

THE EFFECTS OF EXERCISE ON ORGANIZATIONAL AND PERSONAL
OUTCOMES:

A WORK-HOME RESOURCES PERSPECTIVE

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OUTCOMES:
A WORK-HOME RESOURCES PERSPECTIVE

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.....Special thank you and dedication to my sweet, sweet husband Niraj for sharing this journey with me. And to “g-ma” for her unwavering love and support -without which I could not have done any of this. Also, thank you to Cooney, Victoria, and Truman for endless comfort and entertainment.

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ABSTRACT

In the organizational sciences, daily exercise research has largely centered on how exercise replenishes resources depleted by work and thus facilitates recovery during off-work time. However, we know little about whether exercise generates resources that influence individuals at work and subsequently at home, and under what conditions. I theorized that daily exercise results in resource accumulation that leads to more organizational citizenship behaviors, higher job satisfaction, and better job performance. Subsequently, I theorized better work outcomes are associated with a sense of accomplishment that leads to more sharing behaviors at home. I also theorized that the resource accumulation from exercise may depend on contextual characteristics of the exercise (i.e., time of day and accompanied) and individual differences (i.e., autonomous motivation and physical fitness). To test the theorized model, 102 respondents from two different organizations answered three surveys a day for 10 work days. Multi-level modeling was used to test the hypotheses. Results indicated that exercise was associated with greater OCBs, job satisfaction, and job performance via the resources of positive affect, mental focus, and energy. However, the gain in positive affect was strongest for employees who were less fit. OCBs, job satisfaction, and job performance were associated with feelings of accomplishment. The findings illustrate the importance of daily exercise for generating resources useful for outcomes at work. I hope to offer insight into the importance of an expanded view of the role of daily exercise for employees.

Keywords: daily exercise, resource accumulation, conservation of resources theory, recovery

Introduction

In the United States, and in many other countries, national health organizations such as the American Heart Association and the Centers for Disease Control and Prevention seek to increase individual exercise levels. Exercise is highly encouraged for the obvious health benefits such as improved weight, blood pressure, heart rate, and psychological well-being (heart.org, 2017; cdc.gov, 2017). Indeed, many of us even have personal stories or experiences with the ways in which exercise has influenced our daily lives. Consistent with such advice and positive outcomes, organizations have implemented programs designed to help employees achieve greater physical and psychological well-being (Society for Human Resource Management, 2017). As organizational scholars, it is imperative that we seek to understand the impact of exercise on work-related behaviors and outcomes to grasp the full implications of efforts to increase employee exercise behaviors.

In the organizational sciences, exercise research has largely centered on how it can facilitate recovery from work-induced stress (Demerouti, Bakker, Geurts, & Tarris, 2009) or buffer against negative effects at work (e.g., Barber et al., 2017; Burton et al., 2012; Toker & Biron, 2012). Such research has provided valuable insight into some of the broad effects exercise may have. Nevertheless, we lack a clear understanding of whether and how exercise generates resources useful for work and for one's interpersonal relationships at home. However, researchers have theorized that exercise may affect individual outcomes on-the-job (Calderwood, Gabriel, Rosen, Simon, & Koopman, 2016). Further, scholars have noted that on-the-job experiences have important implications for family life (Greenhaus & Powell, 2006). Thus, by gaining more insight

into how exercise influences individuals on-the-job, we can also grasp a fuller understanding of how exercise may affect the nature of an individual's interpersonal relationships at home. As a result, we may more fully understand the implications of engaging in daily exercise.

Research suggests that exercise can provide individuals with important resources such as positive affect, attention, and energy (Chang, Labban, Gapin, and Etnier, 2012; Lambourne & Tomporkowski, 2010; Reed & Ones, 2006; Saklofeske, Blomme, & Kelly, 1992; Yeung, 1996). The work-home resources (W-HR) model (ten Brummelhuis & Bakker, 2012a) offers theoretical insight into how the resources generated by exercise may influence one's work and home life. The W-HR model extends conservation of resources theory (Hobfoll, 1998, 2001) to highlight the notion of spillover, or the idea that domains in an individual's life affect one another. Thus, the WH-R model theorizes about the causal processes through which exercise may influence one's work and family life. Specifically, resources generated in one domain may influence another domain. Although the W-HR model uses the broad term "home" to capture both the personal and family domains, scholars have noted that the personal and family domains are separate and should be treated as such (Wilson & Bauman, 2015). The personal domain refers to the activities one engages in for personal interests outside of one's family while the family domain refers to activities one engages in with family members and home responsibilities (Wilson & Baumann, 2015).

In this paper, I draw upon the work-home resources model to develop a conceptual model examining how exercise helps people build daily resources with spillover effects both at work and at home. More specifically, I theorize that when people

exercise in the past 24 hours, they start the morning at work with personal resources that create better outcomes at work throughout the day. As a result of experiencing better work outcomes, the sense of accomplishment an individual experiences crosses over to influence one's interpersonal interactions at home. However, I note that the personal resources generated from exercise may be impacted by individual differences such as fitness level and motivation for exercise, as well as contextual factors related to the exercise session. See Figure 1 for the model.

This research makes important contributions. First, I extend the research that has traditionally focused on exercise as a recovery tool or as a buffer against negative effects at work. Research has typically taken a replenishment perspective which suggests that for exercise to be of value, personal resources must be depleted. Therefore, by engaging in exercise, depleted employees can replenish their resources. Instead, I take a broader resource perspective which allows for consideration of whether exercise can generate resources that are useful at work, regardless of one's resource level prior to exercising. A broader resource perspective may illustrate that previous conceptualizations have underestimated the value of daily exercise.

Second, scholars have noted that we still do not understand if exercise influences work outcomes, such as job performance (Calderwood et al., 2016). Previous research has often considered how exercise influences one's experiences in the home domain, without considering the work domain. Using the work-home resources model (ten Brummelhuis & Bakker, 2012a), I highlight how the personal resources generated by exercise spillover to work which subsequently leads to positive outcomes at work. Doing so extends our theoretical understanding of how personal domain activities can influence

the work domain. Such research is important for scholars to understand more fully the effects of exercise at work.

Third, I seek to highlight how the resources generated by exercise may ultimately lead to outcomes at work that have a crossover effect on one's partner at home. Previous research has tended to consider only the effects of exercise on the focal individual. However, considering the crossover effect of exercise through improved work outcomes extends theorizing by highlighting the interpersonal implications of exercise. If individuals experience more positive interactions with their partner when they exercise, then exercise also has interpersonal implications. Specifically, the effects of exercise may extend beyond the focal employee and may ultimately influence relationships at home. Therefore, I hope to illustrate how a personal domain activity (e.g., exercise) can lead to work outcomes with implications for one's relationships in the family domain.

Fourth, I highlight some of the boundary conditions under which exercise influences individuals. Understanding the boundary conditions provides important theoretical information about the impact of exercise on one's personal resources by demonstrating under which conditions and for whom resource generation is most likely to occur after exercise. Thus, I theorize about how characteristics of the exercise session and of the individual can alter the resources generated by exercise. Understanding the boundary conditions is also important for practitioners who want to help employees maximize the benefits generated by exercise.

Finally, by using an experience sampling methodology, I answer the call to investigate within-person processes at work (Trougakos, Beal, Cheng, Hideg, & Zweig, 2015). Doing so is important because the processes that occur at the within-person level

may not necessarily be the same as those that occur at the between-person level. For exercise, this means that the effects of individual differences in regular levels of exercise, a between-person difference, may differ from the effects of engaging in exercise on a day-to-day basis. For example, physical fitness is a between person difference associated with lower depression relative to those who are less physically fit (Kavassanu & McAuley, 1995). However, exercising on a day-to-day basis, a within-person difference, may also impact processes that have implications for daily work outcomes. Thus, I will draw on research that looks at the resources provided by a single episode of exercise. Although, as noted, there are between-person effects of general fitness level, the focus of this paper is at the within-person level and daily effects. As a result, empirical investigations of the episodic effects of exercise provide the most accurate description of what happens to an individual after a single episode of exercise on a given day instead of considering what happens when individuals exercise in general.

To conclude, we lack a clear understanding of whether and how exercise affects individual outcomes at work, and subsequently an individual's family life. Thus, I utilize the work-home resources model (ten Brummelhuis & Bakker, 2012a) to develop a theoretical framework highlighting how exercise helps individuals generate resources that spillover to other domains and crossover to influence interpersonal relationships at home. I further highlight how the effects of exercise may vary depending on contextual factors and individual differences. In doing so, I empirically test and extend the work-home resources model to show that that personal resources generated in the personal domain can lead to work and family outcomes. I now define exercise and provide a brief overview of the exercise research in the organizational sciences. I follow with an

overview of the theoretical underpinnings of the work-home resources model before developing my hypotheses.

Background

Exercise refers specifically to “planned, structured, and repetitive bodily movement with the objective to improve or maintain physical fitness” (Caspersen, Powell, & Christenson, 1985, p. 127). More broadly, physical activity refers to “bodily movement produced by skeletal muscles that results in energy expenditure” (Caspersen et al., 1985, 126). While often used interchangeably, the terms physical activity and exercise do not refer to the same thing. All exercise is physical activity, but not all physical activity is exercise. For example, household work is physical activity but is not considered exercise (Caspersen et al., 1985). As another example, purposefully walking briskly to and from work to maintain one’s fitness level falls under the category of exercise. However, walking around the office during the day to accomplish tasks would likely not fall under the category of exercise, but would count as physical activity. According to the American Heart Association, individuals should aim for 150 minutes of moderate exercise or 75 minutes of vigorous exercise per week (heart.org, 2017). Consistent with the current recommendations by organizations such as the American Heart Association and Center for Disease Control, I focus in this paper on exercise. More specifically, I focus on daily exercise, which is not the same as exercise over time. Daily exercise refers to exercise that occurs within a 24-hour period.

Evidence suggests that exercise has wide-reaching effects on an individual’s personal resources reservoir. Researchers have noted that affective states (ten Brummelhuis & Bakker, 2012a; Aspinwall, 1998), attention (ten Brummelhuis & Bakker,

2012a), and energy (Hobfoll, 2011; Quinn, Spreitzer, & Lam, 2012) serve as personal resources. A single session of exercise increases positive, activated affect, defined as affect that is positive in valence and high in arousal, such as happiness and joy (Reed & Ones, 2006). Exercise has also been shown to influence people's cognitive processes as indicated by improvements on tasks of attention (Chang et al., 2012; Lambourne & Tomporkowski, 2010). Further, a single exercise session also influences one's personal energy (Saklofeske et al., 1992; Yeung, 1996). In sum, exercise provides personal resources such as positive affect, attention, and energy that can help individuals function optimally throughout the day. I draw upon research that looks at the resources provided by an episode of exercise to offer insight into how those resources spillover to other domains and subsequently crossover to affect one's partner at home. Before doing so, I briefly review the exercise research from the organizational sciences.

Exercise Research in the Organizational Sciences

In the organizational sciences, research has largely examined whether and how exercise, a personal domain activity, influences personal outcomes in the home domain. Although such research provides insight into the effects of exercise, we lack a clear understanding of whether and how exercise helps individuals build resources that spillover to the work domain and whether and how exercise leads to crossover effects on one's family. Furthermore, we lack a clear understanding of under what conditions exercise mostly likely generates resources. For example, researchers have noted that some effects of exercise, such as those on an individual's cognitive processing, are the strongest in the morning (Chang et al., 2012). However, researchers often ignore what time the exercise took place and other factors that may impact individuals on the job.

The recovery research takes a limited approach and assumes that work is a stressful experience that depletes one's resources. Although limited, the recovery research demonstrates the wide-reaching effects of exercise. Exercise is associated with increased well-being at bedtime after work (Sonnentag, 2001; Sonnentag & Natter, 2004) and decreased fatigue in the morning before work (Rook & Zijlstra, 2006). Exercise is also associated with increased energy in the morning before work (ten Brummelhuis & Bakker, 2012b), as mediated by psychological detachment. Nagel and Sonnetang (2013) also found that exercise after work is associated with recovery, as measured by less emotional exhaustion after work the following day, and that this relationship is mediated by greater optimism, pathway thinking (i.e., finding alternative paths to meet goals), and resilience in the morning before work. Feuerhan and colleagues (2014) found that exercise after work is associated with greater recovery, measured by positive affect before bed, and that the mechanisms driving the relationship between exercise and positive affect are greater psychological detachment, a greater sense of belonging, and greater physical competence. Exercise is also associated with increased cognitive liveliness during off-work time (Oerlemans & Bakker, 2014).

Beyond aiding with recovery, exercise helps to buffer some of the negative effects that can be created by work. Burton and colleagues (2012) found that exercise buffers the relationship between supervisor experiences of stress and employee perceived abusive supervision. The relationship between supervisor stress and employee perceived abusive supervision was weaker when the supervisor exercised more (Burton et al., 2012). In another study, Toker and Biron (2012) found that exercise served as a buffer to the relationship between job burnout and depression such that the relationship between job

burnout and depression was weaker when individuals exercised. Finally, Barber and colleagues conducted a study looking at how exercise can buffer the relationship between negative work experiences and how individuals treat others at home. More specifically, their study found that exercise weakens the association between supervisor undermining and home undermining (Barber et al., 2017).

Although evidence suggests that exercise is beneficial for individuals, research has not provided much insight into whether and how exercise can spark positive spillover and crossover effects that have implications both at work and at home. Only one study measured a work outcome. ten Brummelhuis and Bakker (2012b) found that after exercising during the day, individuals experienced more energy and subsequently more work engagement the following day. As such, the full picture regarding the implications of exercising is obscured.

Additionally, researchers have either asked participants about the time they spent on exercise activities throughout the day (e.g., Rook & Zijlstra, 2006; Oerlemans & Bakker, 2012; Sonnentag, 2001; Sonnentag & Natter, 2004; ten Brummelhuis & Bakker, 2012b) or time they spend on exercise activities after work (Feuerhan et al., 2014; Nagel & Sonnentag, 2013). Such an approach assumes that exercise at all times of the day is equally beneficial to outcomes. However, that may not necessarily be true. Due to natural biological fluctuations in one's hormones throughout the day, exercise may be particularly influential on one's body in the morning (Chang et al., 2012). Thus, we need more information about the boundary conditions under which exercise is most likely to influence individual resource generation.

To gain insight into whether and how exercise affects one at work, and subsequently one's family life, I will draw from the work-home resources model (ten Brummelhuis & Bakker, 2012a). Doing so highlights that exercise generates resources that spillover into other aspects of one's life and crossover to influence other members of one's life. I will also highlight the boundary conditions which may affect resource generation. I now outline the tenets of the work-home resources model to fully develop my theorizing and hypotheses.

Theoretical Overview and Hypotheses Development

The work-home resources (W-HR) model develops more specific propositions about the nature of resources in the work-home interface by building upon the theoretical underpinnings of conservation of resources (COR) theory (Hobfoll, 1989, 2002). Resources refer to "entities that either are centrally valued in their own right...or act as a means to obtain centrally valued ends" (Hobfoll, 2002, p. 307). For example, according to COR theory, mastery, learned resourcefulness, socioeconomic status, and employment are all considered resources (Hobfoll, 1989). Further, COR is based on several key tenets that outline the importance of resources. First, COR theory suggests that employees have resources they want to keep or obtain and that the prospect of losing those resources creates stress that depletes resources. COR theory also suggests that resources tend to come in bundles such that some resources are associated with other resources. For example, having a high socioeconomic status tends to come with having a strong network. Furthermore, having resources helps to build more resources such that those with more resources are able to invest their resources to help build more resources (Hobfoll, 2002). Finally, also important to note, resources are influential in multiple

contexts, meaning that resources at home can also be influential at work (Hobfoll, 2002). In sum, COR theory suggests that resources come in bundles, that having resources helps to gain resources, and that resources have value across domains. While Hobfoll's COR theory applies broadly to life's circumstances (e.g., socioeconomic status), the work-home resources model is more specific and applies theory to the work-home context.

The W-HR model extends COR theory by noting the importance of short-term personal resources for understanding day-level variability in the work-home interface (ten Brummelhuis & Bakker, 2012a). Furthermore, the W-HR model suggests that resources in the personal domain have implications for outcomes in other life domains (i.e., work and family domains) (ten Brummelhuis & Bakker, 2012a). Outcomes are divided into "production, behavioral, and attitudinal outcomes" (ten Brummelhuis & Bakker, 2012a). Production outcomes are the efficiency and effectiveness with which one does one's work; behavioral outcomes refer to individual behaviors that have implications for other types of outcomes; attitudinal outcomes refer to one's beliefs and feelings (ten Brummelhuis & Bakker, 2012a).

I will utilize the W-HR model to offer nuanced insight into how exercise helps people build resources that are important for work and one's family life. Recall that research suggests exercise provides important resources such as increased positive affect, improved attention, and higher energy levels (Chang et al., 2012; Lambourne & Tomporkowski, 2010; Gondola, 1987; Netz et al., 2007; Opezzo & Schwartz, 2014; Saklofeske et al., 1992; Yeung, 1996). These resources have important implications for on-the-job production, behavioral, and attitudinal outcomes (ten Brummelhuis & Bakker, 2012a). Such outcomes at work in turn lead one to experience perceived accomplishment.

One's perception of accomplishment impacts their family life by having a crossover effect on their partner's perceptions of interactions with the individual. However, contextual factors, such as when and with whom the exercise occurred, may serve as boundary conditions to some of the resources generated from exercise. Individual differences, such as the source of one's motivation to exercise and physical fitness, may also serve as boundary conditions to the resources generated by exercise.

Positive Affect

Meta-analytic evidence indicates that a single session of exercise increases positive, activated affect, such as happiness and joy (Reed & Ones, 2006). Similarly, as noted above, Feuerhan and colleagues (2014) found that exercise after work was associated with greater recovery, measured by positive affect before bed. The process through which exercise influences positive affect is at least partially biological. Exercise is associated with increased levels of adrenaline and norepinephrine (noradrenaline), two hormones important for elevating affect (Chang, Labban, Gapin, & Etnier, 2012; Chmura, Nazar, & Kaciuba-Uscilko, 1994). Furthermore, both human and animal studies indicate that exercise is associated with increases in biological compounds associated with affect, such as serotonin, endorphins, and endocannabinoids (Brown, Payne, Kim, Moore, Krebs, & Martin, 1979; Carr et al., 1981; Sparling, Giuffrida, Piomelli, Roskopf, & Dietrich, 2003; Wipfli et al., 2011). Exercise of any duration—even as short and light as a brisk 10-minute walk—has been shown to positively improve affect (Ekkekakis, Hall, VanLanduyt, & Petruzzello, 2000; Reed & Buck, 2009; Reed & Ones, 2006; Thayer, 1987).

According to the work-home resources model, positive affect is a personal resource that has the potential to influence behavioral and attitudinal outcomes (ten Brummelhuis & Bakker, 2012a). I theorize that organizational citizenship behaviors and job satisfaction are two important manifestations of the behavioral and attitudinal outcomes resulting from the positive affective resources generated by exercise. Organizational citizenship behaviors are positive, extra-role behaviors at work (Smith, Organ, & Near, 1983). Job satisfaction refers to the “pleasurable emotional state resulting from the appraisal of one’s job as achieving or facilitating the achievement of one’s job values” (Lock, 1969, 316).

Evidence supports the notion that the positive affective resource generated by exercise influences both one’s organizational citizenship behaviors and one’s job satisfaction. Positive affect encourages humans to approach and engage with their environment, subsequently helping people to build resources (Fredrickson, 2001). For example, positive affect is associated with approach-oriented social behaviors (Dovidio, Gaertner, Isen, & Lawrence, 1995; Fredrickson, 2013; Waugh & Fredrickson, 2006). People that have approach-oriented behaviors are more likely to see helping another person as an opportunity (Higgins, 1998). Further, people with approach-oriented social behaviors are more successful in peer relationships (Nurmi, Toivonen, Salmela-Aro, & Eronen, 1996). Indeed, people who experience positive affect are more likely to behave altruistically towards others (Levin & Isen, 1975). Positive affect also has important implications for one’s job satisfaction. Evidence suggests that positive affect is an important component of life and job satisfaction (Lyumborsky et al., 2005; Weiss, Nicholas, & Daus, 1999). Because engaging in physical activity improves one’s positive

affect, engaging in physical activity should also be associated with greater job satisfaction, through positive affect.

In sum, the work-home resources model suggests that positive affect is a resource that helps to facilitate behavioral and attitudinal outcomes such as organizational citizenship behaviors and job satisfaction. Evidence suggests that exercise is associated with positive affect (Reed & Ones, 2006) and that positive affect is associated with social behaviors linked to helping others (Dovidio et al., 1995; Waugh & Fredrickson, 2006) and to experiencing greater satisfaction (Weiss et al., 1999). As such, I hypothesize the following:

Hypothesis 1: Exercise in the previous 24 hours is associated with greater positive affect at work in the morning.

Hypothesis 2: Exercise in the previous 24 hours has a positive indirect effect on organizational citizenship behaviors via positive affect.

Hypothesis 3: Exercise in the previous 24 hours has a positive indirect effect on job satisfaction via positive affect.

Mental Focus

Research also suggests a link between exercise and indicators of one's cognitive functioning. Meta-analyses indicate that an exercise session is associated with improvements on tasks of attention (Chang et al., 2012; Lambourne & Tomporkowski, 2010). Evidence also suggests that exercise ranging from dancing (Gondola, 1987), to an aerobic training session (Netz et al., 2007; Steinberg et al, 1997), to walking (Opezzo & Schwartz, 2014) is associated with improvements in one's cognitive functioning. Furthermore, exercise is associated with improvements in one's ability to quickly respond

to reaction tasks such as the Stroop task, tasks which require a great deal of attention on the stimuli at hand (Hogervorst, Riedel, Jeukendrup, & Jolles 1996). Exercise influences cognitive processes by influencing the brain's neurological system related to cognitive processing (Hillman, Snook, & Jerome, 2003).

In addition to positive affect, the work-home resources model includes attention as a personal resource (ten Brummelhuis & Bakker, 2012a). Enhanced attention at work likely manifests itself as greater mental focus on work. Mental focus can be defined as how much one is able to concentrate and invest themselves into an activity (Lee, Sheldon, & Turban, 2003). One's attention may be pulled by many different factors including one's work, co-workers, non-work activities, and day dreaming (Gardner, Dunham, Cummings, and Pierce, 1989). However, when one is better able to focus and be absorbed into their work, they should experience better production outcomes at work in the form of better job performance. For example, being more engaged in one's work is associated with improved task performance (Rich, Lepine, & Crawford, 2010). Today's fast-paced work environment, coupled with demand for high-quality service, makes mental focus particularly useful. When people are better able to focus on their work, they are better able to perform their work more efficiently and more effectively.

In sum, the work-home resources model suggests that one's attention has important implications for job performance. Such focus is necessary for performing well in today's fast-paced, service economy. Evidence suggests that exercise is associated with both attention and flexibility (Lambourne & Tomporkowski, 2010; Opezzo & Schwartz, 2014). As such, I hypothesize the following:

Hypothesis 4: Exercise in the previous 24 hours is associated with greater mental focus at work in the morning.

Hypothesis 5: Exercise in the previous 24 hours has a positive indirect effect on job performance via mental focus.

Energy

After exercising, individuals report having more energy (Yeung, 1996). In a comparison of people who engaged in either a relaxation technique or a session of exercise, both groups felt less tense, but those who exercised also felt more energetic (Saklofeske, Blomme, & Kelly, 1992). Furthermore, Thayer (1987) noted that energy levels naturally peak mid-morning and then dip much lower in the afternoon. However, when participants exercised by taking a walk at any point throughout the day, afternoon energy levels were restored to those that were comparable to morning energy levels (Thayer, 1987).

Exercise influences key biological processes related to one's energy levels. In a recent meta-analysis, Kredlow, Capozzoli, Hearon, Calkins, and Otto (2015) considered the effects of an episode of exercise on sleep. Exercise was beneficial for total sleep time, sleep onset latency (how fast you fall asleep), sleep efficiency (how well you sleep), and slow wave sleep (a marker of sleep quantity and quality). Importantly, these effects were found regardless of what time of day the exercise episode occurred (Kredlow et al., 2015). When people get more and higher quality sleep, they experience less sleepiness, which researchers theorize plays an important role in influencing the energetic resources people have (Barnes, 2012). Thus, exercise influences an individual's energetic resources by helping them to sleep longer and better at night.

Energy is another personal resource discussed in the work-home resources model (ten Brummelhuis & Bakker, 2012a). Researchers have theorized the energetic resources provided by exercise can help to achieve positive outcomes at work (Hobfoll, 2011; Quinn, Spreitzer, & Lam, 2012), and evidence suggests that having more energy at work is associated with more productivity (Steers, Mowday, & Shapiro, 2004). Thus, energy may be particularly useful for helping one perform better on the job.

In sum, exercising provides the personal resource of energy, which has important implications for job performance. As noted above, ten Brummelhuis and Bakker (2012b) found that exercising was associated with vigor before work the next morning that was in turn associated with work engagement. As such, I extend the work by ten Brummelhuis and Bakker (2012b) to suggest that exercise is associated with energy not only before work, but also in the morning at work which in turn leads to better job performance.

Stated formally,

Hypothesis 6: Exercise in the previous 24 hours is associated with more energy at work in the morning.

Hypothesis 7: Exercise in the previous 24 hours has a positive indirect effect on job performance via energy.

Home Interpersonal Interactions

One of the key tenets of the work-home resources model is that resources help to build other resources (ten Brummelhuis & Bakker, 2012a). For example, personal resources may lead to outcomes at work, such as helping others, more satisfaction, and better job performance, that help an individual feel they accumulated even more resources such as social support and respect from others. The resulting sense that one has

gained social support and accomplished a job well- done likely means individuals feel they have accomplished a win and as well as a sense of forward movement. Such feelings are associated with making progress (Amabile & Kramer, 2011). As such, the sense of accomplishment one experiences from resource generation likely results in a crossover effect on one's interpersonal interactions at home.

The cross-over effect from the sense of accomplishment may stem from improvements in psychological well-being. Job satisfaction, job performance, and organizational citizenship behaviors not only lead to a sense of progress, but also does so in a way that likely fulfills an individual's fundamental psychological needs for autonomy, competence, and relatedness. Fulfillment of fundamental psychological needs is associated with better psychological well-being. Thus, the resultant perception of accomplishment means that individuals should experience positive well-being outcomes (Sheldon & Kasser, 1998). When individuals have better psychological well-being, the resultant positive emotions may have a contagion effect on one's partner (Barsade, 2002).

Furthermore, because of one's perceived accomplishments at work that day, the individual will be more engaged and interact positively at home because they have more cognitive availability and less resources taken up by worry about work (Hobfoll, 1989; Kahn, 1990). Thus, the individual will have more positive interpersonal interactions with their family at home. For example, the individual may be better able to engage in conversation or more likely to help with chores around the house. In sum, when an individual feels a sense of accomplishment, the has more positive interactions at home.

Hypothesis 8: Organizational citizenship behaviors, job satisfaction, and job performance are positively associated with perceived accomplishment.

Hypothesis 9: Organizational citizenship behaviors, job satisfaction, and job performance have a positive indirect effect on interactions at home with one's partner via perceived accomplishment.

Up to this point, the discussion centered on the ways exercise influences individuals, regardless of contextual differences in the exercise session and regardless of individual differences. However, I theorize that the time of day the exercise occurred and whether the exercise occurred with others influences the personal resources garnered. Individual differences in fitness level and motivation for exercise also influence the personal resources garnered. In the sections below, I highlight how these contextual factors and individual differences serve as boundary conditions for the resources generated by exercise.

Morning Exercise

Whether the individual exercises the prior day before or in the morning before work is an important contextual characteristic of the exercise that may alter the mental focus one accrues. As noted, most research in the organizational sciences either has investigated exercise after work or has confounded the effects of exercise at different times of the day. Indeed, recovery researchers are particularly interested in studying exercise after work because they seek to learn about activities that help individuals return to pre-stressor levels, or the level of stress they experienced before work (Demerouti et al., 2009). However, exercising in the morning before work, relative to the day before, may be particularly important for the mental focus resource generated by exercise. Evidence suggests that exercise in the morning has the strongest effect on cognitive processing (e.g., mental focus) relative to exercise at other times of the day (Chang et al.,

2012). Some scholars have speculated this occurs because morning exercise is particularly influential due to the natural diurnal patterns of the human body (Chang et al., 2012). Furthermore, morning exercise may be particularly influential given that it occurs more closely in time to one's morning resource use at work, making it less likely that the effects have worn off. Thus, I hypothesize the following:

Hypothesis 10: Morning exercise will moderate the positive relationship between (a) exercise and mental focus and (b) the subsequent positive indirect effect on job performance such that the relationship is stronger for those who exercise in the morning before work, relative to those who exercise the day before.

Accompanied versus Unaccompanied Exercise

Another factor that may alter the relationship between exercise and resources garnered is whether an individual exercises accompanied versus unaccompanied. Accompanied exercise refers to when one purposefully exercises with family, friends, or acquaintances. Such exercise does not have to be a team or partner exercise, but it could be. For example, accompanied exercise might mean playing tennis or it might mean going for a jog with someone. Accompanied exercise does not necessarily mean a group exercise class, as attending a class does not necessarily mean the individual purposefully went to exercise with other individuals.

When people exercise accompanied, they experience a connection with other people. The experience of a connection with others is associated with feelings of vitality, aliveness, positive regard, and mutuality (Dutton & Heaphy, 2003). Furthermore, when people feel a sense of close connection with others, they are experiencing fulfillment of their psychological need for relatedness (Deci & Ryan, 2000). Importantly, psychological

need fulfillment is associated with more energy and greater well-being (Deci & Ryan, 2000). Thus, employees who experience a close connection with others during exercise likely experience even greater energetic benefits. As such, I suggest the following:

Hypothesis 11: Accompanied exercise will moderate the relationship between (a) exercise and energy and (b) the subsequent positive indirect effect on job performance such that the relationship is stronger for those who exercise accompanied relative to those who exercise unaccompanied.

Autonomous Motivation

Individual differences also influence the amount of personal resources generated by exercise. One such example is one's level of autonomous motivation for exercising. According to self-determination theory, people engage in behaviors for motivational reasons that lie on a continuum from autonomous to controlled (Deci & Ryan, 2000). Thus, autonomous and controlled motivations lie on opposite ends of the spectrum and may be considered opposite of one another. The extent to which a motivation feels autonomous depends on enjoyment and level of identification with the activity (Sheldon, Turban, Brown, Barrick, & Judge, 2003). More controlled motivation stems from engaging in a behavior for more instrumental outcomes that are separate from the actual behavior (Ryan, Frederick, Lepes, Rubio, & Sheldon, 1997). For example, extrinsic rewards, feeling forced, and feeling guilt are less autonomous and more controlled reasons for engaging in an activity because the individual does not enjoy or identify with the activity (Sheldon et al., 2003). When people are more autonomously motivated, they enjoy the activity and are more likely to experience positive health benefits (Deci & Ryan, 2000). Alternatively, when people engage in an activity for more controlled

reasons, they do not experience the same positive benefits from the activity (Deci & Ryan, 2000). Thus, some people exercise for more autonomous reasons such as the enjoyment of exercise and others exercise for more controlled reasons such as the extrinsically-focused outcome of improving their physical appearance (Ryan et al., 1997), and this affects the resources one garners.

The affective resources one garners from an event depends on their assessment of the meaning of the event (Fredrickson, 2001) which largely depends on one's reasons for taking part in the event. If someone exercises for enjoyment, the individual experiences a greater affective boost after completing such a personally enjoyable activity. As supportive evidence, people feel more enjoyment and better concentration when exercising for more autonomously motivated reasons (Mageau & Vallerand, 2003). As additional supportive evidence, research has found that when people engage in exercise classes for more autonomously motivated reasons, they are more likely to persist and maintain their attendance (Ryan et al., 1997). People who persist do so because they enjoy the activity more and are aware of the benefits gained from exercising.

Alternatively, if someone exercises because they feel controlled to do so, exercise may represent a negative experience that has negative implications for one's positive affect. Controlled reasons to exercise include doctor's orders to get weight under control or feeling compelled to exercise to manage one's physical appearance. When people feel controlled to do something, they experience thwarted fundamental psychological needs (Deci & Ryan, 2000). Thwarted fundamental psychological needs are associated with ill-effects and may lead to negative outcomes (Baumeister & Leary, 1995). As evidence, when people feel more controlled to exercise, they experience greater burnout and

anxiety (Li, Wang, Pyun, & Kee, 2013). Thus, for individuals who exercise because they feel controlled to do so, the relationship between exercise and positive affect may be negative, and thus they engage in less altruistic organizational citizenship behaviors and have lower job satisfaction. Formally stated:

Hypothesis 12: Autonomous motivation will moderate the relationship between (a) exercise and positive affect and (b) the subsequent indirect effects on organizational citizenship behaviors and job satisfaction such that the relationship is positive for those who are more autonomously motivated and negative for those who are less autonomously motivated.

Physical Fitness

Another individual difference that alters the relationship between exercise and personal resources is one's physical fitness. Physically fit people enjoy exercise more because their bodies have adapted to the physical requirements of the activity, and thus they are less uncomfortable in the process (Berger & Motl, 2000). As such, they are more likely to garner affective benefits from exercise (Berger & Motl, 2000). Evidence supports this claim as affective benefits are greatest for those who exercise 3-5 days a week for at least 10-12 weeks, relative to those who exercise less often and for a shorter time-period (Reed & Buck, 2009). Research also indicates that an increase in physical activity load is associated with both an increase in muscle soreness and an increase in mood disturbance (Morgan, Costill, Flynn, Raglin, & O'Connor, 1988). Thus, for people who are less physically fit, the resulting soreness may be associated with fewer affective benefits.

Furthermore, when people are unused to expending so much energy at one time, exercise may also lead to decrements in one's energy levels. Hoffman and Hoffman (2008) examined the effects of physical fitness on one's vigor after exercising. People who exercised 5 or less times in a month, for no more than 25 minutes, during 6 months before the study were considered non-exercisers. People who exercised 3 to 6 times per week, for 30 to 60 minutes each session, during the 6 months leading up to the study were considered regular exercisers. Non-exercisers did not experience changes in vigor 5 minutes after exercising, but regular exercisers did (Hoffman & Hoffman, 2008). Negative effects on energy are also likely enhanced by the fact that exercise is a time-consuming activity. Individuals new to exercise, and thus less fit, must adapt their energy levels to accomplishing tasks at home more quickly when they first add exercise to their schedules. While the challenge of balancing one's schedule to include exercise is difficult for nearly all people, such a balance is likely to be especially difficult for someone new to exercise who has yet to incorporate it into their routine.

In sum, individuals who are less fit may actually experience decreased positive affect and energy. When less fit individuals engage in exercise, they experience more physical discomfort in the process which has a negative effect on one's positive affect (Berger & Motl, 2000). They also have to cope with challenges that are taxing on one's energy. Thus, I hypothesize the following:

Hypothesis 13: Physical fitness will moderate the relationship between (a) exercise and positive affect and (b) the subsequent indirect effects on organizational citizenship behaviors and job satisfaction such that the

relationship is positive for those who are more fit and negative for those who are less fit.

Hypothesis 14: Physical fitness will moderate the relationship between (a) exercise and energy and (b) the subsequent indirect effect on job performance such that the relationship is positive for those who are more fit and negative for those who are less fit.

Method

Participants and Procedures

I recruited participants from 2 large organizations in Central and Eastern Missouri. Firm A is a Bank and Firm B is a government organization. At each company, a point of contact from the HR department sent an e-mail to all employees informing them about the study and inviting them to complete an initial survey. The link to the initial survey contained the informed consent. At the end of the initial survey, I asked employees to provide their name and e-mail if they wished to participate in the daily surveys. I also asked employees to provide the name and contact information for a co-worker and a loved one to provide observational data throughout the duration of the study. The initial survey was completed by 148 employees. Two weeks after sending employees the link to the initial survey, contact information provided by the employee was used to invite co-workers and loved ones to join the study. Daily surveys began for all participants four weeks after the initial survey distribution. Appendix A contains the surveys. In Firm A, in return for participating in the study, employees were eligible to receive points towards their annual goal that reduced their insurance rate. In Firm B, in return for participating in the study, employees were eligible to receive up to \$22

depending on how many of the surveys they completed. Coworkers and loved ones associated with employees in Firm B had their names entered into a drawing for a gift card each time they completed a survey.

Employees received links to three surveys a day for 10 workdays. The links were sent via e-mail except for the evening surveys which were sent via text message (except for one employee who elected to receive the evening survey via e-mail due to not have texting capabilities). I sent the evening survey via text message so employees were not required to check their work e-mail at home. The morning survey links were sent at 9:30a.m. and included questions about exercise in the previous 24 hours, morning positive affect, morning mental focus, and morning energy. Focal employees and their co-workers received the afternoon survey links at 4:00pm. The focal employee survey asked about helping behaviors, job performance, job satisfaction, and progress at work that day. The co-worker survey asked about observations of the focal employee's helping behaviors and job performance. At 7:30p.m., focal employees and their loved one's received an evening survey. Focal employees were asked about interactions with their loved one. Loved ones were asked about their observations of the focal employee's behaviors at home. For the morning and afternoon surveys, each survey shut down so that respondents could not take the survey after the next survey arrived. For the evening survey, any survey completed after 2:00am the morning after the survey was sent was eliminated from the sample.

Of the 148 employees who consented to participate, 139 provided information on at least one day. To run multi-level analyses, only those who completed at least three complete days' worth of surveys were retained for analyses (e.g., Beal, Trougakos, Weiss

& Dalal, 2013; Gabriel, Koopman, Rosen, & Johnson, 2018). The final sample was 102 employees who provided 916 days' worth of data (89.8% completion rate). For some of those 916 days, respondents completed only a morning or afternoon survey.

I tested for differences across the two organizations on 18 variables. Of note, for the daily-variables (e.g., exercise, positive affect, energy, etc.), I tested differences by aggregating across the days. The variables I tested for differences were exercise, positive affect, mental focus, energy, OCB, job satisfaction, performance, progress, partner perceptions, time of exercise, accompanied exercise, motivation for exercise, fitness, organizational tenure, age, gender, job tenure, and hours worked per week. Only two differences were discovered. Average OCB was 2.90 (SD = .88) in Firm A and 3.42 (SD = .91) in Firm B. Average organizational tenure was 12.24 years (SD = 10.53) in Firm A and 7.79 years (SD = 7.66) Firm B.

Across the two samples, participants worked in a variety of occupational types. Some examples include parking enforcement, financial analyst, administrative support, and personal banker, just to name a few. Furthermore, on average, job tenure was 4.74 years (SD = 5.10), organizational tenure was 8.59 years (SD = 8.36). Participants worked an average of 43.34 hours per week (SD = 6.79). The average age was 42.10 years (SD = 12.38). Most participants had a college degree or beyond (70.6%). Participants were 80.4% female and 94.1% white. In the initial survey, employees reported exercising an average of 3.11 days per week. They further reported that an average exercise session lasts 45.05 minutes at an average intensity level of "somewhat hard." Given the lack of differences between the two firms, data from each were combined to create one sample.

Initial Survey

Physical fitness- Physical fitness was measured using a modified version of the Godin and Shephard's (1985) Leisure Exercise Questionnaire. The Godin and Shephard scale asks respondents to indicate the amount of time spent engaging in strenuous, moderate, and light exercise over the past week. The scale was modified in two ways. First, instead of asking for the amount of exercise over the past week, participants were asked in the past month, on average, how many days per week they have typically engaged in exercise. Exercise levels over the past month was chosen instead of the last week given that a longer history of exercise indicates greater physical fitness. Second, instead of indicating the amount of time spent engaging in strenuous, moderate, and light exercise, participants indicated how many minutes they exercised on a typical day and their average exertion level. I did so to shorten the scale and reduce response burden. I pretested the second modification with a sample of students. I calculated the amount of energy expenditure using the original Godin and Shepard scale and my modification. I found a correlation of .86 between them, thus justifying the use of the shortened scale.

Motivation for exercising- Motivation for exercise was assessed with the behavioral regulation in exercise questionnaire which assesses the extent to which one feels autonomous or controlled motivation for exercise by assessing external, introjected, identified, and intrinsic motivations for exercise (Mullan & Markland, 1997). Sample items include "I exercise because other people say I should" for external regulation ($\alpha = .70$); "I feel guilty when I don't exercise" for introjected regulation ($\alpha = .81$); "I value the benefits of exercise" for identified regulation ($\alpha = .63$); and "I exercise because it's fun" for intrinsic regulation ($\alpha = .92$). To create an overall motivation score, the two controlled motivation scores (external and introjected) were added together and then subtracted

from the addition of the autonomous motivation scores (identified and intrinsic) (Sheldon & Elliot, 1998, 1999). As such, higher scores indicate more autonomous motivation for exercising.

Daily Surveys

Unless otherwise noted, all scales used a five-point scale ranging from strongly disagree to strongly agree. Other than the exercise questions, which asked about the last 24 hours, participants answered the morning survey questions as they applied to work so far that day. The afternoon survey asked questions as they applied to work throughout the day. The evening survey asked questions as they applied since leaving work. Reliabilities and within-person variances for each of the scales described below, as well as for the initial survey, can be found in Table 1.

Focal Morning Survey

Exercise in the past 24 hours- To measure daily exercise, participants were asked how many times they have exercised in the last 24 hours. Participants then answered the same modified version of the Godin and Shephard (1985) Leisure Exercise Questionnaire as in the initial survey which required them to indicate how many minutes they exercised on a typical day and their average exertion level. For participants who exercised more than once a day, a composite exercise score was created by summing each exercise session for a given day. To interpret the score in terms of exercise hours instead of exercise minutes, the composite score was divided by 60.

Morning exercise- If participants answered that they had exercised in the past 24 hours, they indicated at what time of day the exercise occurred. If the respondent had exercised between 4:00am and 9:30am, morning exercise was coded as 1, and 0 if not.

Accompanied Exercise- If participants answered that they had exercised in the past 24 hours, they indicated whether they had exercised by themselves, with someone they feel close to, or with an acquaintance. If the respondent had exercised accompanied, accompanied exercise was coded as 1, and 0 if not.

Morning positive affect- Positive affect was measured with three items chosen from the PANAS (Watson, Clark, & Tellegen, 1988). Items included “Inspired,” “Active,” and “Strong.” Within-person α was .75.

Morning mental focus- To measure mental focus, three items were adapted from Lee, Sheldon, and Turban (2003). A sample item includes “I have had good concentration.” Within-person α was .91.

Morning energy- Energy was measured using a shortened version of the subjective vitality scale developed by Ryan and Frederick (1997). A sample item includes “I felt alert and awake.” Within-person α was .87.

Sleep total- Amount of sleep the night before was used as a control variable given its potential influence on one’s positive affect, mental focus, and energy at work (Barnes, 2012). Participants were asked the following: “How many hours and minutes of sleep did you get last night? (e.g., 1 hour and 30 minutes or 1 hour and 0 minutes). Please note this may be different than the number of hours you spent in bed.”

Focal Afternoon Survey

Daily OCB- Organizational citizenship behaviors were measured with four items from the Williams and Anderson (1991) interpersonal behavior scale. Participants rated how many times they had engaged in each of the behaviors throughout the work that day (*1=none; 2=once; 3=twice; 4=three times; 5=four or more times*). Sample items include

“Helped others who had heavy workloads” and “Took time to listen to coworkers’ problems and worries.” Within-person α was .58.

Job performance- Job performance was measured with three items adapted from the Williams and Anderson (1991) in-role performance items. A sample item includes “Adequately completed assigned duties.” Within-person α was .84.

Job satisfaction- Job satisfaction was measured with a single item: “I felt satisfied with my job” from Cammann, Finchman, Jenkins, and Klesh (1983).

Perceived Accomplishment- Perceived accomplishment was measured by an item adapted from Amabile and Kramer (2011): “I made progress towards my goals.”

Co-Worker Afternoon Survey

OCB- Coworkers rated the focal employee using the same OCB scale as the focal employees. Within-person α was .74.

Job Performance- Coworkers rated the focal employee using the same job performance scale as employees. Within-person α was .92.

Focal Evening Survey

Interpersonal capitalization- Interpersonal capitalization was measured with the three-item scale developed by Ilies, Liu, Liu, and Zheng (2017). Sample items include “I told my spouse about some happy events at work” and “I shared my work progress with my spouse.”

Within-person α was .85.

Analytic Approach

The structure of the data was multi-level as it consists of multiple daily responses from individuals over the course of two weeks. Specifically, days (level 1) were nested

within individuals (level 2). The day-level data provides the primary observations used for the analyses. Estimates of the within-person variance for the measures ranged from 28.94% to 62.63% (Table 1). I person-centered (meaning group-mean centered, not grand-mean centered) all day-level predictor variables. Thus, instead of centering exercise in the previous 24 hours around the average for the entire sample, I instead used each individual's own average to center. Doing so allows for clearer interpretation of the coefficients because for variables that are not person-centered, a correlation exists between the level 1 and level 2 variables, making it difficult to interpret findings (Enders & Tofighi, 2007). I conducted analyses using the statistical package mPlus 8 (Muthén & Muthén, 2017). To test the relationship between exercise in the previous 24 hours and the morning resources of positive affect, mental focus, and energy, I used multi-level regression. To test the mediation hypotheses, I used multi-level path analysis to simultaneously estimate the paths between exercise in the previous 24 hours and each of the morning resources and between each of the morning resources and the hypothesized afternoon outcomes (Gabriel, Koopman, Rosen, & Johnson, 2018; Koopman, Lanaj, & Scott, 2016; Wang, Liu, Liao, Gong, Kammeyer-Mueller, & Shi, 2013). Given that scholars have emphasized the importance of modeling maximal random effects structures for generalizability of results, all modeling used random slopes and intercepts (Barr, Levy, Scheepers, & Tily, 2013). Furthermore, given the directionality of the hypotheses, I used one-tailed tests (Preacher, Zypher, & Zhang, 2010). To test the indirect effect, I relied on confidence intervals created using a bias-corrected Monte Carlo simulation with 5,000 replications (Bauer, Preacher, & Gil, 2006). To test the hypothesized moderated

mediation, I investigated the indirect effect at both high and low (+/- 1 SD) levels of the moderator (Preacher, Curran, & Bauer, 2006).

Before testing the hypotheses, I ran a multi-level confirmatory factor analysis (CFA) on the morning positive affect, morning mental focus, morning energy, OCB, and job performance scales. A multi-level CFA is more appropriate than a standard CFA as it accounts for the fact that daily item responses are nested within individuals. Results indicated nearly reasonable fit to the data ($\chi^2(204) = 1537.95$ CFI = .77, RMSEA = .09, SRMR_{within} = .08, SRMR_{between} = .10). The traditional standards of acceptable fit were developed for nonmultilevel analyses, and thus must be considered collectively (Gabriel et al., 2018; West, Taylor, & Wu, 2012). Therefore, given the relative proximity of the fit indices to the traditional cut-off values, I considered the fit adequate to proceed with hypothesis testing. I also ran an alternative model where all morning resources loaded onto one factor and OCB and job performance loaded onto one factor. Model fit estimates ($\chi^2(223) = 4203.28$ CFI = .32, RMSEA = .14, SRMR_{within} = .29, SRMR_{between} = .39) indicated worse fit.

With regards to control variables, scholars have noted the importance of only controlling for variables that are supported with theoretical rationale (Spector & Brannick, 2011). Therefore, I controlled for sleep total the previous night given that scholars have theorized the importance of sleep for one's personal resources throughout the day (Barnes, 2012). Alternatively, I did not have theoretical rationale for controlling for demographic variables. However, I did run models containing gender as a control variable, given the significant correlations between gender and positive affect, energy,

and mental focus. Results did not change. Therefore, given the lack of theoretical rationale for including gender as a control, I only report the models without gender.

Results

Table 2 shows the means, standard deviations, and within-person correlations for the measures. Of note, correlations provided initial support for hypotheses one and six as exercise in the previous 24 hours was positively associated with morning positive affect and morning energy ($r = .07, p < .05$; $r = .13, p < .01$, respectively). Furthermore, morning positive affect, morning mental focus, and morning energy were positively correlated with afternoon job satisfaction and afternoon job performance, although only morning energy was positively correlated with afternoon OCB. Afternoon job satisfaction and afternoon job performance were also positively correlated with afternoon perceived accomplishment while afternoon OCB was not. Afternoon perceived accomplishment was not correlated with evening interpersonal capitalization.

Hypothesis 1 predicted a positive relationship between exercise in the previous 24 hours and positive affect at work in the morning. To test this hypothesis, I used multi-level regression analysis (Table 3). I first ran model 1 containing only the control variable, sleep total. Sleep total was a positive predictor of morning positive affect. In model 2, I added exercise. Examination of results from model 2, using a one-tailed test, indicated a level of significance ($p = .053$) just outside of conventional standards, thus providing a lack of support for hypothesis 1 ($\gamma = .03$) which predicted that exercise in the previous 24 hours was positively associated with positive affect.

Hypothesis 2 predicted a positive indirect effect from exercise in the previous 24 hours to OCBs via positive affect. I ran a multi-level path analysis which simultaneously

estimated the relationships between exercise and positive affect and between positive affect and OCBs. In this model, the relationship between exercise and positive affect again fell just shy of reaching conventional standards of significance ($\gamma = .03$) while the relationship between positive affect and OCBs was significant ($\gamma = .09, p < .05$). As seen in Table 4, the confidence interval created using a bias-corrected Monte Carlo simulation around the indirect effect ($\text{ind} = .0024$), based on values from a one-tailed test, did not contain zero [$\text{CI} = .0002, .007$]. Therefore, hypothesis 2 was supported. Exercise in the previous 24 hours had a positive indirect effect on OCBs via positive affect.

Hypothesis 3 predicted a positive indirect effect from exercise in the previous 24 hours to job satisfaction via positive affect. Therefore, I ran a multi-level path analysis which simultaneously estimated the relationships between exercise and positive affect and between positive affect and job satisfaction. Consistent with Hypothesis 1, the relationship between exercise and positive affect was just shy of reaching conventional standards of significance ($\gamma = .03$). The relationship between positive affect and job satisfaction was positive ($\gamma = .28, p < .01$). As seen in Table 4, the confidence interval created using a bias-corrected Monte Carlo simulation around the indirect effect ($\text{ind} = .007$), based on values from a one-tailed test, did not contain zero [$\text{CI} = .0004, .015$]. Therefore, hypothesis 3 was supported indicating that exercise in the previous 24 hours had a positive indirect effect on job satisfaction via positive affect.

Hypothesis 4 predicted a positive relationship between exercise in the previous 24 hours and mental focus at work in the morning. As with hypothesis 1, I conducted a multi-level regression analysis (Table 3). In model 3, I predicted morning mental focus using only the control variable, sleep total. Sleep total was a significant predictor of

morning mental focus. In model 4, I added exercise. As shown in model 4, using a one-tailed test, exercise in the previous 24 hours was positively related to mental focus ($\gamma = .02, p < .05$), providing support for hypothesis 4.

Hypothesis 5 predicted a positive indirect effect from exercise in the previous 24 hours to job performance, via mental focus. Therefore, I ran a multi-level path analysis which simultaneously estimated the relationships between exercise and mental focus and between mental focus and job performance. In this model, the relationship between exercise and mental focus was significant ($\gamma = .02, p < .05$) and the relationship between mental focus and job performance was also significant ($\gamma = .16, p < .01$). The indirect effect (Table 4) was also significant ($ind = .003$). The confidence interval created using a bias-corrected Monte Carlo simulation around the indirect effect, based on values from a one-tailed test, did not contain zero [CI = .001, .005]. Therefore, hypothesis 5 was supported indicating a positive indirect effect from exercise in the previous 24 hours to job performance, via mental focus.

Hypothesis 6 predicted a positive relationship between exercise in the previous 24 hours and energy at work in the morning. As with hypotheses 1 and 4, I conducted a multi-level regression analysis (Table 3) starting with a model that only included sleep total as a control variable (model 5). Sleep total was a significant predictor of morning energy. I then added exercise in model 6. As shown in model 6, using a one-tailed test, exercise in the previous 24 hours was positively related to energy ($\gamma = .04, p < .01$), providing support for hypothesis 6.

Hypothesis 7 predicted a positive indirect effect from exercise in the previous 24 hours to job performance, via energy. I conducted a multi-level path analysis which

simultaneously estimated the relationships between exercise and energy and between energy and job performance. In this model, the relationship between exercise and energy was significant ($\gamma = .04, p < .01$) and the relationship between energy and performance was also significant ($\gamma = .11, p < .01$). The indirect effect (Table 4) was also significant ($\text{ind} = .005$). As seen in Table 4, the confidence interval created using a bias-corrected Monte Carlo simulation around the indirect effect, based on values from a one-tailed test, did not contain zero [$\text{CI} = .002, .008$]. Therefore, hypothesis 7 was supported indicating a positive indirect effect from exercise in the previous 24 hours to job performance, via energy.

Hypothesis 8 predicted a positive relationship between OCBs, job performance, job satisfaction and feelings of accomplishment. Hypothesis 8 received partial support from the multi-level regression (Table 5), using a one-tailed test. Job performance and job satisfaction were significant related to accomplishment ($\gamma = .35, p < .01$; $\gamma = .43, p < .01$, respectively) while OCBs was not ($\gamma = -0.02$).

Hypothesis 9 predicted that perceived accomplishment would be positively associated with interactions at home. Unfortunately, given the small number of partner responses to the survey, I was unable to test this hypothesis using partner perception ratings. Therefore, I relied on a self-ratings of interpersonal capitalization based on the assumption that such behaviors are noticed by one's loved one's at home. When considering the evening survey along with the morning and afternoon survey, due to the requirement to have three complete days' worth of data, the sample size dropped to 86 participants who completed 780 days' worth of data. I used multi-level regression and conducted a one-tailed test for hypothesis 9, which did not receive support at

conventional levels ($\gamma = -.20$). Therefore, perceived accomplishment was not associated with interpersonal capitalization.

Hypotheses 10 through 14 predicted moderated-mediation. More specifically, they predicted that (a) contextual aspects of the exercise and individual differences influence the relationships between exercise in the previous 24 hours and each of the morning resources and (b) the subsequent indirect effects on work outcomes. To test these hypotheses, I first tested the interaction between exercise in the previous 24 hours and the moderator on the morning resource. If the interaction was not significant, I did not test part (b) of the hypothesis pertaining to the moderated indirect effect. However, if the moderator was significant, I proceeded to test the indirect effect at high and low values of the moderator (Preacher et al., 2006). Furthermore, to test the moderating effects of contextual aspects of the exercise (i.e., morning exercise and accompanied exercise, hypotheses 10 and 11), I utilized only those days on which individuals had exercised as one can only examine contextual aspects of exercise when the person has exercised.

Hypothesis 10 predicted that morning exercise moderates the relationship between (a) exercise in the previous 24 hours and mental focus and (b) the subsequent positive indirect effect on job performance such that the relationship is stronger for those who exercise in the morning relative to those who exercise the day before. For part (a) of the hypothesis, I tested the interaction between exercise and morning exercise on mental focus (Table 6, model 7). Results did not support moderation at conventional statistical levels ($\gamma = -0.007$). As such, I did not proceed to test part (b) of the hypothesis regarding differences in the indirect effect on job performance. Hypothesis 10 was not supported.

Morning exercise did not moderate the relationship between (a) exercise in the previous 24 hours and mental focus and (b) the subsequent indirect effect on job performance.

Hypothesis 11 predicted that accompanied exercise moderates the relationship between (a) exercise in the previous 24 hours and energy and (b) the subsequent positive indirect effect on job performance such that the relationship is stronger for those who exercise accompanied relative to those who exercise unaccompanied. For part (a) of the hypothesis, I tested the interaction between exercise and accompanied exercise on energy (Table 6, model 8). Results did not support moderation at conventional statistical levels ($\gamma = .05$). As such, I did not proceed to test part (b) of the hypothesis regarding differences in the indirect effect on job performance. Hypothesis 11 was not supported. Accompanied exercise did not moderate the relationship between (a) exercise in the previous 24 hours and energy and (b) the subsequent indirect effect on job performance.

Hypothesis 12 predicted that autonomous motivation moderates the relationship between (a) exercise in the previous 24 hours and positive affect and (b) the subsequent positive indirect effects on organizational citizenship behaviors and job satisfaction such that the relationship is positive for those who are more autonomously motivated and negative for those who are less autonomously motivated. For part (a) of the hypothesis, I tested the interaction between exercise and autonomous motivation on positive affect (Table 7, model 9). Results did not support moderation at conventional statistical levels ($\gamma = -.007$). As such, I did not proceed to test part (b) of the hypothesis regarding differences in the indirect effect on OCBs and job satisfaction. Hypothesis 12 was not supported. Autonomous motivation did not moderate the relationship between (a)

exercise in the previous 24 hours and positive affect and (b) the subsequent indirect effects on organizational citizenship behaviors and job satisfaction.

Hypothesis 13 predicted that fitness level moderates the relationship between (a) exercise in the previous 24 hours and positive affect and (b) the subsequent indirect effects on organizational citizenship behaviors and job satisfaction such that the relationship is positive for those who are more fit and negative for those who are less fit. I tested the part (a) of the hypothesis by looking at the interaction between exercise and fitness level on one's positive affect (Table 7, model 10). Results indicate that one's fitness level moderates the relationship between exercise and positive affect ($\gamma = -0.001$). I plotted the significant interaction in Figure 2. Surprisingly, the interaction was not in the predicted direction because the relationship was actually stronger for individuals who are less fit. I then tested the simple slopes for the relationship between exercise and positive affect at high and low values of fitness. Simple slopes analysis showed that when employees were more fit, the relationship between exercise and positive affect was nonsignificant at conventional levels ($\gamma = .03$). Conversely, when employees were less fit, the relationship between exercise and positive affect was positive ($\gamma = .05, p < .05$). Thus, such results indicated that only those individuals who are less fit experienced a positive relationship between exercise in the previous 24 hours and positive affect.

I then proceeded to investigate part (b) of hypothesis 13 regarding differences in the indirect effect of exercise on both job citizenship behaviors and job satisfaction, via positive affect, at high and low values of fitness. Results indicate no significant difference in the indirect effect for organizational citizenship behaviors or job satisfaction at different levels of fitness. In sum, hypothesis 13 was not supported. Although I found

that fitness level moderated the relationship between exercise and positive affect, the relationships were not in the expected direction. Furthermore, the moderation did not influence the indirect effect of exercise in the previous 24 hours on OCB or job satisfaction, via positive affect.

Hypothesis 14 predicted that physical fitness moderates the relationship between (a) exercise in the previous 24 hours and energy and (b) the subsequent indirect effect on job performance such that the relationship is positive for those who are more fit and negative for those who are less fit. For part (a) of the hypothesis, I tested the interaction between exercise and fitness level on energy (Table 7, model 11). Results did not indicate moderation at conventional statistical levels ($\gamma = -.001$). As such, I did not proceed to test differences in the indirect effect on job performance. Hypothesis 14 was not supported. Physical fitness did not moderate the relationship between exercise in the previous 24 hours and energy and the subsequent indirect effect on job performance.

Discussion

I took a resource perspective and investigated whether and how exercise influences personal resources at work and subsequent outcomes throughout the day. Furthermore, by investigating boundary conditions, I sought to clarify when exercise is most likely to impact resources and subsequent outcomes. Results (see Table 8 for a summary) indicate that exercise provides employees with more positive affect, mental focus, and energy at work in the morning. As a result of increased positive affect from exercise, individuals reported greater OCBs and job satisfaction. In turn, job satisfaction and citizenship behaviors were associated with greater feelings of accomplishment. As a result of greater mental focus and energy, individuals reported better job performance.

One's fitness level moderated the relationship between exercise and positive affect such that the relationship was stronger for people who are less fit. These findings have theoretical and practical implications.

Theoretical implications

This study builds upon and extends the recovery literature by considering the role of exercise for generating personal resources. Previous recovery research considered exercise as an activity that replenishes resources depleted by the stress of work and leads to greater resources and well-being during off-work time (Demerouti et al., 2009; Feuerhan et al., 2014; Sonnentag, 2001; Sonnentag & Zijlstra, 2006). Therefore, although previous research has shown that exercise can help individuals feel recovered after work and during off-work time, nobody had yet shown how exercise influences personal resources and subsequent outcomes while at work. The one notable exception is ten Brummelhuis and Bakker (2012b) who demonstrated that exercise the prior day is associated with afternoon work engagement. Instead of assuming resources must be depleted for exercise to be of value, I took a broader resource perspective that included the notion that exercise can generate resources useful at work, regardless of whether one is depleted or not. Evidence from my study suggests that exercise provided employees with more positive affect, mental focus, and energy at work in the morning. Thus, taking a broader resource perspective provides theoretical insight into the mechanisms, specifically positive affect, mental focus, and energy, through which daily exercise influences employees *at* work instead of simply after a depleting day of work. In sum, exercise not only replenishes resources, but also generates resources.

This study further builds upon the recovery literature by investigating how an activity in one's personal domain can influence work outcomes. One's personal domain refers to activities pursued for one's own interests outside of one's family (Wilson & Baumann, 2015).

Previous recovery literature has typically only considered the implications of personal activities for one's personal and family life (for an exception, see ten Brummelhuis & Bakker, 2012b). However, findings in this study indicate that positive affect generated by exercise was associated with OCBs and job satisfaction. Mental focus and energy generated by exercise were associated with performance. Therefore, much like scholars have theorized that resources accumulated in one's family life may spillover to enrich work (Greenhaus & Powell, 2006), the findings from this study illustrate that activities in one's personal domain (i.e., exercise) may also enrich one's work. Such findings are consistent with other research indicating that activities such as volunteering have implications for work-related outcomes (Rodell, 2013). Thus, I offer a clearer picture of the role of daily exercise by extending the recovery literature to highlight that exercise, an activity that most often occurs as part of one's personal life, can influence resources and outcomes at work.

In turn, I theorized that resource generation from exercise and subsequent work outcomes would lead to feelings of accomplishment and better family outcomes. I found that employees felt more accomplished from better work outcomes. However, feelings of accomplishment did not influence subsequent outcomes at home. Scholars have noted that positive affect, mental focus, and energy are short-term resources with more immediate consequences (ten Brummelhuis & Bakker, 2012a). Therefore, job

satisfaction, OCBs, and job performance, which lead to feelings of accomplishment, may be the extent of outcomes from resources generated from exercise. Although the employee feels accomplished at the end of the day, by the time the employee went home, the effects of the morning resources generated by exercise may have already worn off. Furthermore, helping others and performing well on the job may deplete one's resources (Gabriel et al., 2018). As a result, a positive spillover from work to family may be less likely to occur because the individual has fewer resources after a day of successful work. Alternatively, it could be that the effects of day-level resources and work outcomes on home outcomes are not immediately apparent. Instead, the effects accumulate over time such that more resources and better outcomes at work are associated with more long-term outcomes such as promotions and pay raises. As a result, a greater impact on non-work outcomes occurs over the long-term. I encourage future research to further consider how daily exercise influences employees at work and how long those effects may last or even take to accumulate. Currently, we have little understanding of the duration and accumulation process of personal resources. It would be particularly useful to understand how long personal resources influence outcomes throughout the day to know how often individuals should consider generating new resources or replenishing depleted resources. It would also be useful to understand how long resources take to accumulate to influence more long-term outcomes. As such, researchers can and should consider both more frequent and more long-term measurement of resources and outcomes. Doing so will offer further theoretical insight into the duration and accumulation of personal resources.

I also contribute to theorizing about resources at the daily level by considering how individual differences influence resource generation. Although scholars have

theorized that resource generation may not occur equally across all individuals and all contexts, scholars typically assume individuals who have more resources are most likely to generate resources (Hobfoll, 1989, ten Brummelhuis & Bakker, 2012a).

Metaphorically, this can be thought of as the rich get richer. As such, I expected more physically fit individuals to benefit the most from exercise, based on the assumption that those who are more fit have accumulated more personal resources over time (i.e., they are “richer”). However, findings indicated that less fit people have a stronger relationship between exercise and positive affect at work in the morning. Although initially surprising, upon further consideration, this finding might suggest that individuals who are less fit garner more benefits because they have more to gain. More fit employees likely have already accumulated affective resources from exercise over the long-term such that the daily resource gains are less apparent. Indeed, the results support this notion as the more fit individuals had higher morning positive affect on all days, regardless of exercise. I encourage more future research to consider for whom resource gains are most likely to occur at the daily level.

In sum, this study has four important theoretical implications. First, I illustrate how taking a broader resource perspective can shed light on the role of exercise for providing resources at work, regardless of one’s depletion level. Second, I illustrate how a personal-domain activity can have spillover effects on work outcomes. Third, I suggest that the effects of personal resources may wear off sooner than expected, warranting further investigation of resource duration. Fourth, I illustrate that resource generation may not always be the strongest for those who have the most resources, thus highlighting the importance of boundary conditions for resource generation.

Practical implications

This research also has important practical implications. First, these findings complement our understanding of the importance of regular (i.e., long-term) exercise by highlighting the importance of exercise on a given day (i.e., daily exercise) for resources at work. Exercise within 24 hours of the start of a hard work day can provide a strategy for building the resources of positive affect, mental focus, and energy. Furthermore, for some individuals, the long wait for physical health benefits (e.g., substantial weight loss) to accumulate from a long-term exercise program may be demotivating, causing them to stop exercising. Individuals may not necessarily be consciously aware of the daily benefits of exercise such as better mood, mental focus, and energy which in turn lead to better job satisfaction, OCBs, and job performance. Thus, advertising to employees about the benefits of daily exercise may provide more immediate gratification than a long-term exercise program can offer. As a result, employees may be more motivated to continue exercising even when long-term health benefits are not immediately apparent.

For organizations, this study highlights that encouraging daily exercise may help employees achieve firm-valued outcomes such as OCBs and job performance. Firms are increasing their efforts to help employees achieve greater health and well-being (Society for Human Resource Management, 2017). However, scholars often lament that most company's implement wellness initiatives without a clear sense of whether they impact important outcomes at work (Mattke et al., 2013). The results from this study provide empirical insight into the value of encouraging one important wellness behavior: daily exercise. Furthermore, finding that less fit employees are most likely to experience affective benefits from daily exercise suggests that managers and HR professionals

should consider ways to engage and encourage less fit employees to exercise. Such a task may be particularly challenging given that often those who are already fit are the most likely to participate in exercise programs (Mattke et al., 2013). However, consistent with the notion above, advertising the short-term benefits of daily exercise may help to mitigate some of the challenge associated with getting less-fit employees to participate. Nevertheless, before selecting an advertising strategy, companies should consider the financial costs of encouraging non-exercisers to exercise relative to encouraging exercisers to continue to do so. It could be that the costs of encouraging those who are less-fit to exercise are high enough that the benefits do not outweigh the costs.

Limitations and future research directions

As with all studies, mine is not without limitations. I chose to focus on job satisfaction, organizational citizenship behaviors, and job performance to capture, attitudinal, behavioral, and production outcomes consistent with resource-based theorizing (ten Brummelhuis and Bakker, 2012a). However, consideration of other outcomes can offer further insight into how daily exercise influences employees throughout the day. For example, perhaps scholars can consider relational energy, commitment to the organization, or voice behaviors. Furthermore, scholars have noted the need to consider not only the positive outcomes associated with behaviors, but also the so-called “dark side.” Therefore, future research would do well to also consider negative implications of exercise. For example, some resources may be depleted by exercise. A distinction may be made between subjective energy and physical energy (Dawson, Noy, Marma, Akerstedt, & Belensky, 2011). Thus, although I measured subjective energy, exercise may be associated with physical fatigue that inhibits job

performance on some days. Such an effect is likely most problematic for individuals who are less fit, who work physically demanding jobs, who exercise significantly more than they are used to, and who have poor sleep habits. Overall, we have much to learn about the effects of exercise on outcomes throughout the day.

This study employed multiple daily measurements, allowing for time separation of the variables and the use of multi-level modeling. Given the requirement for three complete days' worth of data per focal employee, the sample was limited when including coworker and at-home observations. Thus, although I attempted to include others' observations, hypotheses were ultimately tested using self-report data. As such, I encourage future research to obtain larger samples that include more co-worker, supervisor, and at-home observations. However, I note that such research may be challenging given the demands of participating in a daily ESM study. Furthermore, although previous research indicates relatively strong correlations between self-report and objectively measured exercise (Berstein, Sloutskis, Kumanyika, Sparti, Schutz, & Morabia, 1998; Racette, Schoeller, & Kushner, 1995), I encourage more objective measures of daily exercise such as the use of fitness trackers.

Finally, I note that many of my indirect effects were small with CIs that were close to zero. However, scholars have noted that within-individual effect sizes are quite small and that small effect sizes do not negate their importance (Gabriel et al., 2018). Furthermore, my effect sizes are comparable to other within-individual studies (Gabriel et al., 2018). Regardless, I encourage future to consider other mechanisms and other causal orders that may be underlie the relationship between exercise and outcomes at work. For

example, although not consistent with my theorizing, my modeling cannot rule out the possibility that morning resources do not influence subsequent exercise behaviors.

Conclusion

In sum, this study takes an important step towards understanding the implications of daily exercise for resources at work and subsequent outcomes. Exercise provides individuals with more positive affect, mental focus, and energy at work in the morning. However, the gain in positive affect is strongest for employees who are less fit. Positive affect was associated with OCBs and job satisfaction. Mental focus and energy were associated with job performance. In turn, OCBs, job satisfaction, and job performance were associated with feelings of accomplishment. I hope the findings and limitations of this research spark further interest in an expanded view of the role of daily exercise for employees, beyond just recovery.

References

- Amabile, T., & Kramer, S. (2011). *The progress principle: Using small wins to ignite joy, engagement, and creativity at work*. Boston, MA: Harvard Business School Publishing.
- American Heart Association. (2017). *Healthy living*. Retrieved from http://www.heart.org/HEARTORG/HealthyLiving/PhysicalActivity/Physical-Activity_UCM_001080_SubHomePage.jsp.
- Aspinwall, L. G. (1998). Rethinking the role of positive affect in self-regulation. *Motivation and Emotion*, 22(1), 1-32. doi: 10.1023/A:1023080224401
- Barber, L. K., Taylor, S. G., Burton, J. P., & Bailey, S. F. (2017). A self-regulatory perspective of work-to-home undermining spillover/crossover: Examining the roles of sleep and exercise. *Journal of Applied Psychology*. doi: 10.1037/apl0000196
- Barnes, C. M. (2012). Working in our sleep: Sleep and self-regulation in organizations. *Organizational Psychology Review*, 2(3), 234-257. doi: 10.1177/2041386612450181
- Barr, D. J., Levy, R., Scheepers, C., & Tily, H. J. (2013). Random effects structure for confirmatory hypothesis testing: Keep it maximal. *Journal of Memory and Language*, 68, 255-378. doi: 10.1016/j.jml.2012.11.001
- Barsade, S. G. (2002). The ripple effect: Emotional contagion and its influence on group behavior. *Administrative Science Quarterly*, 47(4), 644-675. doi: 10.2307/3094912

- Bauer, D. J., Preacher, K. J., & Gil, K. M. (2006). Conceptualizing and testing random indirect effects and moderated mediation in multilevel models: New procedures and recommendations. *Psychological methods, 11*(2), 142-163. doi: 0.1037/1082-989X.11.2.142
- Baumeister, R. F., & Leary, M. R. (1995). The need to belong: Desire for interpersonal attachments as a fundamental human motivation. *Psychological Bulletin, 117*(3), 497-529. doi: 10.1037/0033-2909.117.3.497
- Berger, B. G., & Motl, R. W. (2000). Exercise and mood: A selective review and synthesis of research employing the profile of mood states. *Journal of Applied Sport Psychology, 12*(1), 69-92. doi: 10.1080/10413200008404214
- Berstein, M., Sloutskis, D., Kumanyika, S., sparti, A., Schutz, Y., & Morabia, A. (1998). Data-based approach for developing a physical activity frequency questionnaire. *American Journal of Epidemiology, 147*, 147-154. doi: 10.1093/oxfordjournals.aje.a009427
- Berry, L. L., Mirabito, A. M., & Baun, W. B. (2012). What's the hard return on employee wellness programs? *Harvard Business Review, 88*(12), 104-112.
- Brown, B. S., Payne, T., Kim, C., Moore, G., Krebs, P., & Martin, W. (1979). Chronic response of rat brain norepinephrine and serotonin levels to endurance training. *Journal of Applied Physiology: Respiratory, environmental, and exercise physiology, 46*(1), 19-23.
- Burton, J. P., Hoobler, J. M., & Scheuer, M. L. (2012). Supervisor workplace stress and abusive supervision: The buffering effect of exercise. *Journal of Business Psychology, 27*(3), 271-279. doi: 10.1007/s10869-011-9255-0

- Calderwood, C., Gabriel, A. S., Rosen, C. C., Simon, L. S., & Koopman, J. (2015). 100 years running: The need to understand why employee physical activity benefits organizations. *Journal of Organizational Behavior*. doi: 10.1002/job.2064
- Cammann, C., Finchman, M., Jenkins, G. D., & Klesh, J. (1983). Michigan organizational assessment questionnaire. In S.E. Seashore, E. E. Lawler, P. H. Mirvis, & C. Camman (Eds.), *Assessing organizational change: A guide to methods, measures, and practices* (pp. 71-138). New York, NY: Wiley-Interscience.
- Carr, D. B., Bullen, B. A., Skrinar, G. S., Arnold, M. A., Rossenblatt, M., Beitins, I.Z., ... & McArthur, J. W. (1981). Physical conditioning facilitates the exercise induced-secretion of beta-endorphin and beta-lipotropin in women. *New England Journal of Medicine*, 305(10), 560-563.
- Caspersen, C. J., Powell, K. E., & Christenson, G. M. (1985). Physical activity, exercise, and physical fitness: Definitions and distinctions for health-related research. *Public Health Reports*, 100(2), 126-131.
- Center for Disease Control. (2015). *Physical activity for a healthy weight*. Retrieved from https://www.cdc.gov/healthyweight/physical_activity/index.html
- Chang, Y. K., Labban, J. D., Gapin, J. I., & Etnier, J. L. (2012). The effects of acute exercise on cognitive performance: A meta-analysis. *Brain Research*, 1453, 87-101. doi: 10.1016/j.brainres.2012.02.068
- Chmura, J., Nazar, K., Kaciuba-Uscilko, H. (1994). Choice reaction time during graded exercise in relation to blood lactate and plasma catecholamine thresholds.

International Journal of Sports Medicine, 15(4), 172-176. doi: 10.1055/s-2007-1021042

Colcombe, S., & Kramer, A. F. (2003). Fitness effects on the cognitive function of older adults. *Psychological Science*, 14(2), 125-130. doi: 10.1111/1467-9280.t01-1-01430

Dawson, D., Noy, Y. I., Harma, M, Akerstedt, T., & Belenky, G. (2011). Modelling fatigue and the use of fatigue models in work settings. *Accident Analysis and Prevention*, 43, 549-564. doi: 10.1016/j.aap.2009.12.030

Deci, E. L., & Ryan, R. M. (2000). The “what” and “why” of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry* 11(4), 227-268. doi: 10.1207/S15327965PLI1104_01

Demerouti, E., Bakker, A. B., Geurts, S. A. E., & Taris, T. W. (2009). Daily recovery from work-related effort during non-work time. In S. Sonnentag, P. L. Perrewe, J., & D. C. Ganster (Eds.), *Current perspectives on job-stress recovery (Research in occupational stress and well-being, Volume 7)*, (pp. 85-123).

Dovidio, J. F., Gaertner, S. L., Isen, A. M., & Lowrance, R. (1995). Positive affect, cognition, and the reduction of intergroup bias. In C. Sedikides (Ed.), *Intergroup cognition and intergroup behavior* (pp. 337-366). Mahwah, NJ: Erlbaum.

Dutton, J. E., & Heaphy, E. D. (2003). The power of high-quality connections. In K. S. Cameron, J. E. Dutton, & R. E. Quinn (Eds.), *Positive Organizational Scholarship: Foundations of a New Discipline*, (pp. 267-278). San Francisco, CA: Berrett-Koehler Publishers, Inc.

- Ekkekakis, P., Hall, E. E., VanLanduyt, L. M., & Petruzzello, S. J. (2000). Walking in (affective) circles: Can short walks enhance affect? *Journal of Behavioral Medicine, 23*(3), 245-275. doi: 10.1023/A:1005558025163
- Enders, C. K., & Tofighi, D. (2007). Centering predictor variables in cross-sectional multilevel models: A new look at an old issue. *Psychological Methods, 12*, 121-138. doi: 10.1037/1082-989X.12.2.121
- Feuerhan, N., Sonnentag, S., & Woll, A. (2014). Exercise after work, psychological mediators, and affect: A day-level study. *European Journal of Work and Organizational Psychology, 23*(1), 62-79. doi: 10.1080/1359432X.2012.709965
- Fredrickson, B. L. (2013). Positive emotions broaden and build. In P. Devine and A. Plant (Eds.), *Advances in experimental social psychology* (Vol. 47, pp. 1-53). Burlington, MA: Academic Press.
- Fredrickson, B. L. (2001). The role of positive emotions in positive psychology: The broaden-and-build theory of positive emotions. *American Psychologist, 56*(3), 218-226.
- Gabriel, A. S., Koopman, J., Rosen, C. C., & Johnson, R. E. (2018). Helping others or helping oneself? An episodic examination of the behavioral consequences of helping at work. *Personnel Psychology, 71*, 85-107. doi: 10.1111/peps.12229.
- Gardner, D. G., Dunham, R. B., Cummings, L. L., & Pierce, J. L. (1989). Focus of attention at work: Construct definition and empirical validation. *Journal of Occupational Psychology, 62*(1), 61-77. doi: 10.1111/j.2044-8325.1989.tb00478.x

- Godin, G., & Shephard, R. J. (1985). A simple method to assess exercise behavior in the community. *Canadian Journal of Applied Sports Sciences, 10*, 141-146.
- Gondola, J. C. (1987). The effects of a single bout of aerobic dancing on selected tests of creativity. *Journal of Social Behavior & Personality, 2*(2, Pt 1), 275-278.
- Greenhaus, J. H., & Powell, G. N. (2006). When work and family are allies: A theory of work-family enrichment. *Academy of Management Review, 31*(1), 72-92. doi: 10.5465/AMR.2006.19379625
- Griffin, M. A., Neal, A., & Parker, S. K. (2007). A new model of work role performance: Positive behavior in uncertain and interdependent contexts. *Academy of Management Journal, 50*(2), 327-347. doi: 10.5465/AMJ.2007.24634438
- Hillman, C. H., Snook, E. M., Jerome, G. J. (2003). Acute cardiovascular exercise and executive control function. *International Journal of Psychophysiology, 48*(3), 307-314. doi: 10.1016/S0167-8760(03)00080-1
- Hobfoll, S. E. (1989). Conservation of resources: A new attempt at conceptualizing stress. *American Psychologist, 44*(3), 513-524.
- Hobfoll, S. E. (2002). Social and psychological resources and adaptation. *Review of General Psychology, 6*(4), 307-324. doi: 10.1037//1089-2680.6.4.307
- Hobfoll, S. E. (2011). Conservation of resource caravans and engaged settings. *Journal of Occupational and Organizational Psychology, 84*, 116–122. doi:10.1111/j.2044-8325.2010.02016.x
- Hoffman, M. D., & Hoffman, D. R. (2008). Exercisers achieve greater acute exercise-induced mood enhancement than nonexercisers. *Archives of physical medicine and rehabilitation, 89*(2), 358-363. doi: 10.1016/j.apmr.2007.09.026

- Hogervorst, E., Ridel, W., Jeukendrup, A., & Jolles, J. (1996). Cognitive performance after strenuous physical exercise. *Perceptual and Motor Skills*, 83(2), 479-488. doi: 10.2466/pms.1996.83.2.479
- Ilies, R., Liu, X-Y., Liu, Y., & Zheng, X. (2017). Why do employees have better family lives when they are highly engaged at work? *Journal of Applied Psychology*, 102(6), 956-970. doi: 10.1037/apl0000211
- Janicki, D. L., Kamarck, T. W., Shiffman, S. (2006). Application of ecological momentary assessment to the study of marital adjustment and social interactions during daily life. *Journal of Family Psychology*, 20(1), 168-172. doi: 10.1037/0893-3200.20.1.168
- John, O. P., & Srivastava, S. (1999). The Big-Five trait taxonomy: History, measurement, and theoretical perspectives. In L. A. Pervin & O. P. John (Eds.), *Handbook of personality: Theory and research* (Vol. 2, pp. 102–138). New York: Guilford Press.
- Kahn, W. A. (1990). Psychological conditions of personal engagement and disengagement at work. *Academy of Management Journal*, 33(4), 692-724. doi: 10.2307/256287
- Kavussanu, M., & McAuley, E. (1995). Exercise and optimism: Are highly active individuals more optimistic? *Journal of Sport and Exercise Psychology*, 17(3), 246-258. doi: 10.1123/jsep.17.3.246

- Koopman, J., Lanaj, Klodiana, & Scott, B. A. (2016). Integrating the bright and dark sides of OCB: A daily investigation of the benefits and costs of helping others. *Academy of Management Journal*, *59*(2), 414-435. doi: 10.5465/amj.2014.0262
- Kredlow, M. A., Capozzoli, M. C., Hearon, B. A., Calkins, A. W., & Otto, M. W. (2015). The effects of physical activity on sleep: A meta-analytic review. *Journal of Behavioral Medicine*, *38*(3), 427-449. doi: 10.1007/s10865-015-9617-6
- Lambourne, K., & Tomporowski, P. (2010). The effect of exercise-induced arousal on cognitive task performance: A meta-analysis. *Brain Research*, *1341*, 12-24. doi: 10.1016/j.brainres.2010.03.091
- Lee, F. K., Sheldon, K. M., & Turban, D. B. (2003). Personality and the goal-striving process: The influence of achievement goal patterns, goal level, and mental focus on performance and enjoyment. *Journal of Applied Psychology*, *88*(2), 256-265. doi: 10.1037/0021-9010.88.2.256
- Levin, P. R., & Isen, A. M. (1975). Further studies on the effect of feeling good on helping. *Sociometry*, *38*, 141-147.
- Li, C., Wang, C. K. J., Pyun, D. Y., & Kee, Y. H. (2013). Burnout and its relations with basic psychological needs and motivation among athletes: A systematic review and meta-analysis. *Psychology of Sport and Exercise*, *14*(5), 692-700. doi: 10.1016/j.psychsport.2013.04.009
- Lin, K. J., Ilies, R., Pluut, H., Pan-S. (2017). You are a helpful co-worker, but do you support your spouse? A resource-based work-family model of helping and support provision. *Organizational Behavior and Human Decision Processes*, *138*, 45-58. doi: 10.1016/j.obhdp.2016.12.004

- Muthén, L. K. & Muthén, B. O. (2017). *Mplus user's guide* (8th ed.). Los Angeles: Muthén & Muthén.
- Nagel, I. J., & Sonnentag, S. (2013). Exercise and sleep predict personal resources in employees' daily lives. *Applied Psychology: Health and Wellbeing*, 5(3), 348-368. doi: 10.1111/aphw.12014.
- Netz, Y., Tomer, R., Axelrad, S., Argov, E., & Inbar, O. (2007). The effect of a single aerobic training session on cognitive flexibility in late middle-aged adults. *International Journal of Sports Medicine*, 28, 82– 87. doi:10.1055/s-2006-924027
- Mageau, G. A., & Vallerand, R. J. (2003). The coach-athlete relationship: A motivational model. *Journal of Sports Science*, 21(11), 883-904. doi: 10.1080/0264041031000140374
- Mattke, S., Liu, H., Caloyeras, J., Huang, C. Y., Van Busum, K. R., Khodyakov, D., & Shier, V. (2013). *Workplace wellness programs study*. Santa Monica, CA: Rand Corporation.
- Morgan, W. P., Costill, D. L., Flynn, M. G., Raglin, J. S., and O'Connor, P. J. (1988). Mood disturbance following increased training in swimmers. *Medicine and Science in Sports and Exercise*, 20(4), 408-414.
- Nurmi, J., Toivonen, S., Salmela-Aro, K., Eronen, S. (1996). Optimistic, approach-oriented, and avoidance strategies in social situations: Three studies on loneliness and peer relationships. *European Journal of Personality*, 10(3), 201-219. doi: 10.1002/(SICI)1099-0984(199609)10:3<201::AID-PER257>3.0.CO;2-#

- Oaten, M., & Cheng, K. (2006). Longitudinal gains in self-regulation from regular physical exercise. *British Journal of Health Psychology, 11*(4), 717-733. doi: 10.1348/135910706X96481
- Oerlemans, W. G. M., & Bakker, A. B. (2014). Burnout and daily recovery: A day reconstruction study. *Journal of Occupational Health Psychology, 19*(3), 303-314. doi: 10.1037/a0036904
- Oppezzo, M., & Schwartz, D. L. (2014). Give your ideas some legs: The positive effect of walking on creative thinking. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 40*(4), 1142-1152. doi: <http://dx.doi.org/10.1037/a0036577>
- Petruzzello, S. J., Landers, D. M., Hatfield, B. D., Kubitz, K. A., & Salazar, W. (1991). A meta-analysis of the anxiety reducing effects of acute and chronic exercise: Outcomes and mechanisms. *Sports Medicine, 11*(3), 143-182. doi: 10.2165/00007256-199111030-00002
- Preacher, K. J., Curran, P. J., & Bauer, D. J. (2006). Computational tools for probing interaction effects in multiple linear regression, multilevel modeling, and latent curve analysis. *Journal of Educational and Behavioral Statistics, 31*, 437-448.
- Preacher, K. J., Zyphur, M. J., & Zhang, Z. (2010). A general multilevel SEM framework for assessing multilevel mediation. *Psychological Methods, 15*(3), 209-233. doi: 10.1037/a0020141
- Quinn, R. W., Spreitzer, G. M., & Lam, C. (2012). Building a sustainable model of human energy in organizations: Exploring the critical role of resources. *The Academy of Management Annals, 1*-60. doi: 10.1080/19416520.2012.676762

- Racette, S. B., Schoeller, D. A., & Kushner, R. F. (1995). Comparison of heart rate and physical activity recall with doubly labeled water in obese women. *Medicine and Science in Sports and Exercise*, 27, 126-133.
- Reed, J., & Buck, S. (2009). The effect of regular aerobic exercise on positive-activated affect: A meta-analysis. *Psychology of Sport and Exercise*, 10(6), 581-594. doi: 10.1016/j.psychsport.2009.05.009
- Reed, J., & Ones, D. S. (2006). The effect of acute aerobic exercise on positive activated affect: A meta-analysis. *Psychology of Sport and Exercise*, 7, 477-514. doi: 10.1016/j.psychsport.2005.11.003
- Rich, B. L., Lepine, J. A., & Crawford, E. R. (2010). Job engagement: Antecedents and effects on job performance. *Academy of Management Journal*, 53(3), 617-635. doi: 10.5465/AMJ.2010.51468988
- Rodell, J. R. (2013). Finding meaning through volunteering: Why do employees volunteer and what does it mean for their jobs? *Academy of Management Journal*, 56(5), 1274-1294. doi: 10.5465/amj.2012.0611
- Rook, J. W., & Zijlstra, F. R. H. (2006). The contribution of various types of activities to recovery. *European Journal of Work and Organizational Psychology*, 15(2), 218-240. doi: 10.1080/13594320500513962
- Ryan, R. M., & Frederick, C. (1997). On energy, personality, and health: Subjective vitality as a dynamic reflection of well-being. *Journal of Personality*, 65(3), 529-656. doi: 10.1111/j.1467-6494.1997.tb00326.x

- Ryan, R. M., Frederick, C. M., Lepes, D., Rubio, N., & Sheldon, K. M. (1997). Intrinsic motivation and exercise adherence. *International Journal of Sports Psychology*, 28(3), 335-354.
- Saklofeske, D. H., Blomme, G. C., Kelly, L. W. (1992). The effects of exercise and relaxation on energetic and tense arousal. *Personality and Individual Differences*, 13, 623-625.
- Schoenewolf, G. (1990). Emotional contagion: Behavioral induction in individuals and groups. *Modern Psychoanalysis*, 15(1), 49-61.
- Sheldon, K. M., & Kasser, T. (1998). Pursuing personal goals: Skills enable progress, but not all progress is beneficial. *Personality and Social Psychology Bulletin*, 24(12), 1319-1331.
- Sheldon, K. M., Turban, D. B., Brown, K. G., Barrick, M. R., & Judge, T. A. (2003). Applying self-determination theory to organizational research. *Research in Personnel and Human Resources Management*, 22, 357-393.
- Smith, C. A., Organ, D. W., & Neal, J. P. (1983). Organizational citizenship behavior: Its nature and antecedents. *Journal of Applied Psychology*, 68(4), 653-663.
- Society for Human Resource Management (2017). *2017 employee benefits: Remaining competitive in a challenging talent marketplace*. Retrieved from <https://www.shrm.org/hr-today/trends-and-forecasting/research-and-surveys/pages/2017-employee-benefits.aspx>
- Sonnentag, S. (2001). Work, recovery activities, and individual well-being: A diary study. *Journal of Occupational and Health Psychology*, 6(3), 196-210. doi: 10.1037/1076-8998.6.3.196

- Sonnentag, S., & Kuhnel, J. (2016). Coming back to work in the morning: Psychological detachment and reattachment as predictors of work engagement. *Journal of Occupational Health Psychology, 21*(4), 379-390. doi: 10.1037/ocp0000020
- Sonnentag, S., & Natter, E. (2004). Flight attendants' daily recovery from work: Is there no place like home? *International Journal of Stress Management, 11*(4), 366-391. doi: 10.1037/1072-5245.11.4.366
- Sparling, P. B., Guiffrida, A., Piomelli, D., Roskopf, L., & Dietrich, A. (2003). Exercise activates the endocannabinoid system. *Neuroreport, 14*(17), 2209-2211. doi: 10.1097/01.wnr.0000097048.56589.47
- Spector, P. E., & Brannick, M. T. (2011). Methodological urban legends: The misuse of statistical control variables. *Organizational Research Methods, 14*(2), 287-305. doi: 10.1177/1094428110369842
- Steers, R. M., Mowday, R. T., & Shapiro, D. L. (2004). Introduction to special topic forum: The future of work motivation theory. *The Academy of Management Review, 29*(3), 379-387. doi: <http://www.jstor.org/stable/20159049>
- Stoke, J. P., & Levin, I. M. (1990). The development and validation of a measure of negative affectivity. *Journal of Social Behavior and Personality, 5*(2), 173-186.
- ten Brummelhuis, L. L., & Bakker, A. B. (2012a). A resource perspective on the work-home interface: The Work-home resources model. *American Psychologist, 67*(7), 545-556. doi: 10.1037/a0027974
- ten Brummelhuis, L. L., & Bakker, A. B. (2012b). Staying engaged during the week: The effect of off-job activities on next day work engagement. *Journal of Occupational Health Psychology, 17*(4), 445-455. doi: 10.1037/a0029213

- Thayer, R. E. (1987). Problem perception, optimism, and related states as a function of time of day (diurnal rhythm) and moderate exercise: Two arousal systems in interaction. *Motivation and Emotion, 11*(1), 19-36. doi: 10.1007/BF00992211
- Toker, S., & Biron, M. (2012). Job burnout and depression: Unraveling their temporal relationship and considering the role of physical activity. *Journal of Applied Psychology, 97*(3), 699-710. doi: 10.1037/a0026914. doi: 10.1037/a0026914
- Trougakos, J. P., Beal, D. J., Cheng, B. H., Hideg, I., & Zweig, D. (2015). Too drained to help: A resource depletion perspective on daily interpersonal citizenship behaviors. *Journal of Applied Psychology, 100*(1), 227-236. doi: 10.1037/a0038082
- Wanberg, C. R., Zhu, J., & Van Hooft, E. A. J. (2010). The job search grind: Perceived progress, self-reactions, and self-regulation of search effort. *The Academy of Management Journal, 53*(4), 788-807. doi: 10.5465/AMJ.2010.52814599
- Wang, Y., & Guo, D. (2008). The effects of positive emotions on task switching. *Acta Psychologica Sinica, 40*(3), 301–306.
- Wang, M., Liu, S., Liao, H., Gong, Y., Kammeyer-Mueller, J., & Shi, J. (2013). Can't get it out of my mind: Employee rumination after customer mistreatment and negative mood in the next morning. *Journal of Applied Psychology, 98*(6), 989-1004. doi: 10.1037/a0033656
- Waugh, C. E., & Fredrickson, B. L. (2006). Nice to know you: Positive emotions, self-other overlap, and complex understanding in the formation of a new relationship. *The Journal of Positive Psychology, 1*(2), 93-106. doi: 10.1080/17439760500510569

- Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology*, *54*(6), 1063-1070. doi: 10.1037/0022-3514.54.6.1063
- West, S. G., Taylor, A. B., & Wu, W. (2012). Model fit and model selection in structural equation modeling. In R. H. Hoyle (Ed.), *Handbook of structural equation modeling* (pp. 209–231). New York, NY: Guilford Press.
- Williams, L. J., & Anderson, S. E. (1991). Job satisfaction and organizational commitment as predictors of organizational citizenship and in-role behaviors. *Journal of Management*, *17*(3), 601-617. doi: 10.1177/014920639101700305
- Wilson, K. S., & Bauman, H. M. (2015). Capturing a more complete view of employees' lives outside of work: The introduction and development of new interrole conflict constructs. *Personnel Psychology*, *68*(2), 235-282. doi: 10.1111/peps.12080
- Wipfli, B., Landers, D., Nagoshi, C., & Ringenbach, S. (2011). An examination of serotonin and psychological variables in the relationship between exercise and mental health. *Scandinavian Journal of Medicine and Science in Sports*, *21*(3), 474-481. doi: 10.1111/j.1600-0838.2009.01049.
- Yeung, R. R. (1996). The acute effects of exercise on mood state. *Journal of Psychosomatic Research*, *40*(2), 123-141. doi: 10.1016/0022-3999(95)00554-4

Appendix 1: Figures.

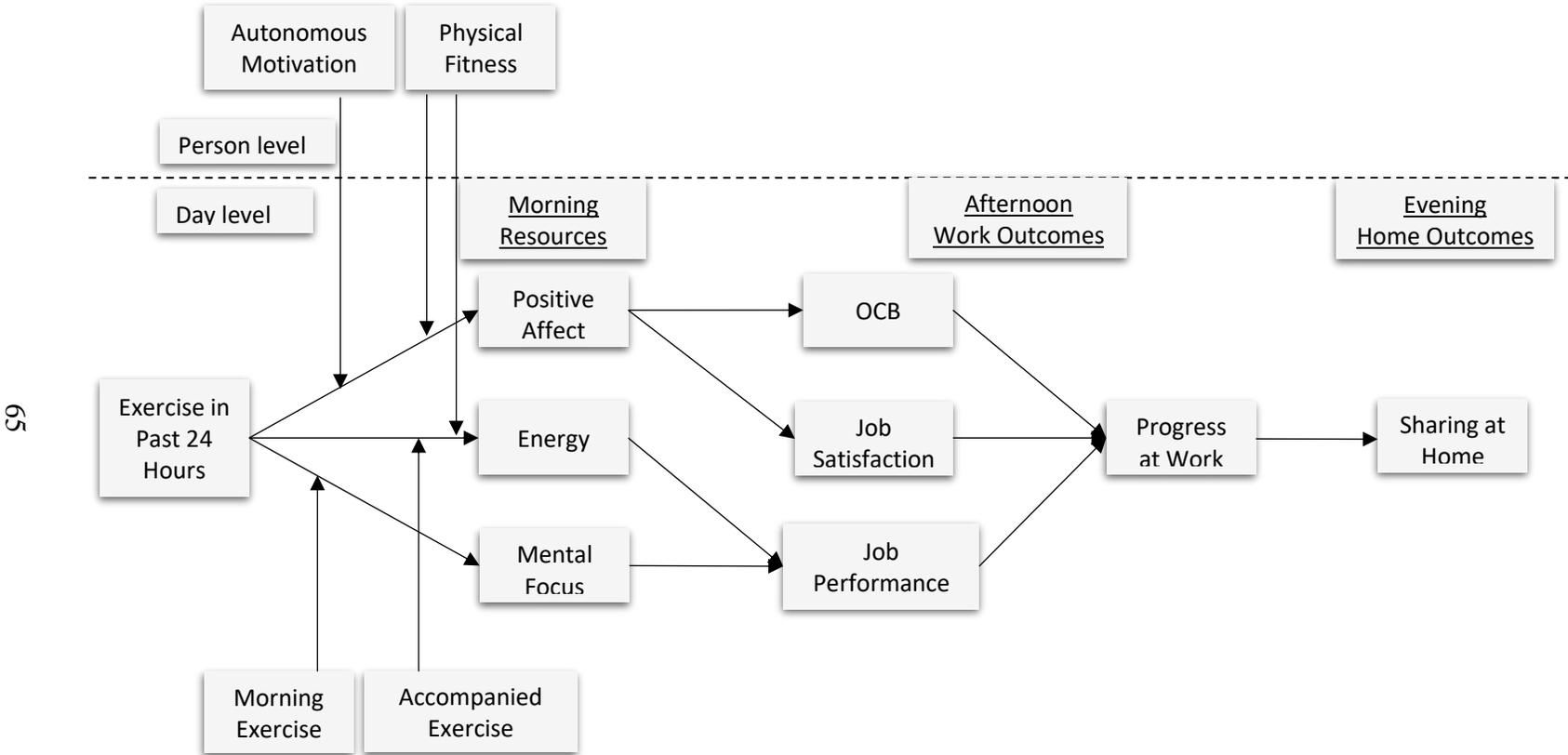


Figure 1. The Effects of Exercise on Organizational and Personal Outcomes

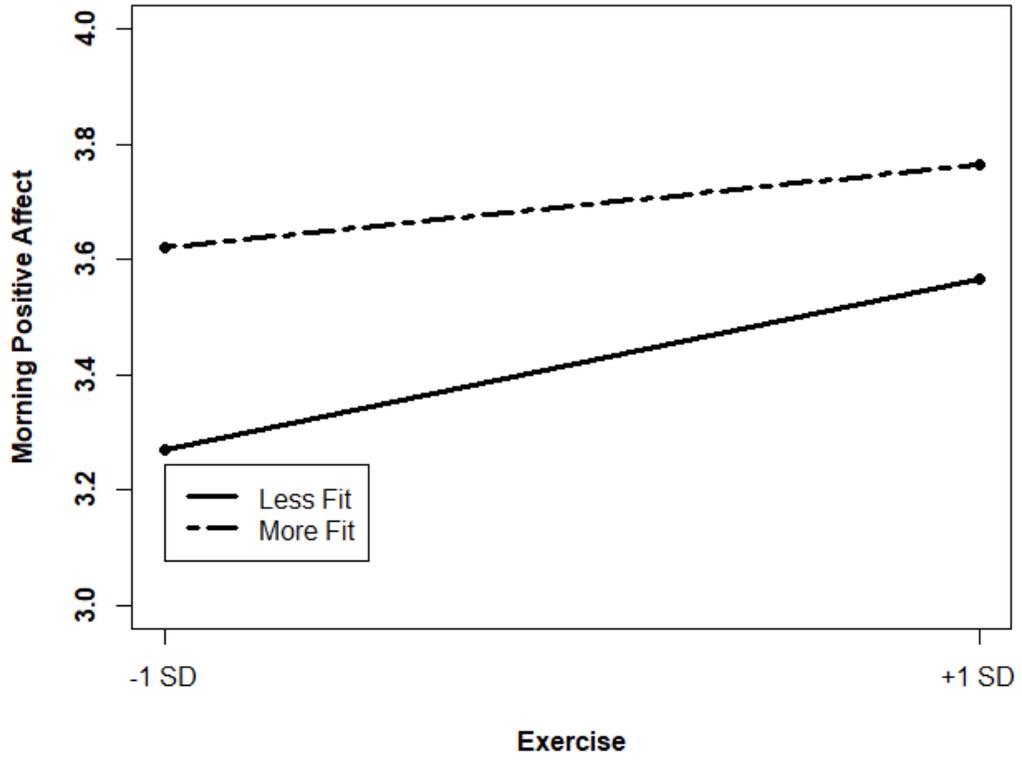


Figure 2. Moderation of fitness on the relationship between exercise and positive affect.

Appendix 2: Tables.

Table 1. Scale reliabilities and within-individual variance.

Construct	Reliability	Within-individual variance (e^2)	Between-individual variance (r^2)	Within-individual variance as a % of total variance
Exercise	-	4.95	2.954	62.63%
Morning Positive Affect	.75	.370	.455	44.85%
Morning Mental Focus	.91	.417	.487	46.13%
Morning Energy	.87	.511	.489	51.10%
Self-rated OCB	.58	.310	.761	28.94%
Self-rated Performance	.84	.214	.382	35.91%
Job Satisfaction	Single item	.434	.857	33.62%
Perceived Accomplish.	Single item	.525	.563	48.25%
Interpersonal Cap.	.85	.915	.681	57.33%
Sleep Total	-	.725	.813	47.14%
Physical fitness	-	-	-	-

Note: The percentage of variance within-individuals was calculated as $e^2/(e^2 + r^2)$.

Table 2. Means, standard deviations, and correlations.

(a) Daily (Level 1) Variables		<i>M</i>	<i>SD</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1.	Exercise	1.85	1.89															
2.	Exercise Time of Day (1=morning)	.34	.39	-.04														
3.	Accompanied Exercise (1=accompanied)	.45	.42	.20**	-.03													
4.	Morning PA	3.49	.71	.07*	.04	-.02												
5.	Morning Mental Focus	3.84	.73	.06	.03	-.05	.47**											
6.	Morning Energy	3.53	.74	.13**	.04	.03	.59**	.54**										
7.	Self-rated OCB	2.99	.90	-.01	-.06	-.07	.05	.05	.09*									
8.	Self-rated Perf.	4.27	.65	.03	.00	-.06	.13**	.18**	.15**	.14**								
9.	Job Satisfaction	3.77	.96	.06	-.07	-.02	.19**	.19**	.17**	.03	.30**							
10.	Perceived Accomplishment	3.89	.80	.05	-.04	-.08	.12**	.16**	.13**	.02	.37**	.48**						
11.	Interpersonal Capitalization	3.20	.91	.08	-.03	-.11	.07	.06	.05	.04	.10*	.05	.00					
12.	Sleep Total	6.90	.95	.04	.05	.00	.10**	.18**	.22**	.05	.07	.01	.07	-.03				
(b) Individual (Level 2) Variable																		
13.	Physical Fit.	10.93	13.80	.67**	.06	-.05	.24*	.04	.13	-.04	.13	.04	.01	.19	-.17			
14.	Autonomous Motivation	2.42	2.20	.37**	-.06	-.13	.40**	.31**	.39**	.04	.07	.25*	.21*	.08	-.05	.45**		
15.	Age	42.10	12.38	-.05	.10	-.30**	.20*	.31**	.25*	.14	-.03	.15	.16	-.19	.00	-.14	.14	
16.	Gender (1=female)	.80	.40	-.22*	-.13	.14	-.28**	-.24*	-.22*	.26**	-.13	-.12	-.02	-.10	-.05	-.27**	-.11	.07

Note: Level 1 n ranges from 256 to 873. Level 2 n ranges from 64 to 102. Correlations for daily, within-individual (Level 1 variables) reflect group-mean centered relationships. Level 1 variables were aggregated to estimate between-individual (Level 2) correlations. * $p < .05$. ** $p < .01$.

Table 3. Results from multi-level regression for morning resources (positive affect, focus, and energy).

	Morning Positive Affect		Morning Mental Focus		Morning Energy	
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Intercept	3.49** (.07)	3.49** (.07)	3.84** (.07)	3.84** (.07)	3.53** (.07)	3.53** (.07)
Control						
Sleep Total	.08** (.03)	.08** (.03)	.14** (.03)	.14** (.03)	.20** (.04)	.20** (.04)
Level 1 Predictor						
Exercise		.03 (.02)		.02* (.01)		.04** (.01)

Note: Level 2 $n = 102$; Level 1 $n = 867$. Values in parentheses are standard errors. Tests were one-tailed. $p < .05$. ** $p < .01$.

Table 4. Indirect effects of exercise energy expenditure on the afternoon work outcomes.

	<i>Indirect Effect</i>	<i>Standard Error</i>	<i>One-tailed 95% CI</i>
Exercise → Positive Affect → OCB	.0024	.0017	.0002, .007
Exercise → Positive Affect → Job Satisfaction	.007*	.004	.0004, .015
Exercise → Mental Focus → Job performance	.003*	.001	.001, .005
Exercise → Energy → Job Performance	.005*	.001	.002, .008

Note. Level 2 $n = 102$. Level 1 $n = 867$. * $p < .05$. ** $p < .01$. Unstandardized indirect effects, standard errors, and bias corrected Monte Carlo bootstrapped (5,000) confidence intervals are reported. Tests were one-tailed.

Table 5. Results from multi-level regression for perceived accomplishment.

	Perceived Accomplishment	
Intercept (γ_{00})	3.89**	(.08)
Predictors		
Organizational Citizenship Behaviors (γ_{10})	-.02	(.05)
Job Satisfaction (γ_{20})	.43**	(.05)
Job performance (γ_{30})	.35**	(.08)

Note. Level 2 $n = 102$; level 1 $n = 761$. Tests were one-tailed. * $p < .05$. ** $p < .01$. Values in parentheses are standard errors.

Table 6. Results for level 1 moderators for the relationship between exercise and morning resources (focus and energy).

	Morning Mental Focus		Morning Energy	
	Model 7		Model 8	
Intercept	3.86**	(.10)	3.64**	(.11)
Control				
Sleep Total	.07*	(.03)	.12*	(.05)
Level 1 Predictor				
Exercise	.01	(.04)	.04**	(.01)
Morning Exercise	.05	(.07)		
Exercise*Morning	-.007	(.04)		
Accompanied Exercise			-.08	(.12)
Exercise*Accompanied			.05	(.04)

Note: Level 2 $n = 89$; level 1 $n = 457$. Values in parentheses are standard errors. Tests were one-tailed. * $p < .05$. ** $p < .01$.

Table 7. Results for level 2 moderators for the relationship between exercise and morning resources (positive affect and energy).

	Morning Positive Affect		Morning Energy			
	Model 9	Model 10	Model 11			
Intercept	3.22**	(.10)	3.35**	(.09)	3.46**	(.10)
Control						
Sleep Total	.07*	(.03)	.08**	(.03)	.20**	(.04)
Level 1 Predictor						
Exercise	.05*	(.03)	.05*	(.02)	.06	(.057)
Level 2 Predictor						
Autonomous Motiv.	.13**	(.03)				
Exercise* Aut. Motiv.	-.007	(.01)				
Fitness Level			.01*	(.01)	.007	(.007)
Exercise*Fitness Level			-.0013*	(.0006)	-.001	(.003)

Note: Level 2 $n = 102$; level 1 $n = 867$. Values in parentheses are standard errors. Tests were one-tailed. $p < .05$. ** $p < .01$.

Table 8. Summary of hypotheses results.

Hypothesis	Prediction	Result
1	Exercise → Positive affect	Not supported
2	Exercise → Positive affect → OCB	Supported
3	Exercise → Positive affect → Job Satisfaction	Supported
4	Exercise → Mental Focus	Supported
5	Exercise → Mental Focus → Job Performance	Supported
6	Exercise → Energy	Supported
7	Exercise → Energy → Job Performance	Supported
8	OCB, Job Performance, Job Satisfaction → Perceived Accomplishment	Partial support
9	Perceived Accomplishment → Interpersonal Capitalization	Not supported
10	Morning Exercise Moderates: Exercise → Mental Focus → Job Performance	Not supported
11	Accompanied Exercise Moderates: Exercise → Energy → Job Performance	Not supported
12	Autonomous Motivation Moderates: Exercise → Positive affect → OCB and Job Satisfaction	Not supported
13	Fitness Level Moderates: Exercise → Positive affect → OCB and Job Satisfaction	Not supported
14	Fitness Level Moderates: Exercise → Energy → Job Performance	Not supported

Note: For more specific details regarding directionality, p-values, and confidence intervals, please refer to the text.

Appendix 3: Survey items.
Morning Employee Survey – to be filled out around 9:30am

Good morning! This questionnaire is the first of two for the day while you're at work and asks about your experiences and feelings at work so far this morning, as well as some of your actions in the last 24 hours. It takes only 3-5 minutes to complete. Thank you!

Are you at work this morning?

(If answered yes, they will continue the survey. If answered no, they will get the following notice).

Thank you for your willingness to complete today's surveys. Unfortunately, because we are interested in your experiences at work, your answers are most useful to us only if you complete them while at work. We appreciate your input and encourage you to follow the link to the survey next time we send it out, if you are at work.

Sleep:

How many hours and minutes of sleep did you get last night? (e.g., 1 hour and 30 minutes or 1 hour and 0 minutes). Please note this may be different than the number of hours you spent in bed.

_____Hours _____Minutes

Please rate the quality of your sleep last night:

Very poor, Poor, Fair, Good, Very good

Exercise:

Exercise refers to purposeful, planned and structured physical activity, that occurred for at least 10 minutes, with the intent to maintain or improve your health.

How many times have you exercised in the last 24 hours? (e.g., run, swim, yoga, lift weights, walk, aerobics class, etc.):

Options 0-3.

Then, for any more than 0:

At approximately what time did you begin your exercise?

Drop down menu of time options

For how many minutes did you exercise?

Minutes_____

Rate your average level of exertion during your exercise session. Your own feeling of effort and exertion is important, not how it compares to other people's.

Extremely light, very light, light, somewhat hard, hard (heavy), very hard, extremely hard

What type of exercise did you engage in (e.g., walking, running, swimming, strength training, yoga, aerobics class, etc.)?_____

Did you exercise primarily indoors or outdoors?

Indoors

Outdoors

With whom did you exercise?

I exercised by myself.

I exercised with someone I feel close to (e.g., a friend or a family member).

I exercised with an acquaintance.

Was your exercise part of a group class (e.g., a spinning class, yoga class, aerobics class, etc.).

Yes

No

Affect:

These questions consist of a number of words that describe different feelings and emotions.

Please indicate your level of agreement that you have felt each of these, **throughout work today:**

1= Strongly disagree; 2= Disagree; 3= Neither disagree or agree; 4= Agree; 5= Strongly agree

Inspired

Active

Strong

Calm

Relaxed

Laid-back

Upset

Nervous

Irritable

Sad

Down

Bored

Please indicate your level of agreement that you felt each of these, **at work so far today:**

1= Strongly disagree; 2= Disagree; 3= Neither disagree or agree; 4= Agree; 5= Strongly agree **Energy**

I felt alive and vital.

I felt alert and awake.

I felt energized.

Mental Focus:

I have had good concentration.

It has been easy for me to pay attention to my work.

I have been able to focus on work.

Afternoon Focal Employee Survey

Good afternoon! This second questionnaire for the day asks a few questions about your experiences, feelings, and activities at work throughout the day today. This questionnaire takes approximately 3-5 minutes to complete.

Have you been at work this afternoon?

- No
- Yes

(If answered yes that they've been at work, they will continue through the survey. If no, they will see this message):

Thank you for your willingness to this afternoon's survey. Unfortunately, because we are interested in your experiences at work, your answers are most useful to us only if you answer them with regard to your experiences at work today. We appreciate your input and encourage you to follow the link to the survey next time we send it out, if you are at work.

Affect:

These questions consist of a number of words that describe different feelings and emotions.

Please indicate your level of agreement that you have felt each of these, **throughout work today:**

1= Strongly disagree; 2= Disagree; 3= Neither disagree or agree; 4= Agree; 5= Strongly agree

Inspired
Active
Strong
Calm
Relaxed
Laid-back
Upset
Nervous
Irritable
Sad
Down
Bored

Please indicate your level of agreement that you have felt each of these, **throughout work today:**

1= Strongly disagree; 2= Disagree; 3= Neither disagree or agree; 4= Agree; 5= Strongly agree **Energy**

I felt alive and vital.
I felt alert and awake.
I felt energized.

Mental Focus:

I had good concentration.
It was easy for me to pay attention to my work.
I was able to focus on work.

Job Satisfaction

I felt satisfied with my job.

Perceived Accomplishment:

I made progress towards my goals.

These questions ask about the frequency of some of your actions **throughout work today:**

Please tell us how many times you have engaged in each of the following:

OCB

1=none; 2=once; 3=twice; 4=three times; 5=four or more times

Helped others who had heavy workloads.

Took time to listen to co-workers' problems and worries.

Took personal interest in other employees.

Passed along information to co-workers.

Please indicate your level of agreement that you have done each of these, throughout work today:

1= Strongly disagree; 2= Disagree; 3= Neither disagree or agree; 4= Agree; 5= Strongly agree

In-role Performance

Adequately completed assigned duties.

Performed tasks expected of me exceptionally well.

Successfully met performance requirements of my job.

Afternoon Co-worker Survey – to be filled out around 4:30 (end of workday)

Good afternoon! This questionnaire asks a few questions about your experiences with and the behaviors of your co-worker since this morning. This questionnaire takes approximately 1-3 minutes to complete.

Have both you AND your co-worker been at work this afternoon?

- No
- Yes

(If answered yes that they've been at work, they will continue through the survey. If no, they will see this message):

Thank you for your willingness to this afternoon's survey. Unfortunately, because we are interested in your experiences with your co-worker, your answers are most useful to us only if you answer them with regard to your experiences with your co-worker at work today. We appreciate your input and encourage you to follow the link to the survey next time we send it out, if you are both at work.

Please tell us how many times your coworker engaged in each of the following, **at work today:**

OCB

1=none; 2=once; 3=twice; 4=three times; 5=four or more times

Helped others who had heavy workloads.

Took time to listen to co-workers' problems and worries.

Took personal interest in other employees.

Passed along information to co-workers.

Please indicate your level of agreement that your coworker has done each of these, **at work today.**

1= Strongly disagree; 2= Disagree; 3= Neither disagree or agree; 4= Agree; 5= Strongly agree

In-role Performance

Adequately completed assigned duties.

Performed tasks expected of them exceptionally well.

Successfully met performance requirements of their job.

Employee After Work Survey

Good evening! This final questionnaire for the day asks a few questions about your experiences at home and throughout the day today. This questionnaire takes approximately 1-3 minutes to complete.

Were you at work today?

If no,

Thank you for your willingness to this evening's survey. Unfortunately, because we are interested in how your experiences at work influence your experiences at home, your answers are most useful to us only if you were at work today. We appreciate your input and encourage you to follow the link to the survey next time we send it out, if you work that day.

These questions ask about some of your activities and feelings since leaving work today: Please indicate your level of agreement that you have done each of these, **since leaving work today:**

1= Strongly disagree; 2= Disagree; 3= Neither disagree or agree; 4= Agree; 5= Strongly agree

(Note: Only those who indicated they have a loved one (vs. roommate) got the interpersonal capitalization questions).

Interpersonal capitalization

I shared some interesting work events with my loved one.

I told my loved one about some happy events at work.

I shared my work progress with my loved one.

Loved one / Partner After Work Survey:

Good evening! This questionnaire asks about your experiences at home and with your loved one (roommate) today. This questionnaire takes approximately 1-3 minutes to complete.

Did your loved one (roommate) work today?

If no,

Thank you for your willingness to this evening's survey. Unfortunately, because we are interested in how your partner's (roommate's) experiences at work influence them at home, your answers are most useful to us only if your partner (roommate) was at work today. We appreciate your input and encourage you to follow the link to the survey next time we send it out, if your partner (roommate) worked that day.

Have you had enough interactions with the person you live with this evening to assess their behavior?

Yes

If no,

Thank you for your willingness to this evening's survey. Unfortunately, because we are interested in how your partner's (roommate's) experiences at work influences your experiences at home, your answers are most useful to us only if you spent enough time together to observe your partner's (roommate's) behaviors. We appreciate your input and encourage you to follow the link to the survey next time we send it out, if you spent time together.

Perceptions:

Please indicate your level of agreement that each of these describes your loved one **after work today:**

1= Strongly disagree; 2= Disagree; 3= Neither disagree or agree; 4= Agree; 5= Strongly agree

Pleasant

Happy

Irritable

Grumpy

Initial Survey:

Thank you for participating! Some of the questions I ask may seem similar. I ask questions in various ways in order to understand you better.

This first set of questions ask you about some of your health activities, in general.

Health measure:

Please rate each of the following
(Poor, Fair, Good, Very Good, Excellent)
Your general health level.
Your health level relative to your peers.
Your health level for you age.

Exercise:

In this section, we ask about your exercise behaviors. Exercise refers to purposeful, planned and structured physical activity, that occurred for at least 10 minutes, with the intent to maintain or improve your health.

Modified Godin Scale:

In the past month, on average, how many **days per week** have you typically engaged in exercise (e.g., run, swim, yoga, lift weights, walk, aerobics class, etc.)?
If more than 0, direct to the questions below:

What type of exercise do you typically engage in? (e.g., walking, running, swimming, strength training, yoga, aerobics class, etc.)

How many minutes do you typically exercise?

Minutes: _____

Rate your average level of exertion during your exercise session. Your **own** feeling of effort and exertion is important, not how it compares to other people's.

Extremely light, very light, light, somewhat hard, hard (heavy), very hard, extremely hard

With whom do you typically exercise?

I exercise by myself.

I exercise with someone I feel close to (e.g., a friend or family member).

I exercise with an acquaintance.

Is your exercise session typically part of a group class (e.g., a spinning class, yoga class, aerobics class, etc.)?

Yes

No

Do you typically exercise primarily indoors or outdoors?

Indoors

Outdoors

These questions ask for a more specific breakdown of your exercise during the last week. Remember, exercise refers to purposeful, planned and structured physical activity that occurred for at least 10 minutes, with the intent to maintain or improve your health.

Vigorous exercise refers to activity that takes **hard** physical effort, makes **your heart beat rapidly** and makes you breathe **much** harder than normal.

During the last 7 days, on how many days did you do **vigorous** exercise?

Days per week: _____

__No vigorous exercise.

How many minutes did you usually spend doing **vigorous** exercise on one of those days?

Minutes: _____

Moderate exercise refers to activity that takes **moderate** physical effort and makes you breathe **somewhat** harder than normal and is not overly exhausting.

During the last 7 days, on how many days did you do **moderate** exercise?

Days per week: _____

__No moderate exercise.

How many minutes did you usually spend doing **moderate** exercise on one of those days?

Minutes: _____

Light exercise refers to activity that takes **minimal** physical effort and may not change your breathing.

During the last 7 days, on how many days did you do **light** exercise?

Days per week: _____

__No light exercise.

How many minutes did you usually spend doing **light** exercise on one of those days?

Minutes: _____

Please rate your level of agreement that each of these is a reason you exercise.

Strongly disagree to Strongly agree

External regulation:

I exercise because other people say I should.

I exercise because others will not be pleased with me if I don't.

I feel under pressure from my friends/family to exercise.

Introjected regulation:

I feel guilty when I don't exercise.

I feel ashamed when I miss an exercise session.

I feel like a failure when I haven't exercised in a while.

Identified regulation:

I value the benefits of exercise.
It's important to me to exercise regularly.
I get restless if I don't exercise regularly.

Intrinsic regulation:

I exercise because it's fun.
I enjoy my exercise sessions.
I find exercise a pleasurable activity.

Demographics:

How long have you been working for your current employer? _____ Years

_____months

How long have you been working in your current job? _____Years _____months

What is your current position (job title)? _____

How many hours a week do you work, including hours spent outside the office?_____Hours

Do you have a significant other (married or unmarried partner) that you live with?

No

Yes

Do you have any dependents (e.g., children or parents) living with you that require care?

No.

If yes, how many?

What is your sex?

Male

Female

Please indicate your ethnic background (check all that apply).

Asian/Pacific Islander

Black/African-American

Caucasian/Non-Hispanic

Hispanic

Native American

Other (Please specify)_____

What is your age?

_____ Years

VITA

Amanda Sue Patel was born in Hays, KS. She grew up and attended school in the Russell, KS area. Amanda earned her bachelor's degree in Psychology with a minor in Spanish from Fort Hays State University. She later returned for an undergraduate degree in Accounting but soon transitioned into the MBA program once she saw the connection between psychology and management. After receiving her MBA, Amanda took over as the supervisor of the communications center at Hays Med where she had been employed throughout her college experience. A year after assuming this position, Amanda left to pursue her PhD. Amanda has always been interested in understanding people and has enjoyed learning how to deepen that understanding especially as it pertains to people at work. In particular, she is passionate about helping people to live their healthiest lives at work and at home.

Outside of work, Amanda is passionate about family, cooking, and baking. In her first year of the PhD program, Amanda took a GLM class where she met her husband, Niraj. Amanda was blessed to marry him in December of 2017 and says that this was one of the best things to come out of her PhD program. Amanda and Niraj love experimenting with different cooking and baking techniques and then sharing their efforts with friends. They have enjoyed perfecting a brownie recipe and a variety of savory German-Indian fusion foods.