LUNCH BREAKS UNPACKED: THE ROLE OF AUTONOMY AS A MODERATOR OF RECOVERY DURING LUNCH

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Work recovery research has focused mainly on how after-work break activities help employees replenish their resources and reduce fatigue. Given that employees spend a considerable amount of time at work, understanding how they can replenish their resources during the workday is critical. Drawing on ego depletion (Muraven & Baumeister, 2000) and self-determination theory (Deci & Ryan, 1985), we employed multi-source experience sampling methods to test the effects of a critical boundary condition, employee lunch break autonomy, on the relation between lunch break activities and end-of-workday fatigue. Although specific energy-relevant activities had a main effect on end-of-workday fatigue, each of these was moderated by the degree of autonomous choice associated with the break. Specifically, for activities that supported the psychological needs of relatedness and competence (i.e., social and work activities, respectively), as lunch break autonomy increased, effects switched from increasing fatigue to reducing fatigue. To the extent that lunch break activities involved relaxation, however, lunch break autonomy was only important when levels of relaxation were low. We conclude that lunch break autonomy plays a complex and pivotal role in conferring the potential energetic benefits of lunch break activities. Contributions to theory and practice are discussed.

Since organizational scholars formally started studying employees at work, understanding ways to manage employee fatigue has been a focus (e.g., Mayo, 1933). Job-related fatigue is a critical indicator of employee overall well-being (Maslach, Schaufeli, & Leiter, 2001). Research on work recovery has examined how various types of breaks from work, and the activities pursued during these periods, replenish personal resources (e.g., energy, focus) and offset the fatiguing effects of work (e.g., Sonnentag, 2001). The majority of this research has focused on employees’ time after the workday is over. Given that employees spend a considerable portion of their day at work, understanding

the nature of recovery during the workday is crucial.

Only recently has recovery research considered the impact of work breaks occurring during the workday (Trougakos, Beal, Green, & Weiss, 2008). Generally speaking, within-workday breaks represent a period that is an employee’s own personal time and during which work-relevant tasks are not formally required or expected (Trougakos & Hideg, 2009). No episode in the working day better reflects this period of autonomy than the ubiquitous break for lunch. Lunch breaks generally present employees with a mid-day opportunity to rest from work and consume food. Typically, lunch breaks represent the longest within-workday break and therefore are likely to play a considerable role in energy recovery. In the current paper, we examine the nature of activities that employees engage in during
the lunch break. Employees are likely to expect to have the freedom to utilize this time to pursue activities. Critically, however, they may not always have the freedom to do so, as recent polls suggest that a third of employees felt pressure from their managers to work through lunch, with similar numbers eating lunch at their desks. In addition, half of the employees polled reported that their workload prevented them from taking a lunch break at all, and almost two-thirds reported being unable to take an hour for lunch (Bupa, 2011; Right Management, 2011). Thus, how employees use the time during their lunch breaks—and the extent to which they have the freedom to determine use of this time—should be critical in determining its recovery potential.

In light of the large body of evidence suggesting that activities contribute to well-being largely to the extent that they are enacted autonomously (e.g., Deci & Ryan, 2000), as well as recent work highlighting the role of autonomy in buffering the depletion of energy (Ryan & Deci, 2008), the failure of the recovery literature to more fully examine employee autonomy during recovery time leaves a significant gap in our knowledge of how break activities impact recovery outcomes. As such, the primary purpose of our study is to examine the role of lunch break autonomy as a critical factor that can amplify or dampen the effects of daily lunch break activities on recovery, in a context in which a person’s work break autonomy is likely to regularly fluctuate. In examining these issues, we leverage two theoretical perspectives—ego depletion theory (EDT; Muraven & Baumeister, 2000) and self-determination theory (SDT; Deci & Ryan, 2000)—that at times make consistent predictions while at other times are seemingly in conflict. We integrate both perspectives and explore the critical role that autonomy plays in explaining their discrepancies.

This theoretical framework has important implications for research on work recovery and other areas of management research. Specifically, identifying and examining boundary conditions within the recovery literature represents a needed progression (see Sonnentag, Binnewies, & Mojza, 2010). Further, past organizational research examining job autonomy and related concepts (e.g., job control; Hackman & Oldham, 1976) has focused primarily on consequences of autonomy over company time, largely ignoring what employees do with the time that is their own (e.g., lunch breaks). Organizational research on autonomy has also largely ignored implications of day-to-day variation in autonomy occurring within-individuals (see Reis, Sheldon, Gable, Roscoe, & Ryan, 2000), even when testing within-person phenomena (e.g., Ilies, Dimotakis, & De Pater, 2010). We provide an intrapersonal examination of break activities that offers more nuanced and dynamic insights into the nature of autonomy as well as daily recovery. Moreover, as lunch breaks are common to most occupations, this study has the potential to contribute to both organizational theory and organizational practice.

**WITHIN-WORKDAY BREAKS**

The study of within-day work breaks dates back to some of the earliest research in management (e.g., Mayo, 1933). Since then, ergonomics researchers have studied micro-breaks as a way to alleviate musculoskeletal discomfort and strain associated with prolonged or repetitive office tasks (e.g., Henning, Jacques, Kissel, Sullivan, & altaras-Webb, 1997). This work has mostly examined the frequency and timing of breaks, while overlooking how people actually utilize them. Employees can engage in numerous activities during their breaks, each of which is initiated and continued with differing degrees of choice or autonomy (Trougakos & Hideg, 2009). For example, an employee might meet friends for a quick bite to eat. This choice might involve varying levels of autonomy, as our motives for engaging in social interaction range from purely instrumental to completely liberated (Deci & Ryan, 2000). The total duration of the employee break may be informative for predicting musculoskeletal fatigue (Boucsein & Thum, 1997), but feelings of energy are likely to be affected by the extent to which the employee engaged in various activities, and also the extent of autonomy involved (Nix, Ryan, Manly, & Deci, 1999).

In contrast to the ergonomics literature, the work recovery literature has only recently considered within-day breaks. This is surprising given that recovery is conceptualized as a process that unfolds throughout the day (Sonnentag & Fritz, 2007). For example, Trougakos et al. (2008) found that low-effort activities (e.g., relaxing) during work breaks resulted in higher levels of positive emotions and lower levels of negative emotions during these breaks, providing preliminary evidence that within-day work breaks have important implications for recovery. However, little is known of the activities that are likely to hinder or speed recovery during the day, and the role of choice in these activities. When we look to research on recovery
during time away from work (e.g., Sonnentag, 2001), although no overarching framework has been established, researchers have focused on activities that are perceived to be relaxing (Fritz & Sonnentag, 2006), activities that involve socializing with others (Sonnentag, 2001), and activities that impact efficacy, either through the continuation of work (Sonnentag & Zijlstra, 2006) or through engaging in mastery-building non-work activities (Sonnentag, Binnewies, & Mojza, 2008). All of these activities, with the possible exception of non-work mastery activities, are likely to occur during the lunch break. Furthermore, this literature suggests that relaxing and socializing activities aid recovery, while work activities impede recovery (for a review, see Demerouti, Bakker, Geurts, & Taris, 2009). What is unclear is why these activities have the potential for aiding or impeding the recovery of energy, a topic to which we turn next.

THE DEPLETION AND RECOVERY OF ENERGY

Although different models conceptualizing psychological energy use varying terms to describe the subjective experience of this dimension (e.g., vitality, fatigue, depletion, energy, etc.), in this paper we rely primarily on the terms “fatigue” and its opposing pole of “energy”. It is our contention that the integration of two theoretical perspectives offers a compelling account of why certain break activities might be particularly advantageous (or disadvantageous) for the recovery of energy. First, EDT (Muraven & Baumeister, 2000) provides a dynamic and momentary model of the energy needed for any volitional behavior (Beal, Weiss, Barros, & MacDermid, 2005). Specifically, EDT suggests that individuals have a limited store of energy for the purposes of regulating behavior at any given moment (Baumeister, Vohs, & Tice, 2007). Each time people engage in behaviors that require self-regulation (e.g., focusing attention, suppressing emotions, managing impressions), resources are depleted, increasing perceived fatigue and impeding subsequent regulatory efforts. According to this “strength” model, resource depletion continues or worsens if there are no opportunities for replenishment (Baumeister et al., 2007; Muraven & Baumeister, 2000). The literature on ego depletion also suggests that, although there are other factors that contribute to feelings of fatigue (e.g., physical exertion), fatigue is a reliable marker of ego depletion (Muraven, Tice, & Baumeister, 1998; Webb & Sheeran, 2003). Thus, the more regulatory resources are expended during opportunities to recover, such as lunch breaks, greater resource depletion will occur, resulting in increased fatigue.

Second, SDT (Deci & Ryan, 2000) suggests that fulfillment of the innate and fundamental needs for relatedness, competence, and autonomy enhances levels of vitality (i.e., energetic feelings reflecting the opposite of fatigue; Ryan & Deci, 2008) and contributes to greater levels of well-being. Specific activities or behaviors provide what Deci and Ryan (2000) call “nutriments” to need fulfillment, which build energetic resources essential to proper functioning of the self. Thus, both EDT and SDT suggest a central store of energy that fuels our ability to engage in thought and behavior important to the self. EDT and SDT differ, however, in the particular emphasis placed on that store of energy and the factors most relevant to determining immediate levels of it. Specifically, research and theory on EDT emphasize factors that deplete or drain energy resources, focusing on activities that require effortful regulation of thought and behavior. Research and theory on SDT emphasize factors that build or restore energy resources, focusing on activities that fulfill the needs for relatedness, competence, and autonomy.

Relatedness and Autonomy on a Lunch Break

To understand the differences between EDT and SDT’s views on recovery and depletion, imagine an employee who, on his or her lunch break, joins a group of coworkers at a restaurant to discuss the events of the day while consuming their respective meals. From the perspective of EDT, this interaction involves a number of depleting elements. First, however, we should mention an important exception to EDT’s emphasis on depletion of resources. Gailliot and colleagues (Gailliot, Baumeister, DeWall, Maner, Plant, & Tice, 2007) have noted that a literal manifestation of the energy depletion metaphor is one’s blood glucose level. To the extent that the meal itself provides caloric fuel, the employee will regain the ability to regulate behavior and feel
less fatigued. However, the self-regulatory activities in which the employee engages increases the potential for ego depletion. Strong norms for agreeable interpersonal behavior (Cialdini & Trost, 1998) imply that people will use laborious emotion and impression management efforts (Leary & Kowalski, 1990) that require regulatory resources and deplete energy levels (e.g., Trougakos, Jackson, & Beal, 2011; Vohs, Baumeister, & Ciarocco, 2005).

SDT offers a somewhat contrasting viewpoint. Engaging in social activity would be considered a primary means of satisfying the need for relatedness. To the extent that this need is fulfilled during the lunch break activity, the energy available to the self, which Ryan and Deci (2008) argue is experienced as feelings of vitality, should increase. Given these two perspectives, and glucose intake notwithstanding, this scenario highlights the differences between EDT and SDT and questions whether the consequence of such an episode would be recovery or the depletion of energy.

Existing literature also supports both positive and negative effects of social activity for recovery. For example, consistent with the predictions of SDT, the literature on social support (e.g., Halbesleben, 2006), as well as most studies of social activity in the recovery literature (e.g., Sonnentag, 2001), finds that engaging in social activities is beneficial for energy levels. However, socializing in a workplace context is fundamentally different from socializing outside of work. First, the lunch break often consists of multiple activities, each with its own characteristics. The independent role of a particular activity, such as socializing, must therefore consider the effects of other potential activities as well. Also, social activity outside of work is likely less constrained than within a workplace context. Avoiding undesirable coworkers or selecting preferred coworkers for lunch is a difficult and unlikely option (Altman & Baruch, 2010). As regulatory efforts during social activities with undesired interaction partners are particularly fatiguing (Vohs et al., 2005), it seems equally plausible that social activities during a lunch break might be fairly fatiguing, as would be suggested by EDT. Therefore, we offer competing hypotheses:

Hypothesis 1a. Consistent with SDT, higher levels of social activities during the lunch break will result in lower end-of-workday fatigue.

Hypothesis 1b. Consistent with EDT, higher levels of social activities during the lunch break will result in higher end-of-workday fatigue.

One of our fundamental premises is that the main effects of these activities may not be as important as the context within which the activities are engaged. We argue that the key factor in determining the outcome lies with an examination of lunch break autonomy. With SDT in particular, autonomy plays a special role. Specifically, “the need for autonomy is essential for the goal-directed behavior to be self-determined and for many of the optimal outcomes associated with self-determination to accrue” (Deci & Ryan, 2000: 242). Thus, autonomy confers the energy increases associated with need satisfaction, particularly for activities relevant to the needs of competence and relatedness; when it is absent, the activity ceases to be self-determined and confers no energy benefits. In addition, as autonomy is itself a fundamental psychological need, SDT along with some empirical work suggest that autonomy leads directly to feelings of energy (Reis et al., 2000; Ryan & Deci, 2008).

Of importance to the current study is the capacity of lunch break autonomy to create the context for recovery. SDT suggests that the choices we make, such as what we do during a lunch break, vary with the level of autonomy. For example, freely choosing to engage in social activity at lunch because it allows one to feel connected to others would, according to Deci and Ryan (2000), reflect the highest level of autonomy (an “integrative” choice). Choosing to go to lunch with coworkers because it is convenient and provides a distraction would be lower in autonomy (an “identified” choice). At the lowest end of the autonomy spectrum are decisions that are extrinsically motivated, such as choosing to go to lunch to curry favor with a colleague or supervisor (an “external” choice). In comparing seemingly conflicting sets of empirical results on the role of choice in depleting vs. enhancing energy, Ryan and Deci (2008) suggest that the energetic benefits of SDT (e.g., Nix et al., 1999) are conferred only as levels of autonomy increase, whereas the depleting effects of effortful self-regulation specified by EDT (e.g., Vohs, Baumeister, Schmeichel, Twenge, Nelson, & Tice, 2008) occur as autonomy decreases. Taken together, we propose:

Hypothesis 2. Higher levels of lunch break autonomy will result in lower of end-of-workday fatigue.
Hypothesis 3. Lunch break autonomy will moderate the effect of social activities during lunch breaks on end-of-workday fatigue, such that social activities result in more fatigue when autonomy is low and in less fatigue when autonomy is high.

Competence and Autonomy on a Lunch Break

SDT suggests that the need for competence provides individuals with the drive to attain the goals they have internalized. As the workplace is rife with opportunities for employees to feel both efficacious and inefficacious (Ashforth & Humphrey, 1995), the need for competence may be particularly relevant. Similar to the earlier discussion of the need for relatedness, Ryan and Deci (2008) suggest that as the need for competence is fulfilled, feelings of energy will increase. Indeed, a great deal of the literature has emphasized the beneficial and energizing feelings that accompany meeting goals and attaining high levels of efficacy (Carver & Scheier, 1990; Sheldon & Houser-Marko, 2001).

Drawing on both SDT and EDT, we suggest that the lunch break may be an important event that influences one’s competence needs. In particular, continuing to work during the lunch break may signal that one is not competent enough to finish work during the time allocated. This may greatly undermine one’s feelings of competence, and consequently lead to diminished energy. Concurring with this view, EDT suggests that continuing to work during the lunch break would be resource-depleting. Work typically requires a great deal of behavior regulation (Beal et al., 2005); attention is focused and the executive functions of the brain (i.e., working memory) are typically being maximized. These efforts result in the depletion of regulatory resources and increase the experience of fatigue (Muraven et al., 1998). In line with EDT, the recovery literature has consistently found that engaging in work activities during respite is associated with poorer recovery (e.g., Trougakos et al., 2008). Combined, SDT and EDT suggest similar propositions for working during the lunch break:

Hypothesis 4. Higher levels of work activities during the lunch break will result in higher end-of-workday fatigue.

We further suggest, however, that this effect is qualified by lunch break autonomy. If employees autonomously choose to engage in work activities during their lunch break, their competence feelings may not be undermined, as they may feel they are not behind on their work. Rather, when autonomously electing to work during the break, employees are likely to feel that they are accomplishing even more. In turn, this may lead to more energy and consequently less depletion as the energy increasing effects of psychological need satisfaction will be realized (Ryan & Deci, 2008). Thus, we suggest lunch break autonomy is pivotal for determining the extent to which engaging in work activities during lunch breaks may be harmful to subsequent levels of energy. High levels of autonomy may offset the negative effect of work activities on subsequent levels of energy. Thus, we propose the following:

Hypothesis 5. Lunch break autonomy will moderate the effect of work activities during lunch breaks on end-of-workday fatigue, such that work activities result in more fatigue when autonomy is low and in less fatigue when autonomy is high.

Relaxing Activities and Autonomy on a Lunch Break

The tenets of EDT suggest a third activity relevant to resource recovery at work. A fundamental premise of the muscle-analogy in EDT is that resources are recovered as the “muscle” is rested. That is, to the extent that we are not engaged in effortful regulation, our resources should recover (Muraven & Baumeister, 2000). Presumably, the most efficient activity that eliminates effortful regulation for restoring energy is sleep (Barber, Munz, Bagsby, & Powell, 2010). Unfortunately, sleep is unlikely a viable lunchtime activity for many workers. Relaxing activities, however, are a more common alternative that should reduce the extent to which one engages in effortful regulation (Hoffman, Benson, & Arns, 1982). As a result, it should be particularly effective in reestablishing the resources necessary for diminishing work-related fatigue.

Hypothesis 6. Higher levels of relaxing activities during the lunch break will result in lower end-of-workday fatigue.

Situations where social and work activities may vary in the degree of autonomous choice are clear. In contrast, relaxation is universally considered a desirable state (Tsai, Knutson, & Fung, 2006). Thus, individuals would seemingly always engage in re-
laxing activities given the choice (which is not the same with social and work activities) and, according to the principles of EDT outlined above, they would likely experience some degree of recovery as a result. However, situations where one has little choice over what to do during their lunch break—for example, if one feels forced to engage in other activities at that time (socializing with coworkers; continuing to work, etc.)—should result in lower recovery. So far the connection between relaxation, autonomy, and recovery seems straightforward: when employees have low autonomy over their lunch break and do not engage in relaxing activities, they will be more fatigued at the end of the workday. However, the other end of the low-autonomy spectrum is somewhat more puzzling: What would we anticipate if an employee feels that he or she has little choice over lunch break activities, but engages in relaxing activities nonetheless? On one hand, EDT suggests that relaxing, regardless of having choice in the matter, will aid recovery. Thus, EDT would predict similar levels of recovery regardless of whether lunch break autonomy was high or low (i.e., main effect of relaxing activities, but no effect of lunch break autonomy). In contrast, SDT would suggest that the lack of choice would, at a minimum, reduce the effectiveness of relaxing activities for replenishing energy (Ryan & Deci, 2008). Thus, increases in relaxing activities may offer recovery benefits, but to a lesser extent when lunch break autonomy is low (i.e., main effects of both relaxing activities and lunch break autonomy).

Combining these two perspectives and integrating SDT and EDT, we suggest that lunch break autonomy will shape the effect of relaxation activities during the lunch break on recovery. In particular, we argue that while high lunch break autonomy may not add to the beneficial effects of relaxing activities (i.e., in line with the predictions of EDT), low lunch break autonomy combined with a lack of relaxing activities may be particularly depleting. In line with this reasoning, regulation occurring under conditions of low autonomy has been demonstrated to be particularly depleting (Moller, Deci, & Ryan, 2006). For example, Muraven, Gagné, and Rosman (2008) examined conditions of high versus low autonomy for a depleting versus a relatively less-depleting task. Performance and feelings of energy were the lowest in the low autonomy and high depletion condition, but were the same in the remaining conditions. Thus, we propose:

**Hypothesis 7.** Lunch break autonomy will moderate the effect of relaxing activities during lunch breaks on end-of-workday fatigue, such that the effect is stronger when autonomy is lower and weaker when autonomy is higher.

**METHOD**

**Procedure and Participants**

The present study employed a multi-level, multi-source design utilizing experience sampling methods (ESM) to assess lunch break activities immediately following employees’ lunch breaks for 10 consecutive workdays, and coworker ratings of employees’ displays of fatigue at the end of each workday (Level 1 variables). Level 2 variables (dispositional and demographic variables) were measured prior to the ESM portion of the study.

Invitations were sent by email to 300 administrative employees at a large North American university. Administrative employees are an appropriate sample for our study given the demanding environment with constant pressures to meet deadlines. Moreover, the administrative personnel held a range of occupations, including operational vice presidents and financial officers, strengthening the external validity of our results. Interested employees clicked on a link that led to a consent form and an online survey that assessed employee demographics and employment-related information. One hundred and three employees (87 female) responded to at least one of the 10 daily questionnaires, resulting in a sample of 809 completed daily surveys. Employees also provided contact information for a coworker who frequently interacts with them on a daily basis. Coworkers were contacted via email and phone, and invited to provide daily assessments of the focal employee. If the coworker indicated not having daily interaction with the focal employee, we asked the focal employee for another coworker and the same process was repeated. Only three of the 103 focal employees did not end up having a suitable coworker. Of the nominated coworkers that were deemed acceptable, 84 completed at least one of the daily surveys.

Twenty-three coworkers who participated also participated as focal employees in the study. There were no significant differences in the means of the study variables between those who were only focal employees and those who also provided coworker ratings, nor were there any significant differences in the ratings of those participants whose evaluat-
ing coworker was also a participant. Each focal participant and coworker was assigned matching identification codes and passwords to ensure confidentiality. All participants received a “ticket” to a prize draw for each survey they completed.

Daily surveys began one week following the initial survey. Past research indicates that a two-week period typically is a sufficient interval by which to capture a representative snapshot of one’s life (Reis & Wheeler, 1991). These daily surveys assessed the extent to which employees engaged in each of the three lunch break activities (relaxing, work, and social) during their lunch break, and their perceptions of autonomy over lunch break activities. Near the end of each of the 10 workdays, coworkers received an email containing a link to a survey measuring the focal employees’ daily displayed end-of-workday fatigue.

Focal employees were on average 39.52 (s.d. = 10.72) years of age and had worked for an average of 7.69 years (s.d. = 8.26). Only those who completed at least three daily surveys and had matching coworker evaluations were included in the final sample (see Singer & Willett, 2003). The final sample used for multi-level analysis consisted of 78 employees for a total of 444 matched daily responses. There were no significant differences on any study variables between participants included in the final sample and those excluded due to missing data.

Measures

Table 1 reports the means, standard deviations, intraclass correlations (% of between-person variability), between- and within-person bivariate correlations, and internal consistency reliabilities for all study variables. Note that here and in the hierarchical linear modeling (HLM) analyses, the variables used are means of the respective scale items. All measures used a 7-point Likert response scale ranging from 1 (not at all) to 7 (to a great extent). Our measures focused on the “extent to which” employees engaged in the various lunch break activities, which allowed us to assess not only whether or not each activity occurred, but also the relative preponderance of the lunch break occupied by each activity, in contrast to categorical responses.

Lunch break relaxing activity. We used a three-item subscale from the Work Recovery Experience Questionnaire (Sonnentag & Fritz, 2007) to assess relaxing activity during lunch breaks. The items were “I kicked back and relaxed,” “I did relaxing things,” and “I took time for leisure.”

Lunch break work activity. We used a modified three-item work activity scale based on Sonnentag’s (e.g., Sonnentag, 2001) break activity measures to assess work activity during lunch breaks. The items were “I spent at least part of the break time finishing/working on what I was doing before the lunch hour,” “I prepared/organized for what I had to do after lunch hour,” and “I worked on some work tasks that I needed to get done.”

Lunch break social activity. We adapted the two social activity items from Sonnentag’s (2001) break activities measure (“I socialized with others” and “I spent time with/talking to others”) to assess social activity during lunch breaks.

Lunch break autonomy. We used three items from the Work Recovery Experience Questionnaire to assess perceptions of autonomy over how to use lunch breaks each day. The items were “I felt like I decided for myself what to do,” “I took care of things the way that I want them done,” and “I did exactly what I wanted to do.”

Others’ reports of end-of-workday fatigue. Co-workers rated the extent to which focal employees appeared fatigued at the end of each workday using

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\begin{array}{ccccccc}
\text{Table 1} & \text{Means, Standard Deviations, ICC1s, Correlations, and Reliabilities} \\
\hline
& M & s.d. & ICC1 & 1 & 2 & 3 & 4 & 5 \\
1. Lunch break social Activities & 3.25 & 2.23 & .31 & (.95) & -.33* & .62* & .30* & -.16 \\
2. Lunch break work Activities & 2.74 & 1.97 & .25 & -.37* & (.89) & -.64* & -.26 & .18 \\
3. Lunch break relaxing activities & 3.70 & 2.11 & .37 & .52* & -.56* & (.96) & .54* & -.21 \\
4. Lunch break autonomy & 4.90 & 1.79 & .38 & .17* & -.23* & .42* & (.88) & -.32* \\
5. Fatigue & 3.06 & 1.64 & .41 & .06 & .02 & -.06 & -.03 & (.87) \\
\hline
\end{array}
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\*p < .05.

Note: Correlations of the variables aggregated to the person-level appear above the diagonal (n = 78), within-person correlations appear below the diagonal (average n per person = 6.03), and internal consistency reliabilities appear in parentheses along the diagonal. Note that ICC1 values reflect the percentage of between-person variance, whereas 1—ICC1 would estimate within-person variance.
two items ("tired" and "sluggish") from the Positive and Negative Affect Schedule (PANAS) (Watson, Clark, & Tellegen, 1988) for 10 consecutive workdays. Coworkers provided ratings of employee fatigue to reduce common method bias and because we deemed that coworkers, being in close proximity to the focal employees, would be able to discern subtle changes in focal employees’ behaviors and expressions.

Fatigue often is conceptualized as an internal psychological state a person experiences (Watson et al., 1988). Research has demonstrated that people can accurately detect the internal states of others based on facial expressions and other verbal and non-verbal behaviors (Ekman, Friesen, & Ellsworth, 1972). We conducted an independent validation for our measure of fatigue. In a separate study with a similar sample and method using 76 university employees and their coworkers, we obtained a bivariate correlation of fatigue ratings of focal employees and a coworker (aggregated across the 10 days) of 0.30 (p < .001). Because the data was nested, we also conducted multi-level regression analysis specifying focal employees’ daily fatigue ratings as a predictor of coworkers’ daily ratings of the focal employees’ fatigue. This analysis yielded a positive and significant relation (γ = .19, s.e. = .05, t = 3.39, p < .001), providing support for coworkers’ ability to detect focal employees’ own perception of fatigue. This level of convergence is similar in magnitude to other peer ratings of experienced states (e.g., Watson & Clark, 1994).

**Control variables.** Due to the nature of ESM data (i.e., intensive time series data), trends, cycles, and serial dependency are all quite likely to be present in the data (Beal & Weiss, 2003). Furthermore, when examining concurrent or lagged effects, it is important to account for these broader patterns of change to eliminate potential confounds. Therefore, to account for the possibility that daily fatigue might be influenced by these factors, we entered a rigorous set of control variables (day, sine, cosine, lagged criterion) in all of our models, consistent with procedures recommended by Beal and Weiss (2003), Marco and Suls (1993), Wang, Hamaker, and Bergeman (2012), and West and Hepworth (1991). Finally, past research on depletion suggests that nutrient consumption can aid in the replenishment of regulatory resources (Galliot et al., 2007). As we were focusing on employees’ lunch breaks, and one of the primary purposes of this break is to consume nutrients, we also controlled for whether or not people ate lunch during this time period. To capture this, at the end of each lunch break we asked participants whether or not they ate lunch during their lunch break time (0 = did not eat lunch and 1 = ate lunch). This variable did not significantly predict fatigue, nor did its inclusion in any of our models significantly alter any of our findings. Therefore, for the sake of parsimony we did not include it in the final tests of our hypothesized model.

**RESULTS**

**Analytical Approach**

In this study, daily reports of lunch break experiences and daily coworker observations of job fatigue were grouped within focal employees. To appropriately model the nested nature of our data, we used multi-level random coefficient modeling. Specifically, HLM version 6.06 with the Restricted Maximum Likelihood (RML) estimation method was employed for the analyses. Following convention in analyzing daily-level data nested within individuals, all Level 1 variables were centered around the individual (e.g., Bono, Foldes, Vinson, & Muros, 2007).

We adopted a hierarchical approach to entering predictors in which a first step examined the contribution of our temporal control variables to predicting others’ reports of end-of-workday fatigue, followed by a second step that examined all main effects of the predictors. Finally, a third step entered the a priori specified two-way interactions between break activities and lunch break autonomy. In keeping with general recommendations for examining multiple predictor variables (Pedhazur, 1997), we entered all predictors simultaneously within each step, as there is the likelihood of some collinearity amongst the predictor variables.

**Preliminary Analysis**

We examined whether there was sufficient within-individual variance in our key variables measured at the daily level to justify within-person modeling. Table 1 indicates that, for all primary predictor and criterion variables, more than half of the total variance was attributable to within-person variation.

Next, we conducted a within-person confirmatory factor analysis using Mplus 6.11 to provide evidence of discriminant validity for the self-report scales used. The model specifying the four scales
(i.e., social activities, work activities, relaxing activities, and perceptions of lunch break autonomy) as loading onto the hypothesized four separate scales provided a good fit to the data, \( \chi^2(38) = 198.77, p < .05, \text{CFI} = .95, \text{RMSEA} = .07 \), with all standardized factor loadings being greater than .72. No other potential factor structures provided better fit to the data, as the median of Satorra–Bentler scaled \( \chi^2 \) difference values (Satorra & Bentler, 2001) was 359.80, with the closest comparison being 135.41 (\( \Delta df = 3, p < .05 \)).

Hypotheses Testing

HLM results of analyses used to test the hypotheses are presented in Table 2. It is first worthy of note that, across the three models, the control variables each accounted for a significant amount of variability in others’ reports of end-of-workday fatigue, suggesting the presence of trends, cyclicity, and serial dependency in the fatigue time series, and allowing the hypotheses to be evaluated free of these sources of variation.

We first present results for our main effect hypotheses. Our Hypothesis 1a and Hypothesis 1b provided competing predictions, with Hypothesis 1a predicting that social activities would result in lower others’ reports of fatigue, and Hypothesis 1b predicting that social activities would result in greater others’ reports of fatigue. As can be seen in step 2 in Table 2, social lunch break activities on average resulted in higher levels of others’ reports of fatigue, supporting Hypothesis 1b and the prediction made by EDT. Further, in support of Hypothesis 4, we found that work activities during the lunch break resulted in greater others’ reports of fatigue. In support of Hypothesis 6, we found that relaxing activities during the lunch break resulted in lower levels of others’ reports of fatigue. The final main effect suggesting that lunch break autonomy would result in lower others’ reports of fatigue (Hypothesis 2) was not supported.

We next present results for our moderation hypotheses (Hypothesis 3, Hypothesis 5, & Hypothesis 7), which identified lunch break autonomy as a key moderating variable of all three lunch break activities on others’ reports of fatigue. In particular, Hypothesis 3 specified that social activities during the lunch break would result in more fatigue when autonomy is low and less fatigue when autonomy is high. As expected, there was a significant interaction (see Table 2, step 3). To interpret this interaction, we first plotted the effects of social activities at low levels of autonomy (i.e., 1 SD below the mean) and high levels of autonomy (i.e., 1 SD above the mean) (see Figure 1, Panel A).

Next, we followed the recommendations of Preacher, Curran, and Bauer (2006) and examined regions of significance using the Johnson–Neyman technique. This procedure flips the logic of a simple slopes test by identifying at what points over

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<th>TABLE 2 Results of HLM-based Regression Analysis</th>
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<td>Step 1</td>
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<tr>
<td>Intercept</td>
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<td>Lagged fatigue (T–1)</td>
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<td>Lunch social activity</td>
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<td>Lunch work activity</td>
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<td>Lunch break autonomy</td>
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<td>Work activity × Autonomy</td>
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* \( p < .05 \).

* Variable increased monotonically each day (from 1 to 10) to model linear trends over the course of the study (see Beal & Weiss, 2003).
the range of scores on a moderator variable (if any) do slopes for a predictor variable become significant. This technique revealed that the slopes for the social activity—others’ reports of fatigue relation became significantly positive (i.e., more social activities associated with more fatigue) for values of lunch break autonomy that were at or below a standardized score of .13 ($p < .05$), and became significantly negative (i.e., more social activities associated with less fatigue) for values of lunch break autonomy that were at or above a standardized score of 1.80 ($p < .05$). Based on the findings, in order for social activities to produce a significant decrease in fatigue, it would require particularly high levels of lunch break autonomy. However, in order for social activities to significantly increase fatigue, it would require only moderate and lower levels of lunch break autonomy. Thus, Hypothesis 3 was supported.

Hypothesis 5 specified that work activities during the lunch break would result in more fatigue when autonomy is low and in less fatigue when autonomy is high. As expected, there was a significant interaction (see Table 2, step 3). The nature of the moderation effect mirrors the findings for social activities (see Figure 1, Panel B). To probe the significant interaction, we again examined regions of significance. Similar to the results for social activities, the slopes for the work activity—others’ reports of fatigue relation became significantly positive (i.e., more work activities associated with more fatigue) for values of lunch break autonomy that were at or below a standardized score of 1.89 ($p < .05$). That is, as with social activities, it would require particularly high levels of lunch break autonomy for work activities to produce a significant reduction in fatigue, yet it would require only moderate and lower levels of lunch break autonomy for work activities to significantly increase fatigue. Thus, Hypothesis 5 was supported.

The final interaction, Hypothesis 7, specified that the negative relation between relaxing activities during lunch breaks and others’ reports of fatigue would be stronger when autonomy is lower and weaker when autonomy is higher. As expected, there was a significant interaction (see Table 2, step 3). The nature of the moderation effect is displayed in Panel C of Figure 1. As can be seen in this figure, high levels of lunch break autonomy do not confer an advantage to engaging in relaxing lunch break activities, but at low levels of lunch break autonomy, relaxing activities have a more pronounced effect on others’ reports of fatigue, particularly when there are low levels of lunch break autonomy and low levels of relaxing activities (i.e., the remaining three predicted values are not significantly different from each other). An examination of the regions of significance supports this interpretation.
Specifically, the effect of relaxing activities on fatigue was significantly negative (i.e., more relaxing activities associated with less fatigue) for values of lunch break autonomy at or below a standardized score of .04 \((p < .05)\). In contrast, it would take a standardized score on lunch break autonomy at or above 8.69 to produce a significantly positive effect of relaxing activities on others’ reports of fatigue (i.e., more relaxing activities associated with more fatigue). Thus, for all effective purposes, only moderate to low levels of lunch break autonomy produce an effect of relaxing lunch break activities on others’ reports of fatigue, and this effect is negative. Thus, Hypothesis 7 was supported.

**DISCUSSION**

Drawing on EDT (Muraven & Baumeister, 2000) and SDT (Deci & Ryan, 1985), we proposed and found that engaging in relaxing activities during lunch leads to less end-of-workday fatigue, while engaging in work and social activities results in more fatigue. Employees’ perceptions of lunch break autonomy did not have a big effect on fatigue; however, it did moderate the links between lunch break activities and end-of-workday fatigue. As predicted, engaging in higher levels of work and social activities was especially fatiguing under conditions of low lunch break autonomy and less fatiguing when autonomy was higher. Further, engaging in lower levels of relaxing activities under conditions of low lunch break autonomy proved to be especially exacerbating for employees’ end-of-workday fatigue, but having higher levels of lunch break autonomy did not increase the benefits of engaging in higher levels of relaxing activities during the lunch break.

**Contributions to Theory and Research**

This research makes several contributions to the existing literature. It is the first study to integrate EDT with SDT in research into work recovery. In doing so, we broaden our understanding of work recovery processes while more fully testing and integrating EDT and SDT. We explore seeming contradictions between these theoretical perspectives and investigate the importance of autonomy in impacting people’s energy levels. Based on SDT, it was expected that engaging in social activities during lunch breaks would enhance people’s energy, as these activities would meet needs for relatedness. By contrast, EDT proposes that lunch break social activities would result in more fatigue as these activities would likely require employees to regulate their behavior. Our results supported EDT’s predictions—employees who socialized more during lunch were rated as being more fatigued by their coworkers at the end-of-the workday. We also suggest that the context of the activities may be especially important to consider, by focusing on workday lunch breaks. As such, employees’ options and expectations might have resulted in a situation where these behaviors would be more fatiguing than if they were to occur in non-work settings, or during work time. The importance of activity context is especially evident when considering the critical role of lunch break autonomy. Past recovery research has not considered if employees actually had autonomy over activity choices. Our findings suggest that it should not be taken for granted that employees actually have the liberty to use their breaks as they see fit. This depth of investigation into conditions surrounding recovery behaviors has largely been lacking.

The nature of each of our interactions also offers insights into the work recovery process, and provides a more complete understanding of how EDT and SDT impact employees’ energy levels. First, in contrast to past recovery research, which consistently predicts that social activities during breaks aid recovery (Demerouti et al., 2009), we demonstrate that, at least for lunch breaks, social activities may impede recovery—except in situations where employees feel high autonomy to select their lunch break social activities. Past research examining social activities in recovery focused on breaks outside of working hours, which are likely to offer employees greater autonomy in selecting the individuals with whom they interact, reducing regulatory demands and increasing the odds that relatedness needs will be fulfilled. With regard to work activities and lunch break autonomy, past recovery research consistently proposed that engaging in work activities during breaks is detrimental for recovery (Demerouti et al., 2009). Our findings suggest that this may be overly simplistic—under conditions of high lunch break autonomy, fatigue is actually lessened. With regard to relaxing activities and lunch break autonomy, EDT’s prediction that relaxing our regulatory “muscles” should result in recovery of lost energy, regardless of level of autonomy involved, was supported. A test of SDT, however, demonstrates that the lack of autonomy combined with low relaxing activities was particularly detrimental for recovery. In this case, we see a clear
instance where considering both perspectives help explain a complex pattern, providing increased insight into recovery processes.

Our research also contributes to the SDT literature, especially the application of SDT to the study of work organizations, by exploring autonomy from a dynamic within-person perspective. Organizational research has primarily focused on the role of SDT at the person or job level, despite the fact that people face constantly changing situations that have fluctuating levels of autonomy in their daily work lives (Beal et al., 2005). Focusing only on overall person or job level autonomy ignores potentially important variations in autonomy that can play a critical role in employees’ work experiences.

Further, our focus on lunch breaks contributes to the emerging research on the effects of within-workday breaks (e.g., Krajewski, Wieland, & Sauerland, 2010). To our knowledge, no published work has focused on how the lunch break choices of employees working in traditional nine-to-five jobs contribute to recovery. As such, our study helps to provide a more detailed picture of recovery as it unfolds over the course of the day, as well as a more complete picture of the dynamic experiences of employees’ everyday work lives (Weiss & Rupp, 2011). An exciting avenue for future research would be to consider how immediate and short-term break activities contribute to more long-term outcomes, such as burnout or other forms of work withdrawal (Maslach et al., 2001).

More broadly, this research suggests that both regulatory resource levels and autonomy over one’s behavior play a crucial role for energy levels and recovery. That is, there is an important interaction between self-regulatory efforts and psychological perceptions of one’s freedom to engage in these efforts. While specific behaviors such as continuing to work or socially interacting with others may drain resources, psychological factors such as autonomy over one’s choices appear to offer a notable buffer to such detrimental effects. Due to the central role self-regulation and self-determination play in determining energy levels in all aspects of daily life, our findings are likely to extend beyond lunch breaks to a host of situations related to recovery—including other breaks throughout the workday, as well as times outside of work such as end-of-day or weekend activities. Further, increasing perceptions of self-determination in break activities might be particularly important in occupations that carry a high physical and emotional burden, such as healthcare (e.g., nurses, physicians), where regularly scheduled breaks may be interrupted or postponed by emergency response requirements (see Lilius, 2012). Knowing that autonomy over breaks can promote faster recovery (e.g., through wellness training or other HR initiatives) may also lead employees to choose activities that are more likely to help them recover. Yet another context in which work break autonomy may be especially critical is for jobs in which fatigue-related errors might have dangerous or catastrophic consequences (e.g., a fatigued firefighter during an emergency). The theoretical lens of self-determination and resource depletion through which we examine short-term worker recovery can therefore provide insights to scholars studying workplace errors or safety (e.g., Christian, Bradley, Wallace, & Burke, 2009).

Practical Implications

Given the increasing number of employees who suffer from fatigue, stress, and burnout, the results of our study have important implications for organizations and employees. Specifically, our results suggest that for a typical day’s lunch break, engaging in work or social activities may yield suboptimal recovery outcomes, while relaxing activities during lunch can aid recovery. It is important to note that these main effects remain even when taking into account other temporal factors (i.e., trends, cycles, and autoregressive patterns), as well as the main effects of autonomy. Therefore, our results show that employees should be aware of what they do during their lunch breaks, as even seemingly inconsequential activity choices made during the lunch break can impact their fatigue at the end of the day.

Furthermore, the extent to which employees can determine how they utilize their lunch breaks may be just as important as what employees do during their lunch. Autonomy over the lunch break can offset the negative effects of work and social activities as well as not engaging in relaxing activities during lunch. In light of increased pressure to continue working and skip lunch in today’s workplace, however, it seems possible that autonomy over the lunch break may be relatively low. Indeed, other authors have suggested that the modern capitalist workplace is characterized by particularly low levels of autonomy (Kasser, Cohn, Kanner, & Ryan, 2007; Ryan, Bernstein, & Brown, 2010). Our results suggest that lower levels of autonomy are likely to have serious negative consequences for well-being. As such, in addition to providing employees with
guidance as to which lunch activities might best aid recovery, a critical take home point of this research for employees, managers, and organizations is that the benefits of autonomy go beyond having choice over work activities to include choice throughout the experience of work, including breaks from work. Thus, managers should be mindful to avoid pressuring employees to work during their breaks. For example, managers may plan team building experiences or other group activities designed to create a more positive work environment during lunches or other breaks. However, if employees are not completely in favor of utilizing personal time for such activities, the immediate outcome could prove to be detrimental for employees.

**Strengths, Limitations, and Directions for Future Research**

As with all research, the current study has both strengths and limitations. First, in addition to the theoretical and practical advances we have already discussed, our methodological design represents a strength of our study. We employed an ESM study that tracked employees each day over a two-week period to capture their daily lunch break experiences. We utilized multiple sources of data by having coworkers rate employees’ displayed fatigue at the end of each day over the same two-week period. Further, because employees completed their measures after lunch, and coworkers completed their evaluations at the end of the workday, we were able to reduce concerns relating to causality. Finally, the rigorous set of control variables we included in our analyses help rule out numerous possible temporal patterns.

In terms of potential limitations, while our measure of others’ reports of fatigue represents an important strength, as described above, one limitation of this approach is that we captured only external, observable symptoms of fatigue while other, more internal, aspects of fatigue could have gone undetected. Using supplemental data, we showed a significant moderate relation between self- and other-reports of fatigue ($r = .30$), suggesting a significant overlap between focal employees’ ratings of fatigue and coworkers’ ratings of focal employees’ fatigue.

Also, although we suggested in our theorizing that the underlying mechanisms of the effect of lunch break activities on fatigue is recovery/depletion of resources according to EDT, or need fulfillment according to SDT, we did not measure these mechanisms. The potential problem with measuring resources and their depletion is that the exact nature of resources (i.e., whether they are physiological or psychological, or both) is still unclear (see Baumeister et al., 2007 for a discussion), and only recently have researchers started to address this issue (e.g., Gailliot et al., 2007). In the current study, we chose to focus on the practical manifestation of the underlying processes (e.g., job fatigue).

Nonetheless, future research should seek to expand on the current findings by assessing actual resources, perceptions of need fulfillment, and the means by which they are depleted or restored in the workplace.

Moreover, although we framed our paper around SDT and EDT due to the conceptual alignment between these perspectives, there are other theoretical views that future research could consider. For example, the Conservation of Resources Theory (COR, Hobfoll, 1989) might be especially relevant to the process we examine in this paper. An essential element of COR is the notion that resources are substitutable and bankable. So, if people do not have access to one type of resource, it might be possible to utilize another resource more immediately at their disposal. The current study was not designed to properly test this notion, as EDT and SDT by and large do not conceptualize their respective resources as substitutable.

Although the dynamic assessment of autonomy at a within-person level represents a strength of the study, other measurement strategies carry their own strengths as well. For example, asking participants about autonomy experienced with respect to each specific activity as opposed to the break as a whole could increase specificity. Of course, it is unclear whether individuals can make fine distinctions between experienced autonomy for fluctuating activities over a brief period of time, but future research may find this approach fruitful.

In addition, the lunch break is only one work recovery experience employees have each day. We did not examine other work breaks (e.g., coffee breaks) or take into account the impact of end-of-day time away from work, or even weekends. Future research is needed to capture a more comprehensive process of recovery as it unfolds throughout the day and over longer periods. Such research would describe the recovery potentials of an extensive range of breaks. This approach could also consider how activities in one break influence activity choice during the recovery potential of other, subsequent breaks (e.g., the relation between...
a morning coffee break and lunch), and provide insights into factors impacting break activity choices.

Future work might also examine how the more immediate processes examined here extend into more aggregate processes and outcomes. For instance, while working during a break may exacerbate immediate depletion effects, it is possible that over the long run the incremental increase in work will provide these employees with an edge in career advancement, although we suspect it is equally plausible that these employees will also experience a greater likelihood of burning out. Similarly, although there may be short-term negative effects on immediate recovery associated with constrained social activity, there are clear long-term benefits of developing strong social ties in the workplace (e.g., Adler & Kwon, 2002).

Another avenue of exploration concerns greater specificity in our measures of activities. For example, our measure of social activities was somewhat limited as we could not be completely certain with whom employees interacted during their lunch break, or the exact nature of these interactions. To the extent that interactions were not with work-related individuals, or that the nature of the interactions did not require self-regulation, then social activities may not have been fatiguing in nature. Future research should explore these additional contextual factors that might influence how social lunch break activities relate to recovery.

Finally, although our study examined employee lunch breaks, we focused on the activities employees engaged in during these times and did not specifically examine what employees ate during their break, although we did measure whether or not they did eat. We did not find an effect for eating lunch on end-of-day fatigue. However, we used a relatively simplistic measure (ate lunch vs. did not eat lunch) of a potentially complex variable, as there are numerous choices people can make when determining what to eat, each with different nutritional factors (e.g., healthy food vs. unhealthy food). Some research has started to explore the relation between work–family conflict and eating choices (e.g., Allen & Armstrong, 2006), but there is little organizational research that focuses on employees’ eating patterns as they relate to employee work recovery. Given the critical nature of proper nutrition in determining well-being, future research should explore the role of nutrient consumption in the recovery process.

CONCLUSION

People spend an increasingly large amount of time at work. Thus, the importance of the longest and most common type of within-workday break, lunch, and employees’ autonomy over this time, are central elements of employees’ work lives and the daily recovery process. Given the ubiquity of—and value employees ascribe to—lunch breaks, it is surprising that past research has not paid greater attention to the effects of lunch break activities on subsequent employee well-being. Integrating EDT with SDT, we demonstrated that while some lunch break activities (i.e., relaxing) enhance recovery, others (i.e., work and social) are detrimental for work recovery during the workday. We further show that employees’ autonomy over how to utilize this time is a critical moderating variable impacting the relation between lunch break activities and work recovery. As our findings suggest, a more complete understanding of the types of work breaks employees experience, the various activities they choose to engage in, and the potential boundary conditions detailing the intricacies of these relationships, is critical to developing a more comprehensive understanding of the processes and outcomes associated with work recovery.

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