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Burkland, Derek S. ***The Effects of Taking a Short Break: Task Difficulty, Need for Recovery and Task Performance***

Abstract

This study examined whether or not *task difficulty* has influence on the effectiveness of break taking, specifically by measuring task performance. Undergraduate psychology students (N = 113) at a mid-sized Mid-western University engaged in a 30-45 minute experimental task of solving either difficult or easy anagrams with a break at the midpoint. Control groups did not receive a break. This study posited that participants working on a difficult task will report a higher need for recovery compared to individuals working on an easy task, and participants working on a difficult task will experience a greater gain in performance following a short 6-minute break than participants working on an easy task. It was concluded that individuals in the easy with break condition (versus difficult with break) benefited more in task performance from taking a break, and all individuals, regardless of task difficulty, indicated a need for recovery.

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Chapter I: Introduction

There has been a resurgence of research on work breaks during the past two decades that focuses on worker recovery (e.g., Boucesin & Thum, 1997; Fritz & Sonnentag, 2006; Sonnentag & Natter, 2004; Taylor, 2005; Trougakos, Beal, Green & Weiss, 2008; Tucker, 2003). Work breaks are one method of recovery, and are important because they have the ability to replenish resources and increase worker productivity (Tucker, 2003). Moreover, break-taking and respites (used interchangeably throughout this paper) have been positively associated with well-being (Fritz & Sonnentag, 2005; 2006; Sonnentag, 2001; Sonnentag & Bayer, 2005; Sonnentag & Natter, 2004), recovery (Boucesin & Thum, 1997; Flesten, 2009; Fritz & Sonnentag, 2006; Krajewski, Wieland & Sauerland, 2010; Sonnentag, 2003; Sonnentag & Zijlstra, 2006) and health (Taylor, 2005). In contrast, break-taking and respites have been negatively associated with fatigue (Boucesin & Thum, 1997; Konz, 1998; Strongman & Burt, 2000; Tucker, 2003; Westman & Eden, 1997) and burnout (Fritz & Sonnentag, 2006; Sonnentag, Binnewies & Mojza, 2010; Westman & Eden, 1997; Westman & Etzion, 1995; 2001).

While a useful place to start, we, at present, lack information concerning the circumstances under which a brief break is more or less valuable. The relationship between work breaks and performance/productivity is mixed, in that research has sometimes shown positive (Beeftink, van Erde & Rutte, 2008; Berman & West, 2007; Fritz & Sonnentag, 2005; 2006; Henning, Bopp, Tucker, Knoph, & Ahlgren, 1997) and sometimes null (Berman & West, 2007; Faucett, Meyers, Miles, Janowitz, & Fathallah, 2007; Lisper & Eriksson, 1980; McLean, Tingley, Scott & Rickards, 2001; Paulus, Toshihiko Nakui, & Putman, 2006; Trougakos et al., 2008) associations. This study contributes to the literature by examining whether or not *task*

difficulty can help explain why breaks are only sometimes related to increases in performance and productivity.

Chapter II: Literature Review

Conservation of Resources (Self-Regulation) Theory. The limited resource model of behavior regulation provides a framework from which to think about daily work behaviors and how to maintain resources. This theory states that the constant regulation of behavior depletes regulatory resources (Baumeister, Bratslavsky, Muraven, & Tice, 1998; Muraven & Baumeister, 2000; Trougakos & Hideg, 2009). Stated another way, people cannot fully engage in tasks using all of their resources in every situation because resources diminish as they use them. Thus, people's bodies need to recover in order to perform at optimum levels.

Ego depletion is the term used to describe the phenomenon in which people's resources are diminished. Baumeister and Tice (1998) define ego depletion as, "a temporary reduction in the self's capacity or willingness to engage in volitional action (including controlling the environment, controlling the self, making choices, and initiating action) caused by prior exercise of volition" (p. 1253). In other words, exerting effort towards a task takes some form of energy, and subsequent work tasks results in lower individual energy levels. In support of this assertion, Baumeister and Tice (1998) conducted four experiments, one of which required participants to suppress (or not suppress) their emotions while watching a sad or funny film, and then perform an anagram task. They predicted that suppressing emotions would deplete an individual's resources. Those that suppressed their emotions had significantly lower task performance, which confirms that ego depletion can be detrimental to subsequent performance.

Moller, Deci and Ryan (2006) expanded research on ego depletion by examining an individual's choice on time spent on a task, and performance. They conducted three separate experiments in order to expand the literature on ego-depletion, specifically manipulating controlled versus autonomous (chose what task to work on) choices while measuring

participants' respective performance levels. The results indicated that individuals in the autonomous-choice condition performed better in all three experiments, and exerted more effort on the tasks. Additionally, Baumeister and Tice (1998) concluded that people have limited resources when making choices, and individuals draw on those same resources for self-control. Therefore, individuals may need breaks in order to make decisions, especially difficult decisions.

It is essential to consider the limited resource model when examining the effects of recovery during a break (Baumeister & Tice, 1998; Tice, Baumeoster, Shmieli & Muraven, 2007; Trougakos et al., 2008). Recovery can be defined as, "… the process during which an individual's functioning returns to its pre-stressor level and in which strain is reduced" (Sonnentag & Natter, 2004, p. 368). All employees engage in daily routines, and they use both their physical and mental resources in order to complete their work tasks. Most employees do not work continuously throughout the workday, and as allowed by many state laws, employees are often allowed to take breaks (e.g., smoke breaks, bathroom breaks, lunch breaks, exercise breaks) throughout the day in order to replenish their resources. In fact, as the literature on ego depletion suggests, most employees would not be able to work throughout the entire day without taking a break because they do not have the concentration or energy to do so.

The premise of the conservation of resource (COR) model is that people conserve and save their energy so that they have the resources available to expend when they deem necessary (Hobfoll, 1989). This theory assumes that individuals have a limited amount of resources at their disposal, and individuals strive to preserve, guard, and build resources that threaten these resources. The COR model suggests that when individuals are <u>not</u> confronted with stressors, they strive to increase their current resources in order to preclude future resource loss (Hobfoll, 1989). Additionally, COR assumes that resources are lost when individuals engage in stressful

work, and that the resources must be recovered (Sonnentag & Natter, 2004). Thus, if an individual depletes his or her resources and has not gained any additional resources, he or she will become stressed. Most importantly, COR posits that individuals need time off (i.e., a break) in order to replenish the resources lost (Sonnentag, 2001). Additionally, the limited resource model predicts that individuals will perform worse at the end of a task (without a break) compared to the beginning since they tap into their limited self-control (Muraven & Baumeister, 2000).

Resources and Stress. As mentioned above, the presence or absence of stressors is related to the gain or loss of mental resources. Specifically, when people use their resources, they may become stressed, and the experience of stress can cause individuals to deplete additional resources (Trougakos et al., 2008; Eden, 1990; Westman & Etzion, 1995; 2001). Individual resources play a vital role in energizing individuals' mental and physical strength, so that they may engage in daily activities with replenished resources (Sonnentag & Zijlstra, 2006). Stress may stem from many sources (e.g., work overload, time pressure, and crossover of stress from a coworker). Westman and Etzion (2001) stated that job demands that surpass individual resources are one cause of stress, and this is of particular interest to the current study because within-day work tasks that are difficult or multi-faceted may deplete an individual's resources more than job tasks that are low in difficulty. Additionally, Westman and Etzion (2001) stated that stress may be one reason for absence in the workplace. The authors found that a vacation from work decreased individual stress levels compared to stress levels prior to his or her vacations, which further supports the notion that breaks facilitate recovery.

Individuals that engage in difficult work activities experience high levels of stress (Greiner, Krause, Ragland & Fisher, 1998; Westman & Etzion, 2001; Wright & Cropanzano,

1998). For instance, Greiner et al. (1998) found that individuals in a high stress group were more likely to be absent from work compared to individuals in a low stress group. This finding is similar to Westman and Etzion (2001), who found that absenteeism, six weeks after workers took a vacation, was lower than the pre-vacation rate of absenteeism. Another possible source of job stress, according to Eden (1990), is a critical job event. Eden (1990) examined individuals' feelings after their computer lab was forcibly shut down for two weeks. He concluded that critical job events aroused stress. However, a respite (vacation) from work, while their lab was shut down, was associated with lower stress levels. These finding shows that stress occurs throughout many episodes in an individual's daily activities, and taking a break (vacation) may ameliorate stress and temporarily restore depleted resources. Finally, Delahaij, van Dam, Gaillard and Soeters (2011) examined individual coping styles, and measured performance during an acute stress task. They found that during an acute stress task, task performance was degraded. That is, the stress experienced during a task can affect task performance.

Daily Work Experience as Episodic Behaviors. Beal et al. (2005) describes people's behaviors as a sequence of episodes (with an inherent theme) that revolve around specific people, occurrences, and goals. To expatiate, Beal et al. (2005) explains that an individual's behavior is constituted by the events that occur in his or her everyday life, and these events are called behavior episodes. For example, an individual's daily routine may consist of waking up, eating breakfast, taking the kids to school, going to work, taking a break from work, finishing work, picking the kids up from school, running errands, and returning home (Beal et al., 2005). Each of these events can be broken down into behavioral episodes. It is important to understand the concept of episodic behaviors if one wishes to research the benefits of recovery.

In order to understand why individuals need to recover, we need to consider available resources. According to the COR model, individuals have limited resources (Baumeister et al., 1998) and expend their resources when they engage in difficult tasks. Furthermore, individuals need to replenish their resources (recover) from tasks in order to engage in further tasks with restored energy (Hobfoll, 1989). The *need for recovery* can be defined as "a conscious emotional state characterized by a temporal reluctance to continue with the present demands or to accept new demands" (Sonnentag & Zijlstra, 2006, p. 331). In other words, people feel that they need to recover (or need a break) when they are either emotionally drained or mentally exhausted. Recovery is essential for people because they are constantly pursuing goals that require both physical and mental resources, and they need to fully engage in daily pursuits in order to achieve their goals. Sonnentag and Zijlstra (2006) found that engaging in work-related activities outside of work was positively related to need for recovery, and Sonnentag (2003) posited that the time spent on leisure activities affects the experience of the following work day. Clearly, individuals need to recover from their work tasks as their subsequent work-tasks will be affected.

Work Breaks. Work breaks are operationalized differently throughout the literature; they consist of breaks lasting anywhere from 2-10 minutes (Henning et al., 1996; Henning et al., 1997) up to 2-5 weeks (Fritz & Sonnentag, 2006; Westman & Eden, 1997). Broadly defined, work breaks are a period of time which the employee does not need to expend energy on work-related tasks (Trougakos & Hideg, 2009). As mentioned above, breaks of differing lengths of time have been investigated by others: vacations (Eden, 1990; Fritz & Sonnentag, 2006; Westman & Eden, 1997; Westman & Etzion, 2001;), weekends, and end-of-day breaks (Fritz & Sonnentag, 2005; Sonnentag, 2001; Sonnentag & Natter, 2004), and within-day breaks

(Boucesin & Thum, 1997; Henning et al., 1996; Henning et al., 1997; Trougakos et al., 2008; Tucker, 2003).

Long Breaks. The majority of work break studies fall in the vacation category (Eden, 1990; Fritz & Sonnentag, 2005; 2006; Westman & Eden, 1997; 2001). A vacation can be defined as, "a time off from work, [that] offers the chance to recover from work demands and to build new resources" (Fritz & Sonnentag, 2006, p. 936). Vacations are separate from other breaks because they last for a longer duration, usually one to five weeks. Most studies examining vacations use multiple self-reports in order to assess constructs such as burnout, resource depletion, performance, and fatigue. For example, Fritz and Sonnentag (2006) assessed task-performance (behaviors that are assigned as job requirements before and after a vacation period) and found that exhaustion levels decreased after the vacation. However, there was not a significant increase or decrease in self-reported measures of task performance. In sum, many vacation studies (Eden, 1990; Fritz & Sonnentag, 2005; 2006; Westman & Eden, 1997; 2001) show that a break from work (vacation) provided an opportunity for recovery. However, the recuperative effects of a vacation do not last more than a few weeks (Westman & Eden, 1997; Westman & Etzion, 2001). Thus, individuals need within-day breaks to recover from everyday stressors.

Similar to vacation research, weekend and end-of-day breaks focus on the experiences related to recovery. Leaving work provides one with the opportunity to engage in plethora of activities. However, many individuals still find themselves thinking about work-related activities even after leaving work. For example, Fritz and Sonnentag (2005) examined performance and social activity during employees' weekends. They categorized stressful outside-of-work activities as "nonwork hassles" (e.g., household chores). Nonwork hassles can be defined as a, "constellation of related and ongoing stressors experienced in day-to-day life"

(Lepore & Evans, 1996, p. 353). Fritz and Sonnentag (2005) found that nonwork hassles were negatively related to task performance. Also, they found that thinking about work tasks after the weekend was related to positive work reflection, and fewer nonwork hassles. This study is particularly important because performance was negatively related to stress, but when there was a work break (weekend) and an individual was involved with little nonwork hassles, the negative relationship between nonwork hassles and performance was mitigated. Research has shown that work breaks may moderate the relationship between stress and performance during weekends (Fritz & Sonnentag, 2005) and vacations (Fritz & Sonnentag, 2006).

Within-day Breaks. The focus of this study is on the relationship between *within-day* work breaks and performance, which has, up to this point, received far less attention in the literature. Note, however, that there has been considerable research covering exercising (booster breaks) as a within-day break (Taylor, 2005; 2011; Taylor, Shego, Chen, Rempel, Baun, Bush, & Hare-Everline, 2010). Within-day work breaks are separate from vacations and weekend and end-of-day breaks in that they focus on short (2-10 minute) breaks. The purpose of short work breaks is to get a quick respite from the immediate stress in order to replenish one's resources (Trougakos & Hideg, 2009; see Figure 1). Lisper and Eriksson (1980) conducted a study of participants driving for eight hours on a speedway. After four hours, participants had a 15 or 60 minute break either with or without food. Roughly every 20 minutes throughout the experiment, the participants were tested on their reaction times via auditory stimulus. Here, results showed that the duration of the break did not affect reaction time performance, but with food, there was a positive relationship between reaction time and performance. It may be that the participants who did not eat while taking a break were not able to mentally disengage from the task; therefore, they may not have recovered depleted resources during their break.

Similar to Lisper and Eriksson (1980), Henning et al. (1996) asked participants to engage in a computer typing task in which they typed a string of words, with one word spelled backwards. The participants were either in a fixed break condition (the break was chosen for them) or a discretionary break condition (the participant got to choose when to take a break). They concluded that a discretionary break helped participants minimize task disruption from short rest breaks.

In addition to examining productivity in the within-day break literature, studies such as Boucesin and Thum (1997) examined *physiological responses* before and after short breaks. For example, while Henning et al. (1996) focused on either a discretionary or fixed work break while measuring performance, Boucesin and Thum (1997) separated participants on a computer writing task to either a short break (7.5 minutes every 50 minutes) or long break (15 minutes every 100 minutes) condition, and measured fatigue. The participants typed a report on the novelty of a patent application, and this took one and a half to two days to complete. Boucesin and Thum (1997) concluded that the long break condition was more effective in reducing fatigue. Relatedly, McLean et al. (2001) tested participants completing an extensive typing task (4 weeks). They too, focused on physiological responses (neck, back pains), and the effects breaks had on muscular fatigue. McLean et al. (2001) concluded that microbreaks (or short breaks) had a positive effect on reducing discomfort in many areas (shoulders, back, neck, and forearm) from computer-related tasks. However, there was no evidence that discretionary microbreaks at 20-minute or 40-minute intervals showed any significant increase in worker productivity. This finding is consistent with results from previous studies (McLean et al., 2001).

Apart from *physiological recovery* after engaging in a break, the COR model posits that individuals need *psychological recovery* after engaging in a task (Hobfoll, 1989). Aside from the

ergonomics literature (which mostly measured *physiological recovery*), Trougakos et al. (2008) conducted one of the few experiments that examined within day break activities. Essentially, recovery was the moderating variable between break and individual resources, such that the stronger the recovery, the more resources an individual will recover. In support of this notion, Trougakos et al. (2008) examined the role of affective (positive and negative) displays in cheerleaders. They found that respites, versus chores, had a positive relationship with positive affective displays in performance. Respites, which are subsumed under the "break" category, can be defined as low-effort activities that help an individual relieve themselves from their daily burdens (Trougakos et al., 2008). In contrast to respites, chores are activities that involve higher self-regulation and are more effortful tasks (Trougakos et al., 2008). Additionally, they concluded that types of breaks individuals engage in during the day will affect their future reported emotions. Overall, the experiments in the within-day workplace have manipulated the duration of the work break, performance feedback, and they have measured task-performance, affective performance and reaction times.

Current Study. Existing research shows that there is not a clear relationship between within-day work breaks and task performance. Sometimes breaks are associated with performance gains, and other times, they are not. The model in the current study (see Figure 1) predicts relationships between a *task* (easy or difficult task), the need to recover after engaging in the task, and performance of the individual after he or she engages in the break.

The COR model assumes that individuals have a limited amount of resources at their disposal, and individuals strive to retain, protect, and build resources that threaten them (Hobfoll, 1989). Environmental circumstances (e.g., work tasks) are thought to cause the depletion of resources. Thus, regardless of the type of task, simply expending energy engaging in tasks is

associated with depleting resources (Baumeister & Tice, 1998; Moller, Deci & Ryan, 2006). The first hypothesis is a test of this part of the COR model:

Hypothesis 1: All participants experience a need for recovery.

However, it is possible that the need for recovery differs based on the amount of energy expended. In fact, Sonnentag and Bayer, (2005) concluded that as workload increases, the need for recovery increases. The COR model posits that individual resources may be restored when a break is taken, especially for tasks that are high in difficulty (Hobfoll, 1989; Westman & Etzion, 2001), which suggests that there may have been more need for a break in the first place. Westman and Etzion, (2001) concluded that the more difficult the job, the more likely an individual will miss work (which indicates need for recovery). Given the evidence, in addition to exploring overall need for recovery, I test the assumption that tasks which are more difficult deplete more individual resources than tasks lower in difficulty. Specifically, people working on difficult tasks will have greater need for recovery than those working on an easy task.

Hypothesis 2: Participants working on a difficult task will report a higher need for recovery compared to individuals working on an easy task.

Of potentially equal interest, is how task difficulty and break-taking relate to performance. Research suggests that the type of break influences individual recovery (Saxbe, Repetti & Graesch, 2011; Trougakos et al., 2008). In other words, not all individuals will benefit equally from taking the same break. The underlying mechanism that allows individuals to recover during breaks is referred to as psychological detachment, defined an "individual's experience of being mentally away from work during off-job time, that is 'switching off' mentally from work" (Kuhnel, Sonnentag & Westman, 2009, p. 577). Within the work break literature, psychological detachment occurs when individuals do not focus on their job tasks.

Thus, psychological detachment is important in order for an individual to recover depleted resources. Taking a break has been associated with increased performance levels (Beeftink, van Erde & Rutte, 2008; Berman & West, 2007; Fritz & Sonnentag, 2005; 2006; Henning, Bopp, Tucker, Knoph & Ahlgren, 1997) and it seems reasonable to suggest that individuals engaging in difficult tasks will deplete more resources compared to easy tasks. Therefore, engaging in a short break should be associated with greater recovery (and consequently performance) for those who were more depleted after working on a task. Specifically, those working on a difficult task are expected to deplete more resources than those working on an easy task, and therefore, have more resources to recover. Their gain in performance resulting from this recovery should have a sharper increase than those who required less recovery.

Hypothesis 3: Across difficulty levels, performance increases following a short 6-minute break.

Hypothesis 4: Individuals working on a difficult task experience a greater gain in performance (measured via percent) following a short 6-minute break than participants working on an easy task.

Chapter III: Methodology Design

Participants

Undergraduates from a mid-sized Midwestern University were recruited to participate in a study for undergraduate course credit. Undergraduates were recruited using SONA, which is the psychology department's undergraduate participant pool. A total of 114 undergraduates participated in this study. Twenty-eight or 29 participants were randomly assigned to each condition. Approximately 60% of participants were female, 38% were male. Two participants did not indicate their genders. Additionally, approximately 76% were between 18-20 years in age, 20% between 21-23 years in age, 2% between 24-26 years in age, and 1% was 27 or older. Finally, 90% indicated their race as White, 1% as Black, and 6% as Other. Two percent of respondents elected not to answer this question.

Materials

Task difficulty. Task difficulty was measured using an anagram task. Thorndike and Lorge's (1944) list of words that occurred at least once every 20,000 words (Mayzner &Tresselt, 1958) were used. The Thorndike and Lorge word frequency counts were found to have a distinguishable effect on anagram solution times in the past (e.g., Mayzner & Tresselt, 1958). Previous studies assessed what is constituted as an easy and difficult anagram (Adams, Stone, Vincent & Muncer, 2011; Mayzner & Tresselt, 1958; Zacks, Hasher, Snaft & Rose, 1983). All anagrams were 5 letters long and all words were similar in word frequency in the English language. The same words were used in each condition. Consistent with previous research (i.e., Adams et al., 2011, Mayzner & Tresselt, 1958), the arrangement of the letters determined the difficulty of the anagram. For example, using the letters (r, o, y, a, l—forms the word "royal") in order to transform the word into an easy anagram, two adjacent letters after the first letter of the

word were switched (royla). Conversely, the difficult condition rearranged more than two adjacent letters (raoly). This study utilized the method by Mayzner and Tresselt (1958) when creating both easy and difficult anagrams. The following letter orderings were used for easy anagrams, in which the numbers corresponded to the rearrangement of letter positions: 12354, 23451, 51234. See Table 1 for an example of both an easy and difficult arrangement example. The difficult anagrams were rotated through the following algorithm when scrambling the letters: 14253, 25314, and 52413. Unscrambled, the words selected for this study created either one or two English words, meaning there were one or two solutions. Participants only needed to find one solution. See Appendix C for a full list of words.

Break. The current study utilized a 6-minute comedy video during the break. The comedy video was found on the website Youtube.com (Judsonlaipply, 2006), which is a website that users can upload videos too and other people can watch. The video was selected because it was the fourth highest rated video on the website after typing in the word "comedy" in the search bar that filters videos. All YouTube videos are rated by only individuals that have a YouTube account, and "Evolution of Dance" has been viewed over 200,000,000 times as of (August 22nd, 2012) and has received very positive ratings. The video is titled "Evolution of Dance" by Judson Laipply and consists of Mr. Laipply performing small dance routines in congruence with 30 popular dance songs. The dance routines that he performs coincide with the song that is playing in the background.

Psychological detachment. Sonnentag and Bayer's (2001) measure of psychological detachment was used in this study. Participants responded using a 5-point Likert scale (1 = not true at all to 5 = very true). The scale was modified to reflect the focal task rather than job tasks. For example, an item that originally read, "While performing this activity, I forgot completely

about my working day", read, "While performing this activity, I forgot completely about the anagram task" (Sonnentag & Bayer, 2001; See appendix A for all questions). Cronbach's alpha ranged from .74 to .90 (Sonnentag & Bayer, 2005).

Need for recovery. The need for recovery scale (2 items) was developed by Van Veldhoven and Meijman (1994). Reported Cronbach's alphas were computed over five days and ranged from .80 and .88 (Sonnentag & Zijlstra, 2006). The scale was modified to reflect the focal task rather than job tasks. For example, an item that originally read, "Today I would have needed more time for relaxing and recovering from work", read, "I needed more time for relaxing and recovering from the anagram task". See Appendix B. The need for recovery was measured by using a 5-point Likert scale (1 = strongly agree to 5 = strongly disagree).

Performance. Scrambled anagrams were displayed in the top of the computer screen (one at a time), and participants submitted their solutions to the anagram at the bottom of the screen. There are a total of 336 anagrams, and participants were directed to solve as many anagrams as possible during each 15-minute task block. For example, one participant may have correctly solved 50 anagrams during the first 15-minute block and only 20 during the next 15-minute block, while another participant may correctly solve 50 anagrams in the first 15-minute block and 70 in the second 15-minute block. Additionally, each anagram had one or two possible solutions, and participants had one chance to solve the anagram. Performance was measured as the number of anagrams solved correctly in each 15-minute (or 30-minute session if not provided a break).

Manipulation check. Stress levels were measured after engaging in the anagram task. Participants in the no break conditions were asked this question at the end of the study, and participants in the break conditions were asked these questions after the first 15-mintue block of

anagrams and again at the end of the second 15-minute block of anagrams. For example, the following question on stress read, "Please rate your stress level while working on the anagram task" on a Likert scale (1 = very stressed to 5 = not stressed at all).

Procedure

The researcher randomly assigned participants to an easy or difficult condition, with or without a break (total of 4 possible conditions). Participants were seated in a computer lab at an individualized computer station. After signing a consent form, participants were told to work as quickly and accurately as possible when solving anagrams. The task utilized a computer program E-Prime for the anagram solving task. Before the participants engaged in the actual task, they were given five practice anagrams. Then, the participants worked on solving the anagram task for 30 minutes (or two 15-minute blocks interrupted with a break). The participants had one chance to solve the anagram correctly. After engaging in the anagram task for 15 minutes, participants in the break conditions were given a 6-minute break during which they viewed the funny YouTube video.

After completing the anagram-solving task, participants completed measures of psychological detachment, need for recovery, and demographic items. As a manipulation check, after the participants completed the anagram task, they were asked to rate the stress experienced. Finally, they were thanked for their time and debriefed. The participants received course credit in their psychology course.

Chapter IV: Results

Preliminary Analyses

To compare across the four different conditions (different difficulty level of task), a standardized measure of performance was needed. The percentage of anagrams solved correctly was computed for each participant. This rate is used for hypothesis testing of performance differences. Correlations among study variables and reliabilities can be found in Table 2. Means and standard deviations can be found in Table 3.

Prior to hypothesis testing, a manipulation check was conducted in order to ensure that the difficult anagrams were rated as more stressful than the easy anagrams, as previous findings indicated that individuals engaging in difficult work activities experience higher levels of stress compared to those doing easy work (Greiner et al., 1998; Westman & Etzion, 2001; Wright & Cropanzano, 1998). Comparisons for average stress reported were made among all 4 conditions using a one-way analysis of variance. Results indicated that the overall ANOVA was significant, F (3,110) = 10.33, $p < .05$. Poc hoc analyses were conducted to evaluate pairwise comparisons of the means. A Bonferroni test indicated that participants in the difficult conditions rated the anagrams as more stressful compared to individuals in the easy conditions. Specifically, participants in the difficult condition without a break *(M* = 3.46, *SD* = .88) and the difficult with break condition *(M* = 3.37, *SD* = 1.08) rated that working on the anagrams was more stressful compared to the easy condition without a break *(M* = 2.66, *SD* = .90) and the easy with break condition *(M* = 2.92, *SD* = .90).

Psychological Detachment. Means on the psychological detachment and follow-up psychological detachment questions are presented in order to show that participants in both break conditions had similar ratings of psychological detachment; meaning that the break (i.e., the

YouTube video) allowed participants to experience a respite (Kuhnel, Sonnentag & Westman, 2009). It was expected that both groups would report experiencing psychological detachment (i.e., no significant differences between them). Higher numbers (response scale ranged from 1-10) indicate increased ratings of psychological detachment. The first set of psychological detachment questions were asked immediately after the break. The same questions were asked when the participants finished their second set of anagrams. Immediately following the break, participants in the easy condition *(M* = 9.93, *SD* = 2.14) and participants in the difficult condition *(M* = 9.82, *SD* = 2.60) reported high psychological detachment, and groups were not significantly different from one another, t (54) = .17, $p > .05$. After completing the second set of anagrams, the psychological detachment questions were asked a second time (as a manipulation check). Participants in both the easy *(M* = 9.32, *SD* = 2.29) and difficult conditions *(M* = 9.43, *SD* = 2.28) reported high psychological detachment. As expected, an independent samples t-test revealed a non-significant difference in psychological detachment between easy and difficult conditions, t (54) = -.17, $p > .05$.

Hypothesis Testing

Hypotheses are presented in order consistent with the conservation of resources (Hobfoll, 1989) model presented in Figure 1. First, the need for recovery is analyzed for participants in all conditions. Second, psychological detachment, which is the mechanism that allows individuals to recover during breaks, is examined. Finally, overall performance scores are discussed.

Hypothesis 1: All participants experience a need for recovery.

Hypothesis 1 stated that all participants would experience a need for recovery. The difficult condition without a break *(M* = 6.39, *SD* = 1.50), difficult condition with a break *(M* = 7.41, *SD* =4.64) easy condition without a break *(M* = 7.48, *SD* = 1.77) easy condition with a

break *(M* = 8.07, *SD* = 1.82), all indicated a moderate need for recovery (lower means indicate *higher* need for recovery). The results indicate support for H1. All four groups reported means above the midpoint of 5 (out of 10) on the need for recovery scale.

Hypothesis 2: Participants working on a difficult task will report a higher need for recovery compared to individuals working on an easy task.

Hypothesis 2 stated that participants working on a difficult task would report a higher need for recovery compared to individuals working on an easy task. A one-way analysis of variance was conducted in order to examine the relationship between task difficulty and ratings for need for recovery for the four unique conditions in the experiment. There was a significant difference among the groups, F (3,110) = 4.79, $p < .05$. Poc hoc analyses were conducted to evaluate pairwise differences. The need for recovery questions were reverse coded, meaning that the lower numbers indicate a higher need for recovery. A Bonferroni test showed that participants in the difficult condition without a break *(M* = 6.39, *SD* = 1.50) indicated a higher need to recover compared to individuals in the easy condition with a break *(M* = 8.07, *SD* = 1.82). These results partially support H2. Participants in the difficult condition without a break reported a higher need for recovery than participants in the easy condition with a break.

Hypothesis 3: Across difficulty levels, performance increases following a short 6-minute break.

Hypothesis 3 stated that across difficulty levels, performance would increase following a short 6-minute break. The plan for data collection originally included four, 7.5-minute performance points. However, given the manner in which the data were collected on E-prime, it was not possible to divide performance into 7.5-minute blocks. Rather, one performance score was collected for groups without a break, and 2 were collected for those with a break. Thus,

testing Hypothesis 3 was not possible. Instead, overall differences in performance scores were examined below.

Hypothesis 4: Individuals working on a difficult task experience a greater gain in performance (measured via percent) following a short 6-minute break than participants working on an easy task.

Hypothesis 4 stated that individuals working on a difficult task experience a greater gain in performance (measured via percent) following a short 6-minute break than participants working on an easy task. First, the total percent of anagrams solved correctly was calculated for each participant for Block 1 and Block 2. Then, the total percent of anagrams solved for Block 2 (15-minutes of solving anagrams) was subtracted from Block 1 (first 15-minutes of solving anagrams) to calculate the difference score. An independent samples t-test was conducted to test this prediction, using the difference scores described above. Participants in the easy and break condition (M = 011%, SD = 015%) had a higher mean than participants in the difficult and break condition (M = 4%, SD = 7%). The difference was significant, t (55) = 2.15, $p < .05$. These results do not support H4. H4 predicted the difficult with break condition would benefit more from the break, when in fact the easy with break condition benefited more from the break.

Supplementary Analysis

A one-way analysis of variance was conducted in order to examine whether differences appeared in the overall performance, using an overall (combined 15-minute Blocks or 30-minute Block) percentage of anagrams solved correctly, among the 4 groups. Results indicated that the ANOVA was significant, F (3, 110) = 47.93, $p < .05$. Poc hoc analyses were conducted to evaluate pairwise differences between the means. A Bonferroni test indicated that participants in the easy condition with a break (M = 71%, SD = 40%) solved more anagrams per minute than

participants in all other conditions. Participants in the easy condition without a break (M = 67%, SD = 27%) solved more anagrams than participants in both difficult conditions (difficult without break, M = 13.4%, SD = 6.7%, difficult with break, M = 13.1%, SD = 7.3%), and participants in the difficult condition solved more anagrams than participants in the difficult condition with a break.

Chapter V: Discussion

Overall, the present study contributes to break taking literature by examining psychological detachment, need for recovery and task performance when individuals are given a short break while working on a difficult or easy task. Individuals that engaged in either the difficult or easy task indicated a need for recovery; although, those working on a difficult task indicated a higher need for recover than those working on an easy task. Also, individuals working on difficult task reported higher stress than individuals working on easy task. However, psychological detachment ratings were similar across both conditions. Results are consistent with previous research in that taking a break is associated with increased task performance for individuals engaging in an easy task, but not a difficult task (Beeftink et al., 2008; Berman & West, 2007; Fritz & Sonnentag, 2005; 2006; Henning et al., 1997). People spend many of their waking hours at their jobs, and this study provides support for the assertion that the need for recovery is a reality regardless of the difficulty of the task. Furthermore, taking a short break provides an opportunity for a respite (psychological detachment). Below, I will offer explanations and rationales for the findings, offer recommendations for organizations and future research.

Consistent with previous research (Westman & Etzion, 2001; Wright & Cropanzano, 1998), participants reported higher levels of stress when working on difficult tasks compared to easy tasks. This is important to mention because the intent of this study was to provide support that individuals who engage in more difficult tasks will report higher stress levels, and higher stress levels indicate a higher need for recovery (Sonnentag & Bayer, 2005). This study supported that supposition – individuals in the difficult conditions rated the need for recovery higher than individuals in the easy conditions. Also, consistent with previous research by

Westman and Etzion (2001), the more difficult tasks depleted more resources than easy tasks. To expand this finding to organizations, many jobs require individuals to engage in difficult tasks for prolonged periods of time, and in return, those individuals experience high burnout rates due to stress (Fritz & Sonnentag, 2006; Sonnentag et al., 2010; Trougakos & Hideg, 2009). Although continuous work demands may not allow for individuals to stop engaging in difficult tasks, both managers and employees should be cognizant of how taking a break can reenergize one's mental resources.

There are positive reasons for experiencing psychological detachment at work. For example, psychological detachment is related to positive moods and lower fatigue (Sonnentag & Bayer, 2005). Also, engaging in respites aids an individual's recovery process, and a positive relationship between respites and positive displays in performance was found (Trougakos et al., 2008). However, a lack of experiencing psychological detachment can result in an increase in emotional exhaustion (Sonnentag et al., 2010). The COR model assumes that individuals have limited resources and they strive to prevent the loss of their resources from circumstantial causes (work tasks; Hobfoll, 1989). The Conservation of Resources Model (Figure 1) states that engaging in tasks drains resources and the more difficult tasks drains more resources than less difficult tasks. The energy lost during task engagement needs to be recovered; therefore, individuals need breaks that induce psychological detachment to make decisions (Baumeister et al., 1998). This study shows that a funny video was one way to take someone's mind off a task. Participants indicated that they experienced psychological detachment. This study also showed that not thinking about a task allowed individuals to recover and replenish depleted resources drained from their work tasks. This finding is important because taking breaks are one strategy to gain energy needed for future tasks. More importantly, people need to take breaks that are

beneficial for recovery. This can be accomplished by engaging in enjoyable behavior during one's work break. The following activities are recommendations when taking a break: watch a funny video, sit quietly, engage in pleasant conversation with co-workers, or go for a walk, to name a few.

Finally, it was expected that individuals in the difficult condition would benefit more (from a break) than the individuals in the easy condition. However, this supposition was not supported. In fact, the opposite was found; individuals in the easy condition benefited more from a break. One possible explanation for this finding is that the individuals in the difficult condition depleted more of their finite resources (Hobfoll, 1989; Muraven & Baumeister, 2000) compared to individuals in the difficult condition. The break may not have been sufficient in order to restore the depleted resources. Another explanation may be that participants in the easy condition may have become automatized (at a subconscious level) when solving anagrams, and therefore, solved the anagrams more quickly throughout the duration of the task. Conversely, participants solving the difficult anagrams may have learned how to solve the anagrams at a slower pace. Moreover, Lisper and Eriksson (1980) found that the length of the break did not affect task performance, but eating food while taking a break was associated with positive subsequent task performance. Therefore, the duration of the break may not be sufficient for individuals in the difficult anagram condition, but having a snack or eating during the break may have positive effects on task performance. Another reason may be that individuals in the easy condition enjoyed working on the task compared, to individuals in the difficult condition. Also, a potential controversy may be that individuals solving easy anagrams "caught on" to the pattern of solving the anagrams more quickly than individuals solving the difficult anagrams. Finally, another possible explanation is that participants may not have been motivated to solve the

anagrams. This could affect the results in a few ways: first, participants could have easily given up on anagrams they could not solve. Second, the participants could have seen the anagram task as a chore and solved the anagrams leisurely, versus viewing the anagrams as a challenge and enthusiastically solve the anagrams.

Practical Implications

Some believe that employees should not be paid for taking a break because that employee is not working on the immediate task. However, aside from the argument that work breaks detract from immediate task performance, fatigue and burnout rates should be considered when pondering the benefits of work breaks. First, research examining within day breaks relationship with performance have not been thoroughly studied, and therefore more evidence is needed before drawing conclusions. Additionally, I recommend that individual's limit the continuous time (working on a task without taking a break) they spend on work tasks, as their resources will continue to deplete without replenishment. Burnout is defined by Fritz and Sonnentag (2006) as a strain resulting from constant stressors at work, and the lack of psychological detachment (more time individuals spend time thinking of work outside of work) may lead to a depletion in energy, which contributes to burnout rates (Sonnentag et al., 2010). Also, fatigue has been found to grow exponentially, and it may be more effective to counteract fatigue by taking multiple short breaks throughout the day (Konz, 1998).

Limitations and Future Research

As with any study, there are a number of limitations that should be mentioned. Anagrams were chose as the task because changing an anagrams difficulty level allowed the manipulation of task difficulty (easy, difficult). First, conclusions based on the need for recovery and psychological detachment scores should be considered with some caution, as the reliabilities

found in the current study are rather low in comparison to what others have described. A previous study by Sonnentag and Bayer (2005) reported Cronbach's alphas for the psychological detachment measure between .74 to .90, and Sonnentag and Zijlstra (2006) reported the need for recovery between .80 to .88. However, Cronbach's alpha for the need for recovery scale in this study was .58, and in the .6 range for the psychological detachment scale. These lows may have occurred due to the small number of questions in each scale, but it is unclear why the reliabilities were so much lower in the present study. Future research should explore additional methods of measuring these two constructs.

Second, anagrams may not be the exemplar task analogous to typical work tasks. For instance, individuals may have an inherent niche for solving anagrams or word puzzles. An individual could subconsciously develop strategies to solve anagrams more quickly after working on them for a prolonged period of time. Additionally, while this study assigned individuals to either a difficult or easy task, people in organizations often switch from engaging in easy to difficult tasks throughout the workday. Also, people usually select the work they want to do, however their managers often assign tasks that employees may or may not enjoy. Therefore, understanding the effects of break taking under varying task difficulty is a promising area for future research.

Also related to the working context (e.g., varying task work throughout the day), this study examined individuals working on a task for a short amount of time. It may not be possible for employees to take a five minute work break every 15 minutes. Future studies should examine task performance and need for recovery after work breaks are given for tasks that take longer than 15 minutes or 30 minutes. Additionally, this study examined the need for recovery and performance after one task, but it would be beneficial to study the effect that breaks have on

performance and need for recovery throughout the workday at an actual organization. Also, insight could be gained from examining recovery tactics via a diary study.

While the findings of this study advance our understanding of break-taking research, there are many avenues for future research, such as the social aspects of taking a break. Participants in this study took a break by themselves and did not socialize with others. In many organizations, employees work in close proximity with one another, and it may be unlikely for those employees take a break alone. Social interaction allows people to take a break from work tasks and can keep people's minds off work tasks (detach). In fact, a study by Trougakos et al (2008) showed that social interaction can be a respite for some individuals. However, individual differences in the way individuals perceive a break, and the different types of breaks, were not examined. Certainly, cultural differences exist regarding the manner in which breaks are taken. For example, collectivistic cultures place high emphasis on breaks that involve social interaction, while individualistic cultures place value on breaks that are taken alone.

While taking breaks during the day may be beneficial, it is unclear when individuals should take a break. Previous research indicated that a break is beneficial for individual performance (Beeftink et al., 2008; Berman & West, 2007; Fritz & Sonnentag, 2005; 2006; Hennin et al., 1997); however, it is not clear as to when an individual should take a break from his or her work (Beeftink et al., 2008; Henning et al., 1996; Moller et al., 2006). Muraven and Baumeister (2000) concluded that individuals perform worse at the end of the task compared to the beginning. Subsequently, by the time a person needs a break his or her resources are more than likely greatly depleted. Therefore, additional research should focus on discretionary breaks as suggested by Moller et al. (2006). For instance, is it more beneficial for an individual to take

microbreaks (i.e., breaks 2-5 minutes long) throughout a task versus a 5-10 minute break during the middle of a task?

While knowing when to take a break is important for future performance, understanding individual differences in experiences/perceptions should be examined. For example, Baumeister et al. (1998) stated that the COR model assumes that individuals have limited resources, and understanding how to expand our resources is essential for reducing stress. Future research could examine strategies, in addition to taking breaks that individuals could adopt in order to make difficult tasks less stressful. It may be beneficial to study certain personality traits that correlate with a lower need for recovery because it may be related to increased tolerance for difficult cognitive tasks. Therefore, it may be that individuals that are more individualistic and have high determination may not need as many, or as long of, breaks compared to individuals that are extroverted.

In addition to individual differences, a more global perspective may be useful when generalizing results. For example, culture differences are one element that is often ignored when examining break-taking research. There is limited research examining the effects of cultural differences and work breaks (Trougakos et al., 2009). Instead, past research focused on individual differences such as the Big 5 personality traits (Gallagher, 1990; Grant & Langan-Fox, 2007; Johansson, 1970; Schaubroeck, Ganster & Jones, 1998; Trougakos et al., 2008). Research suggests that extroverts may not deplete as many resources as introverts when engaging in demanding tasks because extroverts can rely on their social support when they feel stressed (Trougakos et al., 2009). Although research has not examined these factors in relation to other cultures, one can surmise that collectivist cultures, versus individualistic cultures, would have similar results as extroverts. In other words, cultures that place high value in social

interaction may place more emphasis on taking social breaks compared to individualistic cultures. However, understanding how breaks impact worker performance in different cultures needs to be examined, since taking a break affects people differently.

Finally, a possible solution to restore depleted resources for individuals engaging in difficult tasks is to take a longer break. Future research should be focus on the duration of the within-day breaks. For example, individuals in the difficult condition did not benefit as much (in performance) as individuals in the easy condition from the break; they may need additional time to recover. Future research should allow participants in a difficult condition more time on their break, so that they have a chance to recover from depleted resources as needed. However, taking longer breaks may not be viable in work environments when tasks have timelines. It is essential to examine breaks from a cost benefit ratio. Although taking breaks are beneficial for an individual's health, organizations are tasked with maximizing profits. Therefore, companies must walk a thin line and determine the amount of break time an individual can afford to take, taking in account the individuals health while trying to maximize profits.

Conclusion

While a majority of research focuses on work breaks occurring outside of the workplace, this study focused on taking a short break during a difficult or easy task. Stress causes individual resources to be drained; therefore, it is imperative to understand how taking a break replenishes individual resources. This study showed that taking a short break during a task is beneficial for mental resources and task performance. Specifically, increased task performance was found for individuals engaging in an easy task. Additionally, individuals reported a need for recovery after working on both difficult and easy tasks alike, and taking a break that induced psychological detachment is associated with recovered mental resources. Future research on worker recovery

should focus on the duration of short breaks, switching from easy (difficult) to difficult (easy) tasks, discretionary breaks, and examining when it would be most beneficial to take a break during a task. Finally, although this study provided insight to task difficulty and task performance, an important next step should examine a more comprehensive effect of taking short breaks throughout the workday.

References

Baumeister, R. F., Bratslavsky, E., Muraven, M., & Tice, D. M. (1998). Ego depletion: Is the active self a limited resource? *Journal of Personality and Social Psychology*, *74*, 1252–1265.

Baumeister, R. F., Vohs, K. D., & Tice, D. M. (2007). The strength model of self-control. *Current Directions in Psychological Science*, *16*, 351–355.

Beal, D. J., Weiss, H. M., Barros, E., & MacDermid, S. M. (2005). An episodic process model of affective influences on performance. *Journal of Applied Psychology*, 90, 1054–1068.

Bechtold, S. E., Janaro, R. E., & Summers, D. L (1984). Maximization of labor productivity through optimal rest-break schedules. *Management Science*, *30*, 1442-1458.

Beeftink, F., van Eerde, W., & Rutte, C. G. (2008). The effect of interruptions and breaks on insight and impasses: Do you need a break right now? *Creativity Research Journal*, *20*(4), 358-364.

Bennie, J. A., Timperio, A. F., Crawford, D. A., Dunstan, D. W., & Salmon, J. L. (2011). Associations between social ecological factors and self-reported short physical activity breaks during work hours among desk-based employees. *Preventive Medicine*, *53*(1/2), 44-47.

Benton, D. (1990). The impact of increasing blood glucose on psychological functioning. *Biological Psychology*, *30*, 13–19.

Benton, D., Owens, D. S., & Parker, P. Y. (1994). Blood glucose influences memory and attention in young adults. *Neuropsychologia*, *32*, 595–607.

Berman, E. M., & West, J. P. (2007). The effective manager…takes a break. *Review of Public Personnel Administration*, *27*(4), 380-400.

Boucsein, W., & Thum, M. (1997). Design of work/rest schedules for computer work based on psychophysiological recovery measures. *International Journal of Industrial Ergonomics*, *20*, 51-57.

Cohen, J. (1992). A power primer. *Psychological Bulletin, 112*, 115-159.

Delahaij, R., van Dam, K., Gaillard W. K., & Soeters, J. (2011). Predicting performance under acute stress: The role of individual characteristics. *Journal of Stress Management*, *18*, 49-66.

Eden, D. (1990). Acute and chronic job stress, strain, and vacation relief. *Organizational Behavior and Human Decision Processes*, *45*, 175–193.

Faucett, J., Meyers, J., Miles, J., Janowitz, I., & Fathallah, F. (2007). Rest break interventions in stoop labor tasks. *Applied Ergonomics*, *38*, 219-226.

Felsten, G. (2009). Where to take a study break on the college campus: An attention restoration theory perspective. *Journal of Environmental Psychology*, *29*(1), 160-167.

Fleeson, W. (2004). Moving personality beyond the person-situation debate*:* The challenge and the opportunity of within-person variability. *Current Directions in Psychological Science*, *13*, 83–87.

Fredrickson, B. L. (1998). What good are positive emotions? Review of General Psychology, *2*, 300–319.

Fritz, C., & Sonnentag, S. (2005). Recovery, health, and job performance*:* Effects of weekend experiences. *Journal of Occupational Health Psychology*, *10*, 187–199.

Fritz, C., & Sonnentag, S. (2006). Recovery, well-being, and performance-related outcomes: The role of workload and vacation experiences. *Journal of Applied Psychology*, *91*, 936-945.

Gailliot, M. T., Baumeister, R. F., DeWall, C. N., Maner, J. K., Plant, E. A., Tice, D. M., Brewer, L. E., & Schmeichel, B. J. (2007). Self-control relies on glucose as a limited energy source*:* Willpower is more than a metaphor. *Journal of Personality and Social Psychology*, *92*, 325–336.

Gallagher, D. J. (1990). Extraversion, neuroticism and appraisal of stressful academic events. *Journal of Applied Psychology*, *11*, 1053-1057.

Grant, S., & Lanngan-Fox, J. (2007). Personality and the occupational stressor-strain relationship: The role of the big five. *Journal of Occupational Health Psychology*, *12*, 20-33.

Henning, R. A., Bopp, M. I., Tucker, K.M., Knoph,R. D., & Ahlgren, J. (1997). Team-managed rest breaks during computer-supported cooperative work. *International Journal of Industrial Ergonomics*, *20*, 19-29.

Henning, R. A., Callaghan, E. A., Ortega, A. M., Kissel, G. V., Guttman, J. I., & Braun, H. A. (1996). Continuous feedback to promote self-management of rest breaks during computer use. *International Journal of Industrial Ergonomics*, *16*, 71-82.

Hobfoll, S. E. (1989). Conservation of resources*:* A new attempt at conceptualizing stress. *American Psychologist*, *44*, 513–524.

Johansson, C. B. (1970). Strong vocational interest blank introversion extroversion and occupational membership. *Journal of Counseling Psychology*, *17*, 451-455.

Judsonlaipply. (2006, April 6). *Evolution of dance*. Retrieved August 21, 2012, from: http://lynn.libguides.com/content.php?pid=47000&sid=349970

Konz, S. (1998). Work/rest: Part I – Guidelines for the practitioner. *International Journal of Industrial Ergonomics*, *22*, 67-71.

Konz, S. (1998). Work/rest: Part II – The scientific basis (knowledge base) for the guide. *International Journal of Industrial Ergonomics*, *22*, 73-99.

Krajewski, J., Wieland, R., & Sauerland, M. (2010). Regulating strain states by using the recovery potential of lunch breaks. *Journal of Occupational Health Psychology*, *15*(2), 131-139.

Kuhnel, J., Sonnentag, S., & Westman, M. (2009). Does work engagement increase after a short respite? The role of job involvement as a double-edged sword. *Journal of Occupational and Organizational Psychology*, *82*, 575-594.

Lepore, S. J., & Evans, G. W. (1996). Coping with multiple stressors in the environment. In M. Zeidner & N. S. Endler (Eds.), *Handbook on coping: Theory, research, application* (pp. 350–377). New York: Wiley.

Lisper, H., & Eriksson, B. (1980). Effects of the length of a rest break and food intake on subsidiary reaction-time performance in an 8-hour driving task. *Journal of Applied Psychology*, *65*, 117-122.

Mauno, S., Kinnunen, U., & Ruokolainen, M. (2007). Job demands and resources as antecedents of work engagement: A longitudinal study. *Journal of Vocational Behavior*, *70*, 149-171.

McLean, L., Tingley, M., Scott, R. N., & Rickards, J. (2001). Computer terminal work and the benefit of microbreaks. *Applied Ergonomics* , *32*, 225-/237.

Meijman, T. F., & Mulder, G. (1998). Psychological aspects of workload. In*:* P. J. D. Drenth, H. Thierry & C. J. de Wolff (Eds), Handbook of work and organizational psychology, Vol. 2*:* Work psychology (pp. 5–33). Hove, England*:* Psychology Press

Miner, A. G., Glomb, T. M., & Hulin, C. (2005). Experience sampling mood and its correlates at work. *Journal of Occupational and Organizational Psychology*, 78, 171–193.

Moller, A. C., Deci, E. L., & Ryan, R. M. (2006). Choice and ego-depletion: The moderating role of autonomy. *Personality and Social Psychology Bulletin*, *32*, 1024–1036.

Moskowitz, D. S., Brown, K. W., & Cote, S. (1997). Reconceptualizing stability*:* Using time as a psychological dimension. *Current Directions in Psychological Science*, *6*, 127–131.

Muraven, M., & Baumeister, R. F. (2000). Self-regulation and depletion of limited resources: Does self-control resemble a muscle? *Psychological Bulletin*, *126*, 247–259.

Muraven, M., Tice, D. M., & Baumeister, R. F. (1998). Self-control as a limited resource: Regulatory depletion patterns. *Journal of Personality and Social Psychology*, *74*, 774–789.

Paulus, P. B., Nakui, T., Putman, V. L., & Brown, V. R. (2006). Effects of task instructions and brief breaks on brainstorming. *Group Dynamics: Theory, Research, and Practice*, *10*(3), 206-219.

Saxbe, D. E., Repetti, R. L., & Graesch, A. P. (2011). Time spent in housework and leisure: Links with parents' physiological recovery from work. *Journal of Family Psychology*, *25*(2), 271-281.

Schaubroeck, J., Ganster, D. C., & Jones, J. R. (1998). Organization and occupation influences in the attraction-selection-attrition process. *Journal of Applied Psychology*, *83*, 869-891.

Sonnentag, S. (2001). Work, recovery activities, and individual wellbeing: A diary study. *Journal of Occupational Health Psychology*, *6*, 196-210.

Sonnentag, S. (2003). Recovery, work engagement, and proactive behavior: A new look at the interface between nonwork and work. *Journal of Applied Psychology*, *88*(3), 518-528.

Sonnentag, S., & Bayer, U. V. (2005). Switching off mentally: Predictors and consequences of psychological detachment from work during off-job time. Journal of Occupational Health Psychology, *10*, 393-414.

Sonnentag, S., Binnewies, C., & Mojza, E. J. (2010). Staying well and engaged when demands are high: The role of psychological detachment. Journal of Applied Psychology, *95*, 965-976.

Sonnentag, S., & Natter, E. (2004). Flight attendants' daily recovery from work: Is there no place like home? *International Journal of Stress Management*, *11*, 366-391.

Sonnentag, S., & Zijlstra, F. R. H. (2006). Job characteristics and off-job activities as predictors of need for recovery, well-being, and fatigue. *Journal of Applied Psychology*, *91*, 330-350.

Strongman, K. T., & Burt, C. B. (2000). Taking breaks from work: An exploratory inquiry. *Journal of Psychology*, *134*(3), 229.

Sunil, S. & Mirka, G. A. (2004). A laboratory investigation of personality type and beak-taking behavior. *International Journal of Industrial Ergonomics*, *35*, 237-246.

Taylor W. C. (2005). Transforming work breaks to promote health. American Journal of Preventive Medicine, *29*(5), 461-465.

Taylor, W. C., Shego, R., Chen, V., Rempel, D. M., Baun, M., Bush, C. L., & Hare-Everline, N. (2010). The Booster Break program: Description and feasibility test of a worksite physical activity daily practice. *Journal of Prevention, Assessment & Rehabilitation*, *37*(4), 433-443.

Tice, D. M., Baumeister, R. F., Shmueli, D., & Muraven, M. (2007). Restoring the self: Positive affect helps improve self-regulation following ego depletion. *Journal of Experimental Social Psychology*, *43*, 379–384.

Trougakos, J. P., Beal, D. J., Green, S. G., & Weiss, H. M. (2008). Making the break count: An episodic examination of recovery activities, emotional experiences, and positive affective displays. *Academy of Management Journal*, *51*(1), 131-146.

Trougakos, J. P., & Hideg, I. (2009). Momentary work recovery: The role of within-day work breaks. In S. Sonnentag, P. L. Perrewé, D. C. Ganster, S. Sonnentag, P. L. Perrewé, D. C. Ganster (Eds.) , *Current perspectives on job-stress recovery* (pp. 37-84). Bingley United Kingdom: JAI Press/Emerald Group Publishing.

Tucker, P. (2003). The impact of rest breaks upon accident risk, fatigue and performance: a review. *Work & Stress*, *17*, 123-137.

Van Veldhoven, M., & Meijman, T. (1994). Het meten van psychosociale arbeids-belasting met een vragenlijst: De Vragenlijst Beleving en Beoordeling van de Arbeid (VBBA) [Measuring psychosocial workload with a questionnaire]. *Tijdschrift voor Bedrijfs- en Verzekeringsgeneeskunde, 2,* 229–230.

Westman, M., & Etzion, D. (1995). Crossover of stress, strain and resources from one spouse to another. *Journal of Organizational Behavior*, *16*, 169–181.

Westman, M., & Eden, D. (1997). Effects of a respite from work on burnout: Vacation relief and fade-out. *Journal of Applied Psychology*, *82*, 516–527.

Westman, M., & Etzion, D. (2001). The impact of vacation and job stress on burnout and absenteeism. Psychology & Health, *16*, 595–606.

Wright, T. A., & Cropanzano, R. (1998). Emotional exhaustion as a predictor of job performance and voluntary turnover. *Journal of Applied Psychology*, *83*, 486–493.

Table 1

Easy and difficult arrangement example.

	Condition	
Solution	Easy	Difficult
Royal	Oyalr	raoly
12345	23451	14253

Note. The arrangement of the letters determined the difficulty of the anagram. For example, using the letters (r, o, y, a, l—forms the word "royal") in order to transform the word into an easy anagram, two adjacent letters after the first letter of the word were switched (royla). Conversely, the difficult condition rearranged more than two adjacent letters (raoly). In the above example each letter in the word "royal" is paired with a number. For example,"r" is paired with the number "1" ,"o" with "2", "y" with "3", "a" with "4", "l" with "5").

Table 2

Correlation Matrix

Totals	1	2	3	4	5	6	7	8	9
1. Overall performance	--								
2. Performance block 1	0.96**	--							
3. Performance block 2	-0.80	0	--						
4. Performance difference	0.08	0.20	0.21	--					
5. Need for recovery	0.20	0.23*	0.23*	0.11	0.58***				
6. Psychological detachment	0.00	-0.04	-0.04	-0.13	-0.12	0.64***			
7. Follow-up psychological detachment	-0.08	-0.09	-0.09	-0.05	-0.12	0.79**	0.61***		
8. Stress indicator	-0.29*	-0.33**	-0.35**	-0.19	-0.41**	-0.06	-0.02	--	
9. Follow-up stress indicator	-0.18	-0.23	-0.23*	-0.20	-0.30*	0.17	-0.01	0.42**	--

** Correlation is significant at the 0.01 level (1-tailed).

* Correlation is significant at the 0.05 level (1-tailed).

Note. 1. Total average anagram solved per minute. 2. Total average anagram solved per minute for break conditions part one. 3. Total average anagram solved per minute for break conditions part two. 4. Total anagrams solved per minute during block two subtracted by Total anagrams solved per minute during block one. 5. The need for recovery questions totaled. 6. Psychological detachment questions totaled. 7. The follow-up psychological detachment questions totaled.8. Stress indicator question. 9. Follow-up stress indicator question. Reliabilities are reported on the diagonal.

Table 3

Descriptives by Experimental Condition.

Task	Need for Recovery		Psychological Detachment		Overall Task Performance		Block 1 Task Performance		Block 2 Task Performance	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Easy With Break	8.07	1.82	9.93	2.14	0.71	0.41	0.66	0.43	0.73	0.40
Easy Without Break	7.48	1.77	-	-	0.67	0.27	-	-	-	-
Difficult With Break	7.41	1.64	9.82	2.60	0.13	0.07	0.11	0.08	0.15	0.08
Difficult Without Break	6.39	6.39	-	-	0.13	0.07	-	-	-	-

Note. A total need for recovery variable was computed. This variable combined the items in the need for recovery questions; one question had to be reversed scored. Additionally, a total psychological detachment and total follow-up psychological detachment variables were computed; one question had to be reversed scored.

Figure 1

Conservation of Resource Model

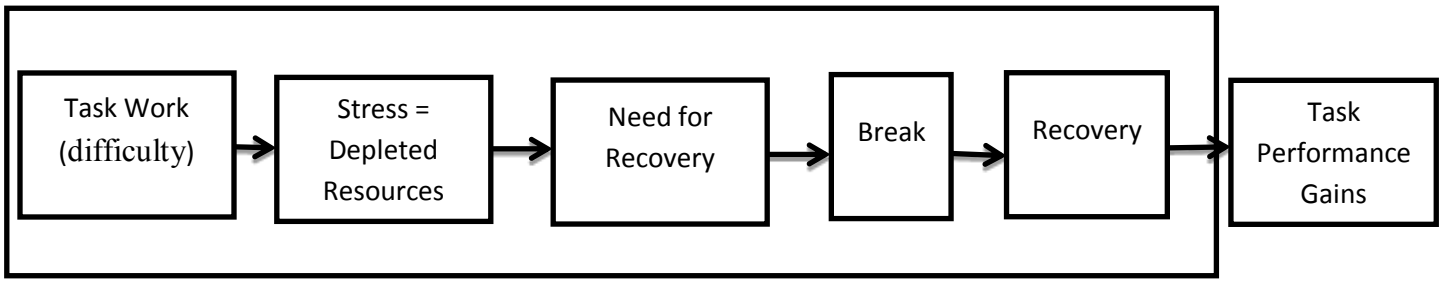

Figure 1. Figure one represents the relationship between task difficulty, Conservation of Resources model, need for recover, break, recovery and task performance.

Appendix A: Psychological Detachment Items

Item from Sonnentag and Bayer (2001) scale:

1. While performing this activity, I forgot completely about my working day
2. While performing this activity, I could 'switch off' completely
3. While performing this activity, I had to think about my work again and again

Modified scale:

1. While performing this activity, I forgot completely about the anagram task
2. While performing this activity, I could 'switch off' completely
3. While performing this activity, I had to think about the anagram task again and again

Appendix B: Need for Recovery Items

Items from Van Veldhoven and Meijman (1994) scale:

1. Today I would have needed more time for relaxing and recovering from work
2. Considering the total of all activities that I pursued after work, I have had enough time to relax and to recover from work today

Modified scale:

1. I needed more time for relaxing and recovering from the anagram task
2. I have had enough time to relax and to recover from the anagram task

Appendix C: List of Anagrams

Words 1-336 occur in the English language once at least every 10,000-20,000 words.

1. group
2. force
3. Sheet
4. learn
5. north
6. great
7. Spoil
8. close
9. other
10. Exist
11. grant
12. given
13. Strip
14. labor
15. Crown
16. Stare
17. Broad
18. Quick
19. chair
20. blood
21. Title
22. often
23. might
24. every
25. enemy
26. bring
27. piece
28. Greek
29. Brief
30. Trick
31. Frame
32. music
33. among
34. daily
35. favor
36. check
37. peace
38. China
39. happy
40. eight
41. mouth
42. enter
43. Teeth
44. pound
45. Chain
46. Charm
47. class
48. Pupil
49. Sorry
50. Broke
51. Fifth
52. Total
53. child
54. mount
55. front
56. alone
57. Unite
58. laugh
59. claim
60. cross
61. Sport
62. Merry
63. Trace
64. Worry
65. again
66. fruit
67. Yield
68. Prize
69. Angry
70. green
71. Event
72. chief
73. pairs
74. March
75. Stuff
76. color
77. field
78. Brush
79. enjoy
80. Equal
81. point
82. first
83. guess
84. Cabin
85. Anger
86. Burst
87. Clerk
88. Brain
89. Honey
90. heavy
91. Limit
92. price
93. board
94. order
95. Thick
96. hurry
97. Blame
98. guard
99. Shoot
100. Brave
101. Giant
102. Porch
103. grass
104. above
105. party
106. paint
107. Forty
108. Drove
109. Steal
110. glass
111. Fault
112. being
113. clean
114. Weigh
115. admit
116. Local
117. agree
118. Noise
119. marry
120. plant
121. Avoid
122. Cease
123. Pause
124. Stair
125. Begun
126. Spite
127. Swing
128. Tower
129. Treat
130. drink
131. prove
132. Shook
133. issue
134. Threw
135. Bless
136. Empty
137. Wheel
138. Shake
139. Troop
140. Flesh
141. Seize
142. Hotel
143. Stage
144. allow
145. Saint
146. April
147. Shine
148. paper
149. Glory
150. black
151. Worse
152. Roman
153. Aside
154. begin
155. floor
156. Blind
157. Model
158. Skirt
159. Spain
160. Alarm
161. dance
162. Steam
163. Route
164. plain
165. break
166. going
167. lower
168. Fixed
169. dream
170. Smell
171. Spare
172. death

173. place
174. large
175. Smart
176. Apart
177. below
178. Occur
179. Sheep
180. Metal
181. Latin
182. Faint
183. crowd
184. geese
185. forth
186. leave
187. Throw
188. Brook
189. after
190. dress
191. Fully
192. build
193. Track
194. Knock
195. Fancy
196. Loose
197. Style
198. Beach
199. Plate
200. Grave
201. guide
202. known
203. Final
204. Dozen
205. Cheer
206. Plane
207. never
208. Utter
209. ought
210. Royal
211. about
212. Fleet
213. built
214. catch
215. Shame
216. Cream
217. light
218. cause
219. could
220. berry
221. crook
222. young
223. wrong
224. touch
225. voice
226. tired
227. thing
228. tight
229. stamp
230. start
231. store
232. sugar
233. sweet
234. value
235. verse
236. twist
237. taste
238. nerve
239. offer
240. owner
241. range
242. ready
243. sense
244. shade
245. sharp
246. short
247. paste
248. rough
249. slope
250. smash
251. round
252. space
253. spade
254. smoke
255. snake
256. solid
257. print
258. south
259. error
260. False
261. heart
262. level
263. flame
264. judge
265. jewel
266. horse
267. match
268. mixed
269. month
270. knife
271. grain
272. early
273. dirty
274. chalk
275. cheap
276. birth
277. apple
278. brick
279. curve
280. cover
281. awake
282. white
283. right
284. brown
285. scale
286. force
287. cough
288. fight
289. crime
290. while
291. under
292. youth
293. where
294. video
295. until
296. tooth
297. terms
298. these
299. think
300. those
301. trial
302. trust
303. truth
304. choke
305. doubt
306. civil
307. press
308. raise
309. night
310. sixty
311. serve
312. score
313. speed
314. sleep
315. since
316. stock
317. story
318. bring
319. block
320. solve
321. carry
322. media
323. lunch
324. money
325. steel
326. stoop
327. stalk
328. stood
329. risen
330. radar
331. rival
332. lived
333. lobby
334. honor
335. glove
336. cycle

Appendix D

YouTube Video

http://www.youtube.com/watch?v=dMH0bHeiRNg