).

According to the JD-R model (Demerouti, Bakker, Nachreiner, & Schaufeli, 2001), there are two mechanisms that aid in work recovery. The first mechanism directly addresses the health impairment process by reducing demands. This is derived from effort-recovery concepts in that decreasing task difficulty or effort can help restore one’s actual ability to cope with the task
(Meijman & Mulder, 1989). Taking away effortful aspects of demands is inherently replenishing because it directly addresses the stressor driving the health impairment process. The second recovery mechanism is related to the motivational process, which provides employees with resources to better manage their demands. The motivational process in the JD-R model draws from Conservation of Resources Theory (COR; Hobfoll, 1989), which suggests people are motivated to protect and build resources such as objects (shelter, money) or conditions (job security, friendships, self-efficacy) of value. In addition to resources having inherent value, they can also help enhance and protect other resources. Indeed, flexible work schedules provide autonomy that can help employees better achieve their work goals and buffer the health impairment process (Demerouti et al., 2001) because it improves their ability to manage how (when and where) effort is expended on work demands. However, when employees have fewer resources to cope with demands, they are more likely to experience strain. The JD-R model suggests that acquiring resources—in addition to reducing job demands—can facilitate recovery (Schaufeli et al., 2009). In other words, two separate strategies for mitigating fatigue are offsetting effort and replenishing motivational incentives (Masicampo et al., 2014).

A common assumption is that work breaks primarily influence recovery through the first JD-R recovery mechanism: demand reduction. That is, work breaks are effective because they physically remove individuals from their work environment. However, within-task micro-breaks explored in the ergonomics literature demonstrate how even short breaks involving physical movement (without physical removal) can be successful in increasing performance outcomes by relieving physical strain (Tucker, 2003) and musculoskeletal discomfort (McLean, Tingley, Scott, & Rickards, 2001). Evidence confirms physical micro-breaks mitigate fatigue effects and increase productivity (Tucker, 2003). However, there is a paucity of research on the content of
within-task breaks and little insight into the underlying processes by which they are effective (Tucker, 2003). In the next section, I discuss how the content of work breaks may differentially affect recovery experiences via demand reduction and motivational processes.

The Role of Psychological Detachment and Positive Affect

Sonnentag and Fritz (2007) describe two key aspects of work recovery experiences according to the JD-R model: the first involves demand reduction, while the latter is related to motivational processes. Psychological detachment—defined as mentally disengaging from work tasks—is an important component of the recovery process with respect to demand reduction (Sonnentag & Fritz, 2015). Current research focuses on psychological detachment outside of work (e.g., weekends, vacations; Sonnentag et al., 2008; Sonnentag, Mojza, Binnewies, & Scholl, 2008; Sonnentag & Fritz, 2007). However, breaks during work (e.g., lunch breaks) may also provide psychological disengagement from work demands (Sonnentag & Fritz, 2015). Mentally shifting away from job demands to a non-work domain contributes to recovery by way of deactivating worn out processes.

Alternatively, positive affect is a component of recovery related to motivational processes (Sonnentag & Fritz, 2007). People strive to obtain, retain, and protect their resources, such as personal characteristics or energies (Hobfoll, 1989). Positive feelings reverse negative activation (i.e., from feeling threatened) by way of restoring lost motivation. Presenting a task as “fun” has been shown to reverse mental fatigue effects in past research because it changes motivation to engage in the task from a “have to” to a “want to” (Laran & Janiszewski, 2011; Masciampo et al., 2014). Also, positive affect has been shown to increase blood flow to the areas in the brain
that are recruited for attentional focus (Lee et al., 2015). Indeed, positive affect and other forms of replenishment can compensate for the psychological costs associated with demanding work. In this study, I focus on two break activities that can facilitate both psychological detachment and positive affect: relaxation and mastery.

Relaxation entails relieving prolonged physical and mental activation via reduced effort (Sonnentag & Fritz, 2007). Relaxation naturally facilitates the reversal of allostatic load reactions (i.e., accumulated stress; fatigue; Meijman & Mulder, 1998). Thus, relaxation is effective for reducing the physiological consequences of work demands, such as muscle tension and heightened cardiovascular responses. When the demanding aspects of a task are removed, employees may also be provided with time to psychologically disengage. The experience of positive emotions is also an aspect of relaxation that contributes to recovery (Sonnentag & Fritz, 2007). Subsequent task performance benefits from breaks that are relaxing via demand reduction and the restorative qualities of positive affect (Lee et al., 2015).

The benefits of relaxation have been observed in multiple studies that provide indirect evidence that relaxation operates via psychological detachment and positive affect. Relaxing activities, like watching an 8-minute funny video clip (Cheng & Wang, 2015) or spending 40 s looking at pictures of nature (Lee et al., 2015) facilitate the recovery process and improve task performance. Positive affect resulting from amusement can counteract mental fatigue effects from effortful tasks (Cheng & Wang, 2015), thus contributing to more positive affect than neutral breaks alone. Relaxing breaks high in positive arousal (viewing a picture of nature) also enabled sustained attention on cognitively demanding tasks better than other breaks with lower positive arousal (viewing a concrete city roof; Lee et al., 2015). Trougakos and colleagues (2009) even noted that two key differences separating respites from chores were that respites
were low effort activities with positive valence whereas chores were high effort activities with negative valence. However, that study assumes that high effort activities are often negative in valence; can recovery occur with high effort activities that increase positive valence?

Research suggests that another route to recovery is mastery activities, which involve challenging learning opportunities that also increase positive affect (Sonnentag & Fritz, 2007). Mastery experiences and relaxation experiences both facilitate psychological detachment and positive affect, but they achieve these outcomes differently. Conceptually, mastery involves switching from an undesirable effortful task that leads to fatigue to a desired effortful task that increases vigor due to motivational processes (Schaufeli et al., 2009). Mastery activities require attention to shift from work to non-work activities; therefore, mastery increases psychological detachment from work demands (Sonnentag & Fritz, 2007). Mastery activities also require more effort than relaxation activities, but mastery activities recuperate feelings of competence that can result in positive affect. The positive arousal of gaining competence and self-efficacy is an important replenishing aspect of mastery experiences (Sonnentag & Fritz, 2007). According to COR theory, feelings of competence can be restorative for individuals who are feeling threatened by job demands (Hobfoll, 1989).

Past research provides indirect evidence that psychological detachment and positive affect are likely the mechanisms that account for why mastery experiences result in recovery. For example, Rook and Zijlstra (2006) found that household activities (e.g., household chores) enabled recovery. They speculated that, while doing these activities, participants actively focused on tasks that were not related to their jobs and may have felt good after accomplishing obligatory responsibilities. Also, in a study of employees across professional and clerical positions, shifting
attention away from work to “learn something new” was positively related to vitality and negatively related to fatigue (Fritz, Lam & Spreitzer, 2012).

The Current Study

Taken together, empirical consensus on break content provides indirect evidence that relaxation and mastery breaks facilitate psychological detachment and positive affect. More direct evidence is required to explore these underlying processes in a micro-break activity context. Given that psychological detachment and positive affect are key contributors to recovery (Sonnentag & Fritz, 2007), they are likely to be two independent processes that could link relaxation and mastery micro-break experiences to performance improvements. Examining these effects in a micro-break context is important given that previous literature on work breaks and employee recovery tends to focus on end-of-day work recovery (Sluiter, 1999; Sluiter, Frings-Dresen, van der Beek, & Meijman, 2001) rather than recovery periods within the work day (Sonnentag & Fritz, 2015). Moreover, occupational health research has only recently begun to consider which types of recovery experiences differentially arise during various recovery activities (Sonnentag & Fritz, 2007) as well as recovery within the work day.

The present study addresses this gap by examining within-task recovery, with a focus on the less studied mastery experiences in addition to relaxation experiences that have been explored in past micro-break research. Specifically, I determined whether both relaxation micro-breaks and mastery micro-breaks can facilitate recovery, replicating and extending results from past research (Cheng & Wang, 2015; Lee et al., 2015). Also, by directly measuring psychological detachment and positive affect, this study helps resolve conflicting findings with
regards to what underlying processes actually facilitate recovery (vanHoff et al., 2006, Rook & Zijlstra, 2006, Trougakos et al., 2009). I expected both mastery experiences and relaxation experiences in the middle of a demanding work task would facilitate (a) psychological detachment and (b) positive affect, which in turn would lead to performance benefits compared to a no break group.

Adopting the relaxing micro-break paradigm from Lee and colleagues (2015), participants were asked to look at a picture of a city roof covered in flowers and greenery for the relaxation micro-break. This type of activity is high in positive affect because aesthetically pleasing images of trees and nature replenish attention via positive valence (Lee et al., 2015). The color green alone has been found to increase feelings of positive affect (Kaya & Epps, 2004). The mastery micro-break involved a themed anagram game that was also designed to be aesthetically pleasing (with colorful visuals). To ensure the relatively effortful task was not experienced as negative, participants were given positive feedback to evoke a sense of accomplishment from making progress on a new task and increase feelings of competence. During the mastery micro-break, participants engaged in a task described as a “fun word scramble game” that has been used in past research as a challenging anagram task (Ammons & Ammons, 1959). Positive feedback was provided after task completion to foster positive affect by boosting enjoyment, enthusiasm and joy (Stotland, 1969), promoting perceived competence (Schaufeli et al., 2009), and fostering motivation (Kluger & DeNisi, 1996). Positive feedback is assumed to boost competence because it provides an upper comparison to standard performance, facilitating self-efficacy or “a global sense of the idealized self” (Carver & Scheier, 1990, p. 20). Adding a theme (i.e., animals) will also make the anagrams and positive performance feedback
believable due to reducing the perceived difficulty of the task (Kaya & Epps, 2004; Carver & Scheier, 1990).

According to theory discussed in the above sections (e.g., Sonnentag & Fritz, 2007, Hobfoll, 1989, Demerouti et al., 2001), both mastery and relaxation experiences psychologically disengage individuals from a main work task and increase positive affect in comparison to a condition without a break. Past research also suggests psychological detachment and positive affect are two underlying processes that link relaxation to performance improvements (Lee et al., 2015; Cheng & Wang, 2015). Given that mastery can also enable detachment and increase positive affect (Glynn et al., 2002; Sonnentag & Fritz, 2007), mastery experiences may have influenced performance similar to relaxation via these processes. Thus, I hypothesized the following regarding differences among individuals who took micro-breaks (mastery or relaxation) versus those who did not take a break:

**H1:** Individuals taking micro-breaks will perform better on subsequent work than those without a break.

**H2:** Individuals taking micro-breaks will report more (a) psychological detachment and (b) positive affect than those without a break.

**H3:** The effect of micro-breaks on performance is mediated through (a) psychological detachment and (b) positive affect.

Directly measuring psychological detachment provides insight into the differential effects of mastery and relaxation breaks on subsequent task performance. Relaxation breaks enable disengagement via a relatively passive process with low demands that allows for the natural stress reversal process to begin. However, high effort mastery breaks may make detachment from the main task even more likely by actively demanding a shift in attention (Glynn et al.,
2002) rather than passively trying to suppress task related thoughts. Although active (high effort) leisure and passive (low effort) leisure both contribute to recovery (van Hooff, Geurts, Kompier, & Taris, 2007), active mastery breaks may facilitate even more psychological detachment in this design where both types are positive in valence.

For instance, chronic task thoughts may be difficult to shut off, especially if there are unfinished demands that need to be addressed in the near future (Syrek & Antoni, 2014). Therefore, active distractions enable recovery by way of demanding attention and disrupting work rumination (Neumann et al., 2004) in such a manner that relaxing tasks do not. With increased detachment, mastery micro-breaks could be even more beneficial to recovery. Thus, I also proposed an additional set of hypotheses wherein the mastery condition may produce better outcomes than the relaxation condition.

**H4:** Individuals taking mastery micro-breaks will perform better than those taking relaxation micro-breaks.

**H5:** Individuals taking mastery micro-breaks will report more psychological detachment

**H6:** The effect of mastery versus relaxation micro-breaks on performance is mediated through psychological detachment
CHAPTER 2

METHOD

Two hundred and forty-seven participants from Northern Illinois University were asked to participate in the present study with course credit compensation. Introductory psychology students were recruited via the University’s online student database, SONA. The study was also offered to upper-level psychology students as a source of course credit (See Appendix A for Recruitment statements). Participants that signed up for the study received two course credits for their time and effort. An a priori power analysis revealed that for a between-groups comparison effect size observed in related studies ($d = .25$; e.g., Lee et al., 2015), a sample of approximately 159 would be needed to obtain statistical power at the recommended .80 level (Cohen, 1988) when analyzing results from a one-way ANOVA for three groups. Thus, a larger sample of 247 participants were asked to volunteer due to anticipated poor quality data. Of the initial sample, responses were excluded from final data analyses if they failed to provide at least half of the critical responses ($n = 9$), if they provided a response on quality check items that indicated it should be removed (e.g., “I honestly don’t think my data should be used”; $n = 23$), if notes from the research assistants suggested data should be removed (e.g., if they were distracted by friends, if their computer crashed; $n = 12$), or if their performance data for the first half and second half of the task was above or below ($n = 2$) two standard deviations from average performance (Howell, 1998). The final sample used in analyses included 201 participants.
In the final sample, 57.1% of participants identified as male (n = 116), 53.7% White (n = 109), 17.7% Black (n = 36), 17.2% Hispanic (n = 35), 7.4% Asian (n = 15), .5% Native Hawaiian (n = 1), and 3.4% other (n = 7). Also, 60% of the students were in their first year of college (n = 122), 14.8% were in their second year (n = 30), 15.3% were in their third year (n = 31), and 9.4% were in their fourth year (n = 19). Also, the average ACT score reported was 22.91 (SD = 3.78), and all participants rated their comfort with English as moderate (n = 44; 22.7%) or high (n = 157; 77.3%).

Participants performed a clerical editing task to operationalize a typical episodic work task. The goal of this task was to create attentional fatigue in participants, the same way a work task might, by requiring self-regulatory effort (Masicampo et al., 2014) and persistence (Cheng & Wang, 2015). In an online survey, participants were given a piece of literature and asked to click on all target letter combinations (es) that follow the letter “I”. This is an adapted version of the letter cancellation task, which Richards et al. (2001) developed initially as a measure of cognitive performance. Letter cross-out tasks are regularly used as self-regulatory fatigue manipulations (e.g., Baumeister, Bratslavsky, Muraven, & Tice, 1998; DeWall, Baumeister, Gailliot, Maner, 2008; Cheng & Wang, 2015), although recent studies have questioned the effectiveness of this and other self-regulation manipulations for consistently producing self-regulatory “depletion” effects (Xu, Demos, Leahey, Hart, Trautvetter, Coward, Middleton, Wing, 2014; Hagger, Chatzisarantis, Alberts, Anggono, Battailler, Birt, … Zwienenberg, 2015). However, this type of task was used because it has shown to be sensitive to performance decrements (Richards et al., 2001) and break manipulations in prior research (Cheng & Wang, 2015). Participants were asked to click on the specified letters in a clerical-type document for the first ten minutes of the task. After the first half, they were automatically directed to a micro-
break manipulation (unless they were assigned to the no break condition, in which case they continued with the clerical editing task), and then automatically asked to continue on with the editing document for the last ten minutes of the task. Ten minute blocks of time were used to stimulate work fatigue from monotonous but effortful tasks (Jung, Makeig, Stensmo, & Sejnowski, 1997). See Appendix C for more details.

To serve as an active break, a challenging anagram game was introduced to participants assigned to this condition as an enjoyable game. During their micro-break, participants played a “fun word construction game” that has been used in other studies as a standard challenging anagram task (e.g., Ammons & Ammons, 1959). The task was adapted to a fun and visually pleasing format with bright colors and involved all animal words as a consistent theme. Positive feedback was provided after task completion to foster enjoyment, enthusiasm and joy (Stotland, 1969) and to promote perceived competence (Schaufeli et al., 2009). This feedback included the statement that they performed better than 90% of their peers. Positive feedback is assumed to boost competence because it provides an upper comparison to standard performance, facilitating more self-efficacy or “a global sense of the idealized self” (Carver & Scheier, 1990). See Appendix D for break instructions and feedback.

To serve as a passive break, a picture of a rooftop full of natural greenery and flowers was viewed by the participants assigned to this condition. During their micro-breaks, they were asked to stare at the roof photograph on the computer monitor. In past studies, this has been used as a low effort activity that is positive in valence (Lee et al., 2015) and meets the criteria to qualify as a relaxing experience (Sonnentag & Fritz, 2007). See Appendix D for break instructions and stimuli.
In the present study, I operationalized post-break performance on the editing task by measuring *frequency rate*; that is, the amount of accurate corrections made in the second session following a break. Participants in the no break condition were automatically presented with a second 10 minute session of the clerical task with no break in between, and participants in the break conditions were automatically presented with a second 10 minute session of the clerical task after their micro-breaks.

I also measured performance in the 10 m session before the break manipulation to obtain baseline measures of performance before the break manipulation. This measure was used as a covariate in analyses to look at individual changes in performance from baseline after the break.

The preexisting recovery measure in the literature (Recovery Experience Questionnaire, Sonnentag & Fritz, 2007) does not directly measure positive affect associated with the experience. Additionally, the existing relaxation and mastery measures were not appropriate for measuring within-task recovery, although the measure of psychological detachment was able to be adapted. Thus, I adapted previous scales to measure the outcomes of state positive affect (valence), state relaxation (arousal) and mastery (competence) to be used as manipulation checks, as well as psychological detachment.

State recovery is important to measure in this context because a key difference between micro-breaks and outside of work leisure time is that micro-breaks enable state recovery within the work environment in attempt to proactively buffer against fatigue as it may be accumulating. Thus, an existing SAM measure of state experiences was adjusted to measure respondents’ level of valence (affect; good/bad), relaxation (arousal; restless/calm) and mastery (competence; incompetent/competent) on a five-point scale, with anchors labeled (Bradley & Lang, 1994; Kervyn, Fiske, & Yzerbyt, 2013). This adapted measure was a combination of anchors from
Kervyn and colleagues (2013) and the Semantic Differential Manikin (SAM) pictures from Bradley and Lang (1994). See Appendix E for the measure and images. Although valence was used most directly in hypothesis testing for positive affect, the arousal and competence dimensions were used as manipulation checks to assess the relaxation and mastery micro-break manipulations, respectively. Specifically, measures of competence and arousal were compared between the mastery micro-break (i.e., “Winning a game”) and the relaxation micro-break (i.e., “Looking at nature”).

At the end of the break tasks (or for participants in the no break condition, after the first 10 minutes of the clerical editing task), all participants completed a measure of psychological detachment from Sonnentag and Fritz (2007). Three items to measure detachment were adapted to logically fit with the experimental design task. See Appendix E.

Participants were also asked questions for assessing characteristics such as age, gender, race, student status, ACT scores, and comfort with English as a language. See Appendix F for the list of demographic items.

Pretest of State Recovery Items

In order to ensure the mastery and relaxation tasks differed in theoretically important variables (i.e., competence and arousal), as well as to test an adapted version of a state affect measure (See Appendix E), I pre-tested these items for the current study using two samples. The first study consisted of participants (N = 30) from the psychology department’s online research recruitment system (SONA) as well as other students enrolled in summer courses. Participants completed an online survey and were compensated with one course credit. The second sample (N
consisted of individuals from the United States recruited using Amazon’s Mechanical Turk (MTurk) program. I asked all participants to rate a list of 20 breaks on the dependent measure of state recovery (See Appendix E). The list of 20 tasks was taken from relevant recovery literature on breaks during work tasks (McFall et al., 2009; Fritz, Lam & Spreitzer, 2012; Lee et al., 2015).

I used six paired samples t-tests to examine pairwise differences in the following four groups: looking at nature, looking at a concrete roof, playing a game, and winning a game. All significance tests were interpreted more conservatively to account for family wise error using a Bonferroni adjustment ($p < .008$).

In the SONA sample (see Table 1 for descriptive statistics; $N = 30$), I found evidence for hypothesized patterns of state recovery ratings for certain tasks. According to a conceptual replication of the Lee et al., (2015) findings, ratings of state affect on a 1 (good) to 5 (bad) scale were more positive in valence for “looking at nature” ($M = 1.41$) than for “looking at a concrete roof” ($M = 2.90$), $t(29) = -5.31$, $p < .001$. To support the use of our new mastery micro-break manipulation being similar in valence to the relaxation micro-break manipulation, affect ratings for “winning a game” ($M = 1.63$) were not different than for “looking at nature,” $t(29) = 1.13$, $p = .269$, but ratings were more positive in affect than for “playing a game” ($M = 2.57$), $t(29) = -4.36$, $p < .001$. Exploring tests of within-subjects contrasts, a repeated measures ANOVA showed that “winning a game” and “looking at nature” were significantly higher in positive affect than the rest of the breaks in the survey, $F(1,19) = 13.965$, $p = .001$, and $F(1,19) = 18.91$, $p < .001$, respectively. Ratings of state arousal on a 1 (restless) to 5 (calm) were not different for “winning a game” ($M = 3.83$) than “looking at nature” ($M = 4.30$), $t(29) = -1.63$, $p = .114$. However the pattern I were expecting was found in the descriptive statistics. Nonetheless, there were differences between “playing a game” ($M = 3.17$) and “looking at nature”, $t(29) = -3.85$, $p$
Importantly, “looking at nature” was rated as significantly more calm than the rest of the breaks, $F(1, 19) = 13.89, p = .001$. Lastly, ratings of state competence on a 1 (incompetent) and 5 (competent) were not different for “winning a game” ($M = 3.93$) than for “looking at nature” ($M = 3.77$), $t(21) = .54, p = .589$, but “winning a game” and “looking at a roof” ($M = 2.87$) did differ in ratings of competence, $t(29) = 3.12, p = .004$.

Table 1: Pre-test Group Descriptive Statistics

<table>
<thead>
<tr>
<th>Task</th>
<th>Affect M</th>
<th>Affect SD</th>
<th>Arousal M</th>
<th>Arousal SD</th>
<th>Competence M</th>
<th>Competence SD</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SONA Sample (N = 30)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Winning a Game</td>
<td>1.63</td>
<td>0.93</td>
<td>3.83</td>
<td>1.17</td>
<td>3.93</td>
<td>1.44</td>
</tr>
<tr>
<td>Playing a Game</td>
<td>2.57</td>
<td>1.10</td>
<td>3.17</td>
<td>1.21</td>
<td>3.30</td>
<td>1.06</td>
</tr>
<tr>
<td>Checking Email</td>
<td>2.30</td>
<td>1.02</td>
<td>3.33</td>
<td>0.99</td>
<td>3.50</td>
<td>1.08</td>
</tr>
<tr>
<td>Making To-Do List</td>
<td>1.77</td>
<td>1.14</td>
<td>3.63</td>
<td>1.20</td>
<td>3.83</td>
<td>1.05</td>
</tr>
<tr>
<td>Talking to Peer</td>
<td>1.73</td>
<td>0.79</td>
<td>3.73</td>
<td>0.87</td>
<td>3.63</td>
<td>1.09</td>
</tr>
<tr>
<td>Talking to Boss</td>
<td>2.23</td>
<td>0.86</td>
<td>3.40</td>
<td>1.16</td>
<td>3.30</td>
<td>1.09</td>
</tr>
<tr>
<td>Cleaning Desk</td>
<td>1.33</td>
<td>0.55</td>
<td>4.13</td>
<td>1.14</td>
<td>4.33</td>
<td>0.84</td>
</tr>
<tr>
<td>Making a Phone Call</td>
<td>2.20</td>
<td>1.13</td>
<td>3.53</td>
<td>1.14</td>
<td>3.80</td>
<td>0.99</td>
</tr>
<tr>
<td>Venting</td>
<td>2.57</td>
<td>1.33</td>
<td>2.67</td>
<td>0.99</td>
<td>3.07</td>
<td>0.87</td>
</tr>
<tr>
<td>Reflecting</td>
<td>2.17</td>
<td>1.05</td>
<td>3.23</td>
<td>1.14</td>
<td>3.47</td>
<td>1.07</td>
</tr>
<tr>
<td>Helping</td>
<td>1.27</td>
<td>0.52</td>
<td>4.07</td>
<td>1.23</td>
<td>4.30</td>
<td>1.09</td>
</tr>
<tr>
<td>Scheduling</td>
<td>2.10</td>
<td>1.35</td>
<td>3.20</td>
<td>1.47</td>
<td>3.57</td>
<td>1.12</td>
</tr>
<tr>
<td>Commenting on Facebook</td>
<td>2.10</td>
<td>0.85</td>
<td>3.67</td>
<td>1.03</td>
<td>3.63</td>
<td>1.02</td>
</tr>
<tr>
<td>Setting a New Goal</td>
<td>1.33</td>
<td>0.61</td>
<td>3.57</td>
<td>1.16</td>
<td>3.93</td>
<td>0.94</td>
</tr>
<tr>
<td>Thinking of What Gives You Joy</td>
<td>1.50</td>
<td>0.78</td>
<td>4.10</td>
<td>1.06</td>
<td>3.67</td>
<td>1.12</td>
</tr>
<tr>
<td>Learning from a Blog</td>
<td>1.60</td>
<td>0.77</td>
<td>3.67</td>
<td>0.88</td>
<td>3.70</td>
<td>1.02</td>
</tr>
<tr>
<td>Messaging on Facebook</td>
<td>1.80</td>
<td>0.89</td>
<td>3.63</td>
<td>1.03</td>
<td>3.77</td>
<td>1.01</td>
</tr>
<tr>
<td>Responding to Emails</td>
<td>2.57</td>
<td>1.41</td>
<td>2.83</td>
<td>1.34</td>
<td>3.47</td>
<td>1.04</td>
</tr>
<tr>
<td>Looking at Nature</td>
<td>1.40</td>
<td>0.62</td>
<td>4.30</td>
<td>1.09</td>
<td>3.77</td>
<td>1.36</td>
</tr>
<tr>
<td>Looking at Roof</td>
<td>2.90</td>
<td>1.40</td>
<td>3.10</td>
<td>1.19</td>
<td>2.87</td>
<td>1.25</td>
</tr>
<tr>
<td>All break grand mean</td>
<td>1.95</td>
<td>0.01</td>
<td>3.54</td>
<td>0.10</td>
<td>3.62</td>
<td>0.07</td>
</tr>
</tbody>
</table>

In the MTurk sample (see Table 1 for descriptive statistics, $N = 59$), I found evidence for hypothesized patterns of state recovery ratings for certain tasks. Again, according to a conceptual
replication of the Lee et al., (2015) findings, ratings of state affect on a 1 (good) to 5 (bad) scale were more positive in valence for “looking at nature” \((M = 1.53)\) than for “looking at a concrete roof” \((M = 3.10)\), \(t(58) = -10.04, p < .001\), but were no different than for “winning a game” \((M = 1.83)\), \(t(58) = 2.33, p = .023\). Also, per our hypothesis that this scale might work as a manipulation check for the micro-break manipulations (i.e., looking at nature is calm/relaxing), participants’ ratings of state arousal on a 1 (restless) to 5 (calm) were more restless for “winning a game” \((M = 3.53)\) than “looking at nature” \((M = 4.31)\), \(t(58) = -5.52, p < .001\). Also, “looking at nature” was rated as being more calm than the other breaks, \(F(1,19) = 13.89, p = .001\). Lastly, I found statistically nonsignificant but descriptively different ratings of state competence on a 1 (incompetent) and 5 (competent) scale, where participants’ ratings suggested they would feel more competent for “winning a game” \((M = 4.14)\) than for “playing a game” \((M = 3.49)\), \(t(58) = 5.56, p < .001\), and descriptively different but not significantly different competence ratings for “winning a game” and “looking at nature” \((M = 3.92)\), \(t(58) = 1.46, p = .150\). Further, “winning a game” resulted in higher participant competence ratings than the other breaks in this sample, \(F(1,19) = 10.54, p = .002\).

Procedure

A brief description of the study was available to participants before signing up for the study on the university’s research database, SONA, and to other students in the form of an email from their professors who agreed to promote the study as a source of credit for their students. Participants were asked to freely participate in the study titled “Work Simulation Activities.” Upon arrival to the laboratory at their chosen time slot, participants were given a recruitment
statement detailing the research process (See Appendix A). Upon provided consent, participants were given instructions for the performance task (Appendix C) and asked to begin and complete the first half. Once they worked on the task for 10 min, the Qualtrics survey program automatically advanced to the micro-break manipulation. If participants were randomly assigned to the no break condition, they were not asked to perform a break activity but instead were presented with state recovery measures (See Appendix E) and automatically asked to continue on with the clerical editing task for another 10 minutes (i.e., they just end 40 s earlier than other participants who received a break).

Next, individuals in the break conditions were asked to participate in 40 s micro-breaks (mastery or relaxation break depending on randomly assigned condition; See Appendix D). The length of micro-breaks varies greatly across literature domains, with the ergonomic literature suggesting the average length of micro-breaks is 27.4 s when subjects freely choose their breaks on monotonous work tasks (Henning, Sauter, Salvendy, & Krieg, 1989). Given that longer micro-breaks increase recovery (Henning et al., 1989), a 40 s micro-break length should be sufficient to produce effects for our study (Lee et al., 2015).

After completing a 40 s task, participants were asked in all conditions to fill out measures of state recovery (See Appendix E), which appeared automatically on their screen. Next, they continued with the performance task for a second 10-minute episode. After their time was up, participants were automatically presented with a final general survey including a second state measure of recovery (i.e., detachment and state recovery scales) and demographics (See Appendix G). Individuals that successfully participated were thanked for their participation and fully debriefed before receiving their course credits (See Appendix H).
CHAPTER 3

RESULTS

Before testing our hypotheses, I checked if our data met the assumptions for analysis of variance to avoid biased results. First, the data for two potential intervening variables, positive affect and state arousal, were significantly skewed with skewness statistics of .90 (SE = .17) and -.88 (SE = .17), respectively. The graphical distribution of the primary variables indicated relatively normally distributed measures of state affect, psychological detachment, and performance scores. However, although the graphical distributions suggest skewness for the manipulation check measures, it is theoretically plausible that participants scored, on average, closer to either end of the scales given the momentary nature of state measures (with relatively little context) and the anchor words themselves (e.g., “competent” is a normal state vs “incompetent”).

In initial data cleaning, descriptive statistics were closely examined on all measures to check for extreme outliers (those data that fell above or below the mean by two standard deviations or more; Howell, 1998). Outliers were subject to deletion if they were two standard deviations away from the mean on the dependent measure of performance (n = 2). They were also removed if lab assistants, who assisted with data collection, took note of any unusual behavior (e.g., if participants were distracted by friends, if the computer crashed; n = 12). After initial data cleaning, I examined boxplot graphs, and no influential outliers were identified in our
sample that were not already excluded, except for one extreme outlier that was identified as particularly abnormal on the state competence measure (above 3 standard deviations away from the group mean; Tabachnick et al., 2001). Also, reliability statistics were assessed for the multi-item detachment measure and demonstrated relatively normal internal consistency for the measure ($\alpha = .64$; Sonnentag & Fritz, 2007). Also, there was no missing data on the measures critical to hypotheses.

However, some individuals chose not to answer on certain demographic items (e.g., ACT scores). Participants were provided with a “prefer not to answer” response option on all measures which was treated as missing data for analyses. This option was provided to prevent any missed items due to skipping, but allowed people to intentionally skip items if they desired (i.e., to retain the right to withdraw from participation on specific items per IRB requirements). In initial data cleaning, entire cases were deleted when more than half of the data essential to the study was missing ($n = 9$). Patterns of missing data were examined to determine that less than 5% of the data were missing, and were missing completely at random. Cases with minimal missing data (i.e., only missing select demographic responses) were not deleted after initial data cleaning. Lastly, I asked participants to fill out self-reported single item (SRSI) indicators at the very end of the survey. These items were intended to allow respondents to indicate how much effort and attention they devoted to the study. Most individuals reported putting “quite a bit” or “a lot of” effort towards the study (86.7%). Also, most individuals reported giving the study “most of their” or “their full” attention to the study (94.1%). Also, most participants agreed to the item “in your honest opinion, should we use your data in our analyses?” ($n = 201$), while others honestly replied no to this question ($n = 23$) and were removed from the dataset before analyses during initial cleaning. See Appendix F for more details of these measures.
State recovery measures using the SAM picture measure were tested as manipulation checks. Average scores on these measures that were presented directly following the breaks were compared to test expected differences based on the recovery activity performed. Group differences were not significant on the arousal measure; levels of arousal (i.e., calm/restless) were not significantly different between those who completed a mastery break ($M = 4.09, SD = 1.05$), a relaxation break ($M = 3.87, SD = 1.29$) and no break ($M = 3.92, SD = 1.02$; $F(2, 200) = 0.69, p = 0.50$). Also, group differences were not significant on the competence measure; levels of competence (incompetent/competent) did not differ between those who received a mastery break ($M = 4.12, SD = 0.92$), a relaxation break ($M = 4.00, SD = 0.98$) and no break ($M = 3.76, SD = 0.96$; $F(2, 200) = 2.50, p = 0.08$). See Figure 1 for graphs describing manipulation group averages. Additionally, participant performance on the clerical editing task either before or after the break was not statistically different between conditions.

Figure 1: Descriptive Results for Manipulation Checks
Table 2: *Descriptive Statistics across Conditions*

<table>
<thead>
<tr>
<th>Condition</th>
<th>Mastery break</th>
<th>Relaxation break</th>
<th>No break</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td><strong>Manipulation Checks</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arousal (Restless/Calm)</td>
<td>68</td>
<td>4.09&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1.05</td>
</tr>
<tr>
<td>Competence (Incomp./Competent)</td>
<td>68</td>
<td>4.12&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.92</td>
</tr>
<tr>
<td><strong>Hypothesis Measures</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Performance</td>
<td>68</td>
<td>54.79&lt;sup&gt;a&lt;/sup&gt;</td>
<td>21.64</td>
</tr>
<tr>
<td>Psychological Detachment</td>
<td>68</td>
<td>2.94&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.98</td>
</tr>
<tr>
<td>Affect (Good/Bad)</td>
<td>68</td>
<td>1.72&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.77</td>
</tr>
</tbody>
</table>

*Notes. Arousal* is the a state measure ranging from 1(*restless*) to 5(*calm*) adapted from Bradley & Lang, 1994 and Kervyn, Fiske, & Yzerbyt, 2013; *Competence* is a state measure ranging from 1(*incompetent*) to 5(*competent*) adapted from Bradley & Lang, 1994 and Kervyn, Fiske, & Yzerbyt, 2013; *Performance* is the frequency of correct responses on the post-break clerical editing task and mean differences were tested controlling for pre-break performance; *Psychological Detachment* is adapted from the Sonnentag & Fritz Recovery Experiences Questionnaire; *Affect* is the a state measure ranging from 1(*good*) to 5(*bad*) adapted from Bradley & Lang, 1994 and Kervyn, Fiske, & Yzerbyt, 2013; Means within a row that do not share a subscript differ significantly (*p* < .05).

The statistical tests of manipulation checks do not fully support our initial design of the break activities. However, the descriptive patterns of the data were examined in Figure 1. Importantly, I expected those in the relaxation condition to, on average, report feeling more calm, not more restless, on the arousal measure because it is lowest in effort. This suggests that individuals in the relaxation condition were less calm than those in the no break and the mastery condition, descriptively. However, scores on the competence measure descriptively supported the expected pattern, where those in the mastery condition (who received bogus positive feedback about their performance) felt most competent compared to the relaxation and the no break conditions.
Hypothesis 1 stated that individuals taking micro-breaks (mastery or relaxation) would perform better on the clerical work task than those without a break. Pre-break performance on the first half of the clerical editing task was treated as a covariate, and post-break performance on the clerical editing task was treated as the performance dependent variable. An ANCOVA showed that the post-break performance for participants who received either type of break \((M = 53.02, SE = 22.38)\) was significantly better than those who did not receive a break \((M = 49.63, SE = 21.61)\), \(F(1,198) = 8.79, p < .001\) when controlling for pre-break performance (H1 supported). Additionally, the interaction between pre-break performance and condition when predicting post-break performance was nonsignificant, such that the relationship between pre-break and post-break performance did not change depending on condition.

Hypothesis 2 stated that both break conditions (mastery and relaxation) would increase self-reported recovery experienced more than the no break condition. A one-way ANOVA suggested the groups differed on the psychological detachment measure, \(F(2,200) = 18.04, p < .001\), such that individuals who received a mastery or relaxation break scored higher on the psychological detachment measure \((M = 2.93, SD = 0.98 \text{ and } M = 2.51, SD = 0.92, \text{ respectively})\), compared to those who did not receive a break \((M = 2.03, SD = 0.77)\). For psychological detachment, planned contrasts compared the no break condition to the two break conditions using weights of \([-1, .5, .5]\), respectively, which also demonstrated that micro-break participants reported more psychological detachment \((M = 2.72, SD = 0.95)\) than those without a micro-break \((M = 2.03, SD = 0.92; t(198) = 5.61, p < .001)\). However, another one-way ANOVA suggested the groups were not significantly different on positive affect, \(F(2,200) = 1.26, p = 0.29\) (H2 partially supported). See Table 2 for descriptive statistic details for all conditions and outcome measures.
Hypothesis 3 stated that the effect of micro-breaks on performance would be mediated through (a) psychological detachment and (b) positive affect. To test the differences between the two proposed indirect effects of breaks on performance after accounting for multiple mediators, I used Process Model 7 (Hayes, 2013). This bootstrapping approach to hypothesis testing for multiple mediators was a better test of the path differences than a SOBEL test because indirect paths may not be normally distributed. However, neither positive affect ($b^* = .00, b = -.00, SE = .11, 95\% CI = -.23, .23$) nor psychological detachment ($b^* = -.01, b = -.40, SE = .62, 95\% CI = -1.81, .71$) indirect effects were supported for the relationship between the break conditions and subsequent task performance (H3 not supported). See Figure 2 below for specific model details. Overall, these data suggest that micro-breaks indeed resulted in improved task performance and within-task recovery, but only affected psychological detachment processes. There was no effect of micro-breaks on positive affect compared to a no-break group.

Figure 2: *Results for Hypothesis 3*

*Notes.* Standardized regression coefficients are italicized following unstandardized regression coefficients for each separate path. The unstandardized and standardized regression coefficients between break condition and performance, controlling for psychological detachment and positive affect, is in parentheses. Indirect effects for tested mediator variables are reported within their respective boxes. *Indicates the true regression coefficients are within an interval that does not include zero*

I also explored differences between mastery and relaxation breaks. Hypothesis 4 stated that mastery breaks would result in increased performance compared to relaxing breaks. An
ANCOVA suggested the two groups did not differ significantly on post-break performance when controlling for pre-break performance, $F(2,200) = 0.77, p = 0.38$ (H4 not supported).

Hypothesis 5 stated that mastery breaks would increase self-reported recovery experienced more than relaxing breaks. A one-way ANOVA suggested the groups differed on the psychological detachment measure, $F(2,200) = 18.04, p < .001$. Planned contrasts comparing the mastery break condition and the relaxation break condition [0, -.5, .5] on self-reported recovery, suggested that mastery micro-breaks resulted in higher psychological detachment reports ($M = 2.94, SE = 0.98$) than the relaxation micro-breaks ($M = 2.52, SE = 0.91$; $t(198) = 2.73, p < .001$; H5 supported). See Table 2 for descriptive statistics across conditions.

Last, Hypothesis 6, examined whether the effect of mastery versus relaxation micro-breaks on performance was mediated through psychological detachment. Again, I tested this mediation hypothesis using Process Model 4 (Hayes, 2013), to use bootstrapping to examine the differences between the specific indirect effect and the direct effect of mastery (vs. relaxation) breaks on performance accounting for psychological detachment. Psychological detachment did not mediate performance effects due to micro-break type ($b^* = -.01, b = -.58, SE = .57, 95\% CI = -2.26, .19$; H6 not supported). Thus, although mastery breaks resulted in more psychological detachment than relaxation breaks, it did not translate into performance differences based on micro-break type. See Figure 3 for specific model details.
Figure 3: Results for Hypothesis 6

Notes. Standardized regression coefficients are italicized following unstandardized regression coefficients for each separate path. The unstandardized and standardized regression coefficients between break condition and performance, controlling for psychological detachment, is in parentheses. The indirect effect for psychological detachment is reported within the box. *Indicates the true standardized regression coefficient is within an interval that does not include zero.
CHAPTER 4
GENERAL DISCUSSION

This study examined whether or not mastery and relaxation micro-breaks lead to recovery within a single task. The reason that micro-breaks have received limited attention in the past is because traditional recovery scholars focus on recovery outside of work, where disengaging from work thoughts while physically removed from work is fundamental to the recovery process (Sonnentag & Fritz, 2007). However, with theoretical support from basic work stress and recovery models (e.g., Hobfull, 1989; Meijman & Mulder, 1989), I suspected recovering throughout the work day in attempt to proactively mitigate fatigue is possible. Also, existing within-work day recovery findings suggest some breaks (e.g., learning something new) are related to increased vitality, but employees are not successful in picking the right activities (Trougakos et al., 2008). Thus, underlying recovery experiences influence recovery outcomes with or without physical removal from the workplace (Sonnentag, Venz, & Casper, 2017).

The current study experimentally tested theoretically inspired micro-break activities during a monotonous work task to examine not only if within-task recovery is possible, but what variables potentially caused differences in short-term recovery outcomes (e.g., performance). In line with hypotheses, the results suggest that taking either a relaxation or mastery micro-break results in better subsequent task performance than a no-break condition. Regardless of break type, performance on average benefits from taking even a short, 40s break. However, the effect
of micro-breaks on task performance was not mediated through either psychological
detachment or positive affect as expected, even though both micro-breaks boosted psychological
detachment.

The second goal of the study was to examine the differences in recovery and performance
outcomes between two types of breaks: a high effort, positive break (mastery) and a low effort,
positive break (relaxation). In this aim, contradictory findings exist in regards to what break
activities result in the best recovery outcomes. There is a controversial supposition that “rest”
activities are more beneficial to recovery than “chores” or effortful activities (Trougakos et al.,
2009; Rook & Zijlstra, 2006). This comparison itself may be problematic because core recovery
experiences (namely psychological detachment and positive affect) are not always accounted for
when comparing traditional respite activities with effortful activities. The current study measured
recovery experienced within relaxation and mastery experiences in attempt to gain insight into
specifically what is causing recovery to occur. By manipulating mastery and relaxation activities,
and measuring subsequent psychological detachment and positive affect, this study tested
whether better recovery experiences can be achieved via mastery than relaxation, and why.

Confirming expectations, mastery micro-breaks resulted in more psychological
detachment from the main work task. However, the data did not support our hypothesis that
individuals who took a mastery micro-break would perform (on average) better after the break
compared to those who took a relaxing break. Given that a mastery micro-break resulted in more
detachment than a relaxation micro-break—with with equivalent performance benefits—more
work should include mastery activities in exploring within-task recovery during the workday.
Limitations and Future Directions

The interpretation of the data is limited by a lack of statistical support for the manipulation check measures. Both micro-breaks were theoretically inspired and designed based on their levels of two factors: mastery experiences boost competence, and relaxation experiences are calming (Sonnentag & Fritz, 2007). It was a goal of this design to measure both of these experience types immediately after the micro-breaks, to test if recovery activities influenced the anticipated recovery experiences. However, the manipulation check measures of state competence and state arousal did not significantly differ between the conditions. This resulted in a lack of clarity around intervening mechanisms that explain the relationship between breaks and performance. This also provides challenges when making inferences about specific types of recovery experienced during these breaks. Thus, although the pre-test of these break types provided some support that individuals performing such tasks would experience what I expected, the state measures in the main study did not support that conclusion.

Importantly, given both breaks did enhance subsequent performance, there is still reason to believe participants received motivational gains (e.g., competence) and/or demand reduction (e.g., relaxation). It may be the case that the adapted measures for state competence and state arousal were not precise. Both measures were significantly negatively skewed, where almost all participants reported feeling competent (the extreme end of the incompetent/competent scale), and feeling calm (the extreme end of the calm/restless scale). Thus, restriction of range may present difficulty in testing these variables as measures sensitive to detect state competence and state arousal. Another difficulty with interpreting the responses is that state measures may not have provided enough context for individuals to provide accurate momentary self-reports. Thus, the stem “currently I feel…” may not have provided a clear object to which respondents can
form an attitude (Eagly & Chaiken, 2005), thus resulting in a lack of sensitivity to actual state differences.

Relatedly, it is possible that self-report measures for underlying psychological processes might measure perceptions rather than actual substantive outcomes (Sonnentag et al., 2017). In the future, momentary recovery and underlying psychological processes could be explored using measures more sensitive to small changes in processing rather than perceptions. This is especially important because individuals are not accurate in selecting breaks they believe will benefit their performance (Trougakos et al., 2008), which might be why the relationship between recovery outcomes and self-reported recovery experiences were not always related the way I expected.

Additionally, although the scope of the conclusions from this study is limited to taking breaks from monotonous work tasks, the conclusions can be applied to a large array of job tasks. Understanding within-task recovery from monotonous, vigilance tasks is relevant for many occupations such as human operators (Jung et al., 1997), assembly line work, and office jobs, as well as many tasks that are common to various jobs (e.g., editing, data entry, attentional alertness tasks). However, in the future, it might be useful to explore the different types of work that cause fatigue. In understanding what individuals are recovering from, we might better direct which experiences or activities are most effective in returning to pre-stressor levels of functioning (Pribram & McGuiness, 1975). It may be the case that the benefits from the micro-breaks on performance in this study do not generalize to recovery from other types of fatigue. Fatigue depends on characteristics of the individual or characteristics of the work itself (Demerouti et al., 2001). For instance, some individuals high in neuroticism are, on average, going to have higher arousal than those low in neuroticism, thus may benefit more from a relaxing break compared to
a mastery break regardless of recovery experiences. Further, different work tasks might inherently require different recovery experiences (e.g., mastery or relaxation). Although this study demonstrated that mastery micro-breaks facilitate more psychological detachment than relaxation micro-breaks, there may be reason to believe other recovery experiences may be more important depending on what individuals are recovering from. However, in an hourly survey study, researchers did find evidence that micro-breaks in general (collapsed across all types) increased vitality and decreased fatigue within the work day across various occupational roles (e.g., finance, HR, marketing, administration; Zacher et al., 2014).

According to the Job-Demands Resource model (Demerouti et al., 2001), different work tasks may involve different psychological demands. Being that people recover from job demands when the functional systems that have been continuously challenged during work tasks are relieved (Meijman & Mulder, 1998), breaks from work must involve activities that allow for employees to recover from the specific task that depleted them in the first place. Therefore, if different work tasks demand effort from different functional systems, one would presume they necessitate different recovery needs. Stressful work tasks, for instance, require executive function resources, as they are high in arousal and demanding on cognitive focus. On the other hand, boring monotonous work tasks require persistence and motivation to resist impulses (Baumeister et al., 1998), and they produce negative affect (Watson, Wiese, Vaidya, & Tellegen, 1999). In general, boring work tasks deplete motivation whereas stressful work tasks deplete executive functioning (e.g., planning, critical thinking and focus). Both work task types are negative, but the difference is that boring tasks result in feelings of fatigue, characterized by negative low arousal, whereas the stressful tasks result in feelings of negative activation, characterized by high arousal (Watson & Clark, 1994; Watson, et al., 1999). Therefore, we can
presume that different work tasks require qualitatively different demands thus might benefit from different types of micro-breaks. Specific recovery needs should direct recovery activities in future research.

Lastly, it is important to mention the lack of performance differences found between break activities. Mastery micro-breaks and relaxation micro-breaks did not result in different performance outcomes (although both were better than having no break). This may suggest that at least these two types of breaks may, in fact, be created equal with respect to performance. However, it may be the case that the design did not critically test the different break activities. For instance, the 40s length of the micro-breaks used in this design was chosen to replicate a similar within-task recovery study (Lee et al., 2015). A longer break might be necessary to allow for differential effects of various break types (mastery vs. relaxation). Also, both break types were pre-tested to be similar in levels of positive affect. If positive affect is more influential on performance outcomes than psychological detachment for within-task recovery, it would make sense that both break types resulted in similar performance boosts. If this were the case, the current study would have failed to test differences in experiencing positive affect while taking a break versus not taking a break, perhaps because of the lack of sensitivity in the measures used.

Using a laboratory experiment, this study tested the effects of micro-break activities on subsequent task performance outcomes and suggested that micro-breaks improved task performance and facilitated within-task recovery (i.e., psychological detachment). Such work is vital to the current recovery research, which tends to use more non-experimental methods and has a focus on recovery activities outside of work. However, the underlying processes explaining these effects are still unknown. The replenishing processes (e.g., competence) and demand reduction processes (e.g., arousal) that were measured using single state items did not differ
across individuals who received a break and those who did not. They also did not differ between individuals who took different types of breaks. Also, although groups differed on self-report measures of psychological detachment, it did not mediate the relationship between break assignment and subsequent task performance. There was also no effect of micro-breaks on positive affect compared to a no-break group. This suggests that micro-breaks can facilitate recovery, in terms of detachment, but more work should be done to explore these processes more precisely with respect to positive affect.

Also, mastery micro-breaks resulted in more psychological detachment than relaxation micro-breaks. Such findings correspond with expectations that effortful activities are more “attention capturing” than relaxing ones. However, this difference did not translate into performance differences based on micro-break type. This suggests that the different micro-break activities were not meaningfully different in regards to performance outcomes. These results build on existing recovery theories by further demonstrating within-task recovery, and suggest future work should include mastery activities in exploring recovery during the workday. Using research on micro-breaks is important for learning how to manage workplace performance based on work recovery models (e.g., Hobfoll, 1989; Meijman & Mulder, 1989). The negative stigma behind taking work breaks should be corrected (Zacher et al., 2014), and more research supporting workday breaks will advocate for employee health by demonstrating the productivity benefits that result from recovery.
REFERENCES


APPENDIX A

MAIN STUDY RECRUITMENT
**Recruitment Script (to be distributed by SONA)**

We invite you to participate in a study titled “Work Simulation Activities.” Your participation in this study will involve the completion of a clerical task, a small break activity, and a few measures of how you feel. Your entire participation will not exceed 60 minutes. You will receive two (2) research credits for participation via the SONA system. The risks to you as a participant are minimal. You must be 18 years old or older to participate.

**Recruitment Script (to be distributed by Instructors)**

We invite you to participate in a study titled “Work Simulation Activities”. Your participation in this study will involve the completion of a clerical task, a small break activity, and a few measures of how you feel. Your entire participation will not exceed 60 minutes. The risks to you as a participant are minimal. You must be 18 years old or older to participate. You will receive course credit in your class based on your instructor’s discretion.
APPENDIX B

MAIN STUDY CONSENT
Recruitment Statement for Research Participation

I invite you to participate in a research study entitled, “Work Simulation Activities”. The purpose of this study is to understand how to perform your best on clerical activities. Only individuals who are 18 years of age or older and are comfortable with English are eligible for participation for course credit. Topics covered in this study include demographic information, state measures of how you feel, and evaluation of editing performance.

Your participation in this study will involve the completion of a clerical task, a shorter unrelated activity, and a few measures of how you feel. Your entire participation will not exceed 60 minutes. Individuals enrolled in PSYC 102 will receive two (2) research credits for participation via the SONA system. For participants in other courses, course credit may vary based on instructor discretion. The risks to you as a participant are minimal. Loss of confidentiality has been mitigated by not collecting your name at any time.

The results of this study may be published in scientific research journals or presented at professional conferences. However, your record will remain confidential and data will be reported in the aggregate. For your participation, you will be provided three course credits for fully completing the requests. However, your participation may benefit society by allowing the researcher to understand the relationship between breaks and performance.

Your participation is voluntary; therefore, you may choose not to participate or skip questions you are not comfortable with answering. If you decide not to participate, there will not be a penalty to you or loss of any benefits to which you are otherwise entitled. You may withdraw from this study at any time. If you have any questions or concerns about your rights as a research participant, you may contact the Northern Illinois University Office of Research Compliance (815-753-8588). If you have questions about this research study, you can contact the principal investigator below:

Amanda Conlin
I/O Social Graduate Student
Department of Psychology
Northern Illinois University
(630) 605-0800
Aconlin1@niu.edu

Larissa Barber
Assistant Professor/Faculty Advisor
Department of Psychology
Northern Illinois University
lbarber@niu.edu

I understand the above and grant my consent to participate:

__________________________________________________________
Name

__________________________________________________________
zid
APPENDIX C

PERFORMANCE TASK INSTRUCTIONS
Instructions for all participants: In a few moments, you will begin a clerical editing task. To perform well, you must make corrections (click on) all target letter combinations of “es” that follow the letter “l”. In this text document, simply use your mouse to CLICK ON the letters you wish to “correct”, per instructions. Take your time with this task. You will have 20 minutes in total to make progress on this document. The screen will automatically ask you to switch tasks for a short break in the middle of the 20-minute work session.

Feedback after task completion: Thank you for completing the main task in this study. Please continue on the following screen to answer some questions about yourself.
APPENDIX D

BREAK INSTRUCTIONS
Mastery break stimuli

*Anagram Task Instructions:* Please take a moment to perform a task. In the space below, CLICK on the words that can be made from the letters in the following word: “ANIMALS”. Continue until 40 seconds is up. This short time will serve as a break from the clerical editing task.

*Anagram Task Feedback:* Great job. You performed better than 90% of your peers on this task (advanced level). Please continue with the work simulation task.

Relaxation break stimuli

*Green Roof Instructions:* Please take the next moment to look at the photo on the following screen. Continue until 40 seconds is up. This short time will serve as a break from the clerical editing task.

*Green Roof Feedback:* Please continue with the work simulation task.
APPENDIX E

STATE RECOVERY MEASURE AFTER MICRO-BREAK
State Recovery (Bradley & Lang, 1994; Kervyn, Fiske, & Yzerbyt, 2013)

Currently I feel...

1. I forgot about the clerical editing task
2. I didn’t think about the clerical editing task at all
3. I got a break from the demands of the clerical editing task

Recovery Experiences (Sonnen-tag & Fritz, 2007)
Please respond to the following questions regarding how you felt during the last activity. 1 (I do not agree at all) to 5 (I fully agree)

1. I forgot about the clerical editing task
2. I didn’t think about the clerical editing task at all
3. I got a break from the demands of the clerical editing task
APPENDIX F

GENERAL SURVEY AFTER TASK COMPLETED
State Recovery (Bradley & Lang, 1994; Kervyn, Fiske, & Yzerbyt, 2013)

Currently I feel...

Recovery Experiences (Sonnentag & Fritz, 2007)
* Modified for task (original wording in italics)
Please respond to the following questions regarding how you felt during your entire work session.
Response Options: (I do not agree at all) to 5 (I fully agree).
1. I forgot about the clerical editing task
   a. I forgot about work
2. I didn’t think about the clerical editing task at all
   a. I don’t think about work at all.
3. I got a break from the demands of the clerical editing task
   a. I get a break from the demands of work.

Demographics:
1. Age:
2. Gender: (Male/Female)
3. Race: (White/African American/Hispanic/Asian/Other)
4. Student status: (First year/Second year/Third year/Fourth year)
5. ACT Score (or SAT):
6. Please rate your comfort with reading and understanding English: (Low/Moderate/High)
Participant Engagement Questions (Meade & Craig, 2012):

Lastly, it is vital to our study that we only include responses from people that devoted their full attention to this study. Otherwise years of effort (the researchers’ and the time of other participants) could be wasted. You will receive credit for this study no matter what, however, please tell us how much effort you put forth towards this study.

Response Options: 1 (almost no) 2 (very little) 3 (some) 4 (quite a bit) and 5 (a lot of)

1. I put forth ____ effort towards this study

Also, often there are several distractions present during studies. Please indicate how much attention you paid to this study. Again, you will receive credit no matter what. We appreciate your honesty!

Response Options: 1 (almost no) 2 (very little of my) 3 (some of my) 4 (most of my) and 5 (my full)

2. I gave this study ____ attention
Response Option: 1 (yes) or 2 (no)

3. In your honest opinion, should we use your data in our analyses in this study?
Thank you for participating in this study.

Today you completed a 20 minute work simulation task (clicking on letters to simulate editing) while taking a small break in the middle. The purpose of this study was to identify which types of breaks during monotonous tasks are most effective in recovering resources. You were randomly assigned to one of three conditions: no break, mastery break (Anagram game), or relaxing break (green roof picture). We were trying to measure which of these conditions would enable the best performance on a monotonous task because some are thought to be better at enabling recovery from fatigue than others. Research on recovery suggests mastery breaks may be more replenishing of resources (i.e., mastering a challenge) than relaxing breaks (e.g., staring at a relaxing green rooftop). We predicted that those in the active break condition would perform better on the main clerical task than those with no break or with a passive break because they were better able to recover resources during the break.

If you are interested in this topic, we recommend that you read the following:


We would like to remind you that this is an ongoing study that will continue to run throughout the remainder of the semester. For this reason, we ask that you DO NOT discuss the experiment with anyone other than the researchers. WHATEVER HAPPENS IN THE LABORATORY STAYS IN THE LABORATORY.

Now, this is a little extreme. In reality, there are people (who are not fellow NIU students) to whom you can speak about the research in which you participate. Remember, any student who participates in an experiment should do so without detailed foreknowledge of the experimental procedure. Hence, please do not describe such details to people who might later sign up for the study and participate in it, as we will be conducting this study for a few semesters.

We are emphasizing this rule because some of the NIU psychology researchers did a study showing that people did talk to each other about the experiments. It did not happen much, but it happened enough that it caused the researchers to be worried about it. Remember, we are trying to conduct good scientific research, and at the same time, trying our best to make the experiments educational for you. For us to achieve both of these goals, we need you to not divulge details about experiments to other people in PSYC 102 after you are told about them. Thus, please follow this rule with respect to other PSYC 102 students.

Thank you for taking part in this project. If you have more questions about the study, please feel free to contact the primary investigator, Amanda Conlin at aconlin1@niu.edu or the faculty advisor, Dr. Larissa Barber at lbarber@niu.edu.
This verifies participation in Syllabus Information and Instructor Perceptions experiment of NIU Students.

The Experiment is worth two (2) research credits in Introductory Psychology (PSYC 102).

The date of the session was ____________ and the time was ____________.

Participant Name: _____________________________________________________

Experimenter Signature: ________________________________________________
APPENDIX H

PRE-TEST RECRUITMENT STATEMENT AND INFORMED CONSENT
Informed Consent: Perceptions of Work Break Activities

We invite you to participate in a research study entitled, “Perceptions of Work Break Activities”. This study is conducted by Amanda Conlin and Dr. Larissa Barber in the Department of Psychology at Northern Illinois University. The purpose of this study is to understand how people perceive various types of work breaks after working on other types of tasks.

**Eligibility Requirements:** Only individuals who are 18 years of age or older and are comfortable with English are eligible for participation for course credit.

**Procedures:** Your participation in this study will involve an online survey that asks you to rate 20 work break activities on how they would make you feel. You will also report some demographic information. This study should take you 5-10 minutes to complete.

**Compensation:** You will be provided one SONA credit for fully completing the study.

**Non-Participation Statement:** Your participation is voluntary; therefore, you may choose not to participate or skip questions you are not comfortable with answering. If you decide not to participate, there will not be a penalty to you or loss of any benefits to which you are otherwise entitled. You may withdraw from this study at any time.

**Risks/Discomfort, Confidentiality, and Publication Statement:** The risks to you as a participant are minimal. Loss of confidentiality has been mitigated by not collecting your name at any time. The results of this study may be published in scientific research journals or presented at professional conferences. However, your record will remain confidential and data will be reported in the aggregate. If you have any questions or concerns about your rights as a research participant, you may contact the Northern Illinois University Office of Research Compliance (815-753-8588). If you have questions about this research study, you can contact the principal investigator or faculty advisor below:

Amanda Conlin  
I/O Social Graduate Student  
Department of Psychology  
Northern Illinois University  
(630) 605-0800  
Aconlin1@niu.edu

Larissa Barber  
Assistant Professor/Faculty Advisor  
Department of Psychology  
Northern Illinois University  
lbarber@niu.edu

I understand the above and grant my consent to participate:

NO “I do not agree”  YES “I agree”

*Exit Survey*  *Continue with Survey*
APPENDIX I

PRE-TEST GENERAL SURVEY
Break activity tasks (McFall et al., 2009; Fritz, Lam & Spreitzer, 2011; Lee et al., 2015). Please imagine you are working hard at a school or work related task. You decide to take a break from the task and focus for a short time on a different activity. Rate how each of the following activities would make you feel.

1. Winning a computer game where you unscramble words
2. Playing a computer game where you unscramble words
3. Checking your e-mail
4. Making a to-do list
5. Talking to a co-worker or peer
6. Talking to your boss or teacher
7. Cleaning your desk or work space
8. Making a phone call
9. Venting about a problem
10. Reflecting on the meaning of your work
11. Offering to help someone
12. Check and update your schedule
13. Commenting on a friend’s Facebook timeline
14. Setting a new goal
15. Thinking about what gives you joy at school or work
16. Learning something new from a blog post
17. Responding to a message on Facebook
18. Responding to a large batch of emails
19. Looking out the window at nature
20. Looking out the window at a concrete roof
APPENDIX J

PRE-TEST DEBRIEFING STATEMENT
Study Completion Information

Thank you for participating in this study. Please enter your ZID below so that we may assign you credit in SONA.

ZID: ____________________________

The purpose of this study was to identify which types of breaks are perceived as more effective for recovery experiences. We are validating a measure of state recovery by using the scales with pictures of how one may feel at a given time. Research on recovery has validated scales of the extent to which one has “recovered” from work, but no measures have been aimed at measuring state levels of recovery. If you are interested in this topic, we recommend that you read the following: Bradley, M. & Lang, P.J., (1994). Measuring emotion: The self-assessment manikin and the semantic differential. *Journal of Behavior, Theory, and Experimental Psychiatry, 25*(1), 49-59.

Thank you again for taking part in this project. If you have more questions about the study, please feel free to contact the primary investigator, Amanda Conlin (aconlin1@niu.edu) or the faculty advisor, Dr. Larissa Barber (lbarber@niu.edu).