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RESEARCH REPORT

# Give Me a *Better* Break: Choosing Workday Break Activities to Maximize Resource Recovery

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Surprisingly little research investigates employee breaks at work, and even less research provides prescriptive suggestions for *better* workday breaks in terms of when, where, and how break activities are most beneficial. Based on the effort–recovery model and using experience sampling methodology, we examined the characteristics of employee workday breaks with 95 employees across 5 workdays. In addition, we examined resources as a mediator between break characteristics and well-being. Multilevel analysis results indicated that activities that were preferred and earlier in the work shift related to more resource recovery following the break. We also found that resources mediated the influence of preferred break activities and time of break on health symptoms and that resource recovery benefited person-level outcomes of emotional exhaustion, job satisfaction, and organizational citizenship behavior. Finally, break length interacted with the number of breaks per day such that longer breaks and frequent short breaks were associated with more resources than infrequent short breaks.

*Keywords:* effort–recovery model, breaks, resources, health



> There is virtue in work and there is virtue in rest. Use both and overlook neither.
>
> —Alan Cohen

Most employees would agree that they need breaks to "make it through the day." Evenings, weekends, and vacations have numerous benefits, such as decreased burnout (Fritz & Sonnentag, 2006; Westman & Eden, 1997); increased performance (Fritz & Sonnentag, 2006); and even lowered blood pressure, heart rate, and epinephrine excretion levels (Frankenhaeuser et al., 1989). Despite important implications for employee health and performance, little research has investigated employees on break during the workday (Trougakos & Hideg, 2009). A greater understanding of workday break activities and timing is important, as Meijman and Mulder (1998) noted in their effort–recovery model that recovery periods must be "both quantitatively and qualitatively sufficient" (p. 25) and that "time is the crucial variable" (p. 24).

In the present study, we aim to understand how breaks can benefit employees and organizations through improved health and well-being. Our overall goal is to provide theory-driven, prescriptive suggestions for workday breaks by determining when, where, and how break activities are most beneficial. Building on Trougakos, Beal, Green, and Weiss (2008), we define a break as a period of the workday when work-related tasks are not required or expected or when employees proactively shift their attention away from work tasks as needed. Applying the effort–recovery model as a theoretical lens (Meijman & Mulder, 1998), we examined the recovery process by which break characteristics lead to somatic health symptoms (i.e., headache, eyestrain, muscle soreness), with resources as a critical mediating mechanism. We also assessed the impact of postbreak resource recovery on broader work outcomes, including emotional exhaustion, job satisfaction, and organizational citizenship behavior (OCB).

## Theoretical Foundations

The effort–recovery model (Meijman & Mulder, 1998) is particularly helpful to understand workday breaks because it describes the process by which workers respond to work demands by expending resources, incurring negative cumulative effects over prolonged periods without rest. Resources are a wide range of valued assets (Hobfoll, 1989) that help enact a schema or an organizing cognitive framework (Feldman & Worline, 2012), with energy being the cornerstone resource (Quinn, Spreitzer, & Lam, 2012). Energy encompasses both physical energy (i.e., the capacity to perform work) and energetic activation (i.e., the subjective feeling of being energized). In addition to energy, Quinn and colleagues (2012) have also identified motivation and concentration as relevant to the process of resource production, protection, and depletion (see also Cole, Bruch, & Vogel, 2012). Motivation serves to enact schemas by supplying the incentive to behave in a certain

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form, direction, intensity, and duration (Halbesleben & Bowler, 2007). Concentration aids enacting schemas by facilitating information processing and inhibiting diversions (Quinn et al., 2012).

Unfortunately, energy, motivation, and concentration resources are not in limitless supply but rather are like batteries that periodically need recharging. According to the effort–recovery model, resources are expended and recharged by the opposing stress processes of reactivity and recovery (Linden, Earle, Gerin, & Christenfeld, 1997). Reactivity refers to the immediate physiological and psychological reactions to a stressor. The physical and mental effort expended by the prolonged activation of physiological and psychological systems drains resources and leads to such negative outcomes as fatigue and increased negative affect (Thomsen, 2006). Meijman and Mulder (1998) predict that without sufficient recovery, these outcomes will be exponentially increased over time. Recovery, or the psychophysiological unwinding following effort expenditure at work (Geurts & Sonnentag, 2006), allows the physiological and affective systems to return to prestressor levels (Meijman & Mulder, 1998).

## Characteristics of Workday Break Activities That Enhance Resource Recovery

Trougakos, Hideg, Cheng, and Beal's (2014) research on lunch breaks demonstrated that relaxing breaks were related to less fatigue and that social and work-related breaks were only negatively associated with fatigue when employees had high autonomy. Drawing on this research and the effort–recovery model, we propose that relaxing (i.e., less effortful), preferred, and non-work-related activity characteristics will facilitate recovery of resources during the break. We also propose three additional factors important to the effort–recovery model (i.e., outside the office, break length, and time of break). Each of these characteristics is a means by which employees can decrease effort and/or increase recovery during a workday break.

The first characteristic that can enhance recovery is by engaging in *less effortful* activities. Mentally or physically effortful break activities like exercise, class homework, or running errands require utilization of resources, which are the same resources that could be drained by effortful work demands (Meijman & Mulder, 1998). All effortful break activities that draw from this resource pool therefore may hinder resource recovery by posing additional demands. On the contrary, engaging in low-effort break activities should aid recovery by withholding effort for a period of time and allowing systems to stabilize (Sonnentag & Fritz, 2007). Thus, we hypothesize:

> *Hypothesis 1:* Break activities that are less effortful are associated with more resources after the break than activities that are more effortful.

The second characteristic to aid recovery is choosing a break activity one *prefers*. When a chosen behavior is not consistent with their preferences, individuals tend to spend more energy justifying their choice or modifying their preference (Dhar & Gorlin, 2013; Rapp, Jacovina, Slaten, & Krause, 2014; Sharot, Fleming, Yu, Koster, & Dolan, 2012), placing additional burden on mental resources and deterring recovery. Therefore, we propose:

> *Hypothesis 2:* Break activities that are more preferred are associated with more resources after the break than activities that are less preferred.

A third characteristic relevant to resource recovery is engaging in *non-work-related tasks*. When employees are on break, sometimes they allow work to bleed into break activities (e.g., conversation with a coworker that steers into work topics, asking advice from coworkers, or reading a book about solving a work-related problem). Because it is necessary to remove work demands (Meijman & Mulder, 1998) and psychologically detach from work (Etzion, Eden, & Lapidot, 1998) to allow resource levels to be refreshed, we hypothesize:

> *Hypothesis 3:* Break activities that are more non-work-related are associated with more resources after the break than activities that are less non-work-related.

Fourth, breaks *outside the office* space, whether outside the building or still in the same building, may enhance recovery. "Being away" is important to resource recovery because the ample stimuli outside the office space retain individuals' attention resources in an automatic, bottom-up manner, so that the top-down, controlled attention resources engaged at work have room to replenish (Kaplan, 1995). This "change of scenery" helps recovery, whether it is walking in nature (Berman, Jonides, & Kaplan, 2008; Felsten, 2009), in the urban setting (Herzog, Maguire, & Nebel, 2003), or even indoors like museums and houses of worship (Kaplan, Bardwell, & Slakter, 1993). Therefore, we propose:

> *Hypothesis 4:* Break activities outside the office are associated with more resources after the break than activities inside the office.

A fifth critical break characteristic that is likely to enhance recovery is *break length*, or taking a break that is long enough to allow physiological systems to reset and stabilize to the baseline level but not too excessively long to provide diminishing returns. For example, a laboratory study with a self-paced data entry task reported that the degree of recovery was proportionate to the length of the break (Hennfng, Sauter, Salvendy, & Krieg, 1989). Another study found visual acuity deficits required at minimum 16-min breaks to recover to preshift acuity levels (Haider, Kundi, & Weissenböck, 1980). However, research on resource recovery via vacation, for example (Fritz & Sonnentag, 2006), also suggests that more effort was needed to complete work tasks after being away from work because accumulated work awaited upon return. This anticipated higher postbreak work demand, in turn, can lead to anxiety and more negative rumination on work and thus fewer resources after longer breaks. We propose:

> *Hypothesis 5:* Break length has an inverted U-shaped relationship with resources after the break.

Finally, *timing of the break* is also a critical factor in the efficiency and effectiveness of resource recovery. For performance in computer jobs, research supports a linear decline associated with homeostatic theory (Valdez et al., 2005), which suggests that resources are at their highest shortly after awakening and diminish throughout the day because of one's need for recovery. Individuals are able to expend effort to meet work demands early in the work

shift, but as the shift wears on and with limited resource recovery, individuals experience greater strain meeting work demands (Meijman & Mulder, 1998). Experimental evidence and algorithms utilized in operations research support this view. Assuming that the performance decay rate in productivity due to fatigue is continuous from the beginning of the shift, allowing rest breaks earlier in the shift has the potential to increase output, referred to as the "front-loading schedule" (Bechtold, Janaro, & Sumners, 1984; Wyatt & Fraser, 1925). Based on this rationale, we propose:

*Hypothesis 6:* Breaks taken early in the shift are associated with more resources after the break than breaks taken later in the shift.

## Outcomes of Resource Recovery

Over time, effort without sufficient recovery will lead to poor health outcomes (Meijman & Mulder, 1998), including psychosomatic complaints and sleep disturbance (Ursin & Eriksen, 2004). Ergonomics research confirms that breaks are related to improved health outcomes (e.g., Dababneh, Swanson, & Shell, 2001). We further specify that health benefits such as reduced headache, eyestrain, and lower back pain occur through recovery of resources at the event level of each break. According to the effort–recovery model, characteristics of the break influence somatic symptoms precisely because these characteristics, as described above, are conducive to resource recovery; hence, we expect full mediation. This leads us to hypothesize:

*Hypothesis 7:* Resources after the break fully mediate the relationship between break characteristics and somatic symptoms.

Finally, we predict cumulative reactions to recovery across the span of the work week (i.e., at the person level). The effort–recovery model predicts that prolonged effort expenditure without recovery can lead to resource drain, such as fatigue and negative affect (Thomsen, 2006), whereas recovery allows individuals to replenish the resource pool that facilitates positive work experiences (Kühnel, Sonnentag, & Westman, 2009), such as positive attitudes and helping behaviors. We therefore included emotional exhaustion, job satisfaction, and OCB as outcomes of recovery or lack thereof. A consistent level of recovery enables individuals to avoid resource depletion (Hobfoll, 1989), cope better with the demands of work (Sluiter, de Croon, Meijman, & Frings-Dresen, 2003), and provide energy that fuels such positive outcomes as work engagement (Kühnel et al., 2009). Consequently, well-recovered employees are less likely to experience emotional exhaustion and are more likely to be in a positive and fulfilling state of mind (Kühnel et al., 2009) and thus higher job satisfaction. This favorable work experience can result in higher discretionary behavior such as OCB to reciprocate favorably toward the organization (Blau, 1964). Thus, we hypothesize:

*Hypothesis 8:* At the person level, resources are associated with (a) less emotional exhaustion, (b) more job satisfaction, and (c) more OCB.

# Method

## Sample

Ninety-five hourly administrative employees (17% males) from a midsized private university in the southern United States participated in the study. The average age was 46 years ($SD$ = 12 years, range = 22–67 years), and the average job tenure was 7 years ($SD$ = 6 years, range = 0–23 years). Eighty-five percent of the participants reported themselves as being White/Caucasian, 70% were married, and about half (47%) of the participants had children living at home. This is the first publication from these data collected as part of a larger data collection effort.

## Procedures

To better understand the nature of the episodic break and its within-person processes and influences, we utilized experience sampling methodology (ESM; Beal & Weiss, 2003). We asked participants to respond to a survey after every break they took during the workday.

Study participants were recruited through the organization's e-mail. We sent e-mails to 499 employees, and 96 responded with interest (19% response rate). Interested participants were scheduled for a 30-min training session in which one of the authors met face to face with each participant to stipulate the purpose of the study, obtain informed consent, and explain the survey procedures. At the end of the training session, participants were asked to complete a survey to collect demographic information. One participant dropped out of the study after the training session, leaving 95 participants. All the data were collected through online surveys.

Then, we asked participants to record their daily well-being and break activities for the next workweek. Throughout the day, participants were instructed to complete a short survey after each break they took. We told participants that a break was defined as "any period of time, formal or informal, during the workday in which work-relevant tasks are not required or expected, including but not limited to a break for lunch, coffee, personal e-mail, or socializing with coworkers, not including bathroom breaks." The short break survey assessed characteristics of the break, resources, and somatic symptoms. Respondents completed 959 total break surveys (range = 3–40 surveys per person)—on average, two break surveys per day (range = 0–12).

At the end of the workweek survey period, we asked participants to complete a postsurvey that included job satisfaction, emotional exhaustion, and OCB. Participants were instructed to respond to these scales thinking about "the past 5 workdays, including today." Following completion of the postsurvey, we paid each participant $40.

## Measures

**Break characteristics.** Building upon Trougakos et al. (2008) and Tucker, Dahlgren, Akerstedt, and Waterhouse (2008), we created one-item measures of participants' perceptions of the break activities performed for the majority of time on the break anchored on a 5-point scale (1 = *strongly disagree*; 5 = *strongly agree*): less effortful ("I extended mental or physical effort on this activity" reverse coded), preferred ("I prefer to engage in this activity"), and

non-work-related ("I thought about or talked about work during this activity" reverse coded). These types of one-item measures are common in ESM research and are valid for concrete constructs (Bergkvist & Rossiter, 2009; Drolet & Morrison, 2001; Rossiter, 2002). We measured the location of the break activities by coding the respondents' descriptive answers to an open-ended question about what activities they performed during the break. One of the authors and a trained graduate student coded the activity as 0 = inside the employee's office or 1 = outside their office (in the same building or outside the building). Cohen's kappa was 0.96, which indicated strong interrater reliability (Cohen, 1968). Break length was assessed with the item "How many minutes did your most recent workday break last?" and then we converted minutes to hours. Finally, time of break was measured as number of hours elapsed since 8:00 a.m. (standard workday start time at this organization).

**Resources.** We created three items to measure resources on a 5-point scale (1 = *very low*; 5 = *very high*). After the break, we asked (a) "What is your current level of energy?" (b) "What is your current level of motivation?" and (c) "What is your current level of concentration?" ($\alpha$ = .92). To confirm our predictions that these three items loaded onto one latent factor, we first conducted a multilevel confirmatory factor analysis (CFA) in Mplus 7.3 (Muthén & Muthén, 1998–2012). The CFA was just identified, and the factor loadings at the event level were .78, .87, and .91 for energy, concentration, and motivation, respectively (person level: .94, .96, and .98). We also conducted the average variance extracted (AVE) test that depicts the percentage of variance in the items explained by the construct and indicates the extent of convergence among the items measuring the same construct (Bagozzi, Yi, & Phillips, 1991). The AVE estimates were .73 and .92 at the event level and person level, respectively, exceeding the .50 threshold.

**Somatic symptoms.** The somatic health symptoms scale was adapted from the Hopkins Symptom Checklist (HSCL) by Derogatis, Lipman, Rickels, Uhlenhuth, and Covi (1974). We shortened the measure to include only four items for parsimony and to reduce participants' survey fatigue. We also added the item *eyestrain* to capture this symptom commonly experienced by computer workers (Boucsein & Thum, 1997; Rosenfield, 2011). Right after a break, we asked the participants to indicate the extent to which they are currently experiencing (a) headache, (b) eyestrain, (c) lower back pain, (d) muscle soreness, and (e) heavy feelings in arms or legs on a 5-point scale (1 = *not at all*; 5 = *a lot*; $\alpha$ = .70).

**Person-level outcomes.** We assessed three person-level outcomes on the postsurvey at the end of the workweek using a 5-point scale (1 = *strongly disagree*; 5 = *strongly agree*). Emotional exhaustion was measured with the eight-item emotional exhaustion scale from the Oldenburg Burnout Inventory (Halbesleben & Demerouti, 2005), such as "During my work, I often felt emotionally drained" ($\alpha$ = .85). We assessed job satisfaction with the three-item scale from Cammann, Fichman, Jenkins, and Klesh (1983). An example item was "All in all, I am satisfied with my job" ($\alpha$ = .86). OCB was assessed with Van Dyne and LePine's (1998) seven-item scale, which includes items such as "I assist others in this group with their work for the benefit of the group" ($\alpha$ = .87).

**Controls.** We assessed two controls each morning on a 5-point scale (1 = *strongly disagree*; 5 = *strongly agree*): sleep quality from the night before and morning fatigue. Sleep quality included one item created for this study: "Last night I slept easily and well." Morning fatigue was assessed with the eight-item subjective experience fatigue scale (Jansen, Kant, & van den Brandt, 2002), including "Physically I feel exhausted" ($\alpha$ = .91). We also included three items to assess prebreak resources on the survey completed after the break to use as a control (e.g., "What was your level of motivation immediately before you took this break?"; $\alpha$ = .92).

## Analyses

ESM data are naturally hierarchical (see Beal & Weiss, 2003 for a detailed description of ESM analysis strategies). Accordingly, we used multilevel structural equation modeling (SEM) with Mplus 7.3. Responses to the morning and daily break surveys were analyzed at the event level (within), while responses to the postsurvey were analyzed at the person level (between). We deleted one outlier with an unusually long break length (240 min).

# Results

## Decomposition of Variance

To determine if there was sufficient variance at both the within- and between-persons levels to justify multilevel modeling, we assessed the intraclass correlation coefficient (ICC(1); Klein & Kozlowski, 2000). Research has shown that ICC(1)s as low as .05 indicate Level 2 effects (LeBreton & Senter, 2008). Our data suggested that ICC(1)s were sufficiently high to justify person-level effects (.06–.65) with a substantial within-person portion of the total variance for each scale (35%– 94%; see Table 1), supporting use of multilevel modeling.

## Descriptive Statistics

Table 1 summarizes the correlations among study variables, and Figure 1 describes the changing level of average pre- and postbreak resources across the workday. As Figure 1 demonstrates, postbreak resources tended to be relatively stable across the workday, whereas prebreak resources decreased in the afternoon, especially after 5.5 hr. Prebreak resources also were usually below the level of postbreak resources. This provides some evidence that breaks help employees recover resources, and our hypotheses investigate this relationship in more detail.

## Hypothesis Tests

The hypothesized full mediation model fit well, $\chi^2(7, N = 958) = 17.24, p < .05$; comparative fit index (CFI) = 1.00, Tucker Lewis index (TLI) = .91, root-mean-square error of approximation (RMSEA) = .04, standardized root-mean-square residual (SRMR) for within = .01, SRMR for between = .00. Hypotheses 1–6 predicted that break activities that were less effortful, more preferred, more non-work-related, outside the office, longer (quadratic), and earlier in the day would be associated with more resources after the break. Hypotheses 1, 3, 4, and 5 were not supported, as we found that less effortful, non-work-related, outside the office, and break length squared were not related to

Table 1
*Multilevel Descriptive Statistics and Correlations*

| Scale | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Morning sleep | — | −.57** | .15** | −.03 | .05 | .02 | .01 | .04 | .02 | .12** | −.11* | | | |
| 2. Morning fatigue | −.58** | (.91) | −.16** | −.01 | −.06 | −.02 | −.00 | −.05 | .00 | −.14** | .19** | | | |
| 3. Prebreak resources | .29* | −.42** | (.92) | −.05 | −.03 | −.03 | −.05 | .01 | −.10* | .40** | −.22** | | | |
| Break characteristics | | | | | | | | | | | | | | |
| 4. Less effortful | .16 | −.04 | −.04 | — | .09* | .09** | −.24** | −.19** | −.01 | −.02 | −.05 | | | |
| 5. Preferred | .14 | −.03 | .04 | .01 | — | −.06 | .10** | .14** | .01 | .17** | −.10** | | | |
| 6. Non-work-related | .02 | −.09 | .10 | .24 | .06 | — | −.08* | −.10** | .05 | −.08* | −.01 | | | |
| 7. Outside the office | −.22 | −.14 | .13 | −.16 | .06 | .01 | — | .60** | .04 | .10** | .00 | | | |
| 8. Break length | −.08 | −.32 | .26 | −.33 | .19 | −.06 | .58** | — | −.02 | .13** | −.06 | | | |
| 9. Time of break | −.12 | .01 | −.10 | .06 | .15 | .28 | −.46* | −.46 | — | −.14** | .12** | | | |
| 10. Postbreak resources | .32** | −.34** | .68** | −.17 | −.05 | .28* | −.01 | .03 | .09 | (.92) | −.24** | | | |
| 11. Somatic symptoms after break | −.35** | .50** | −.31** | .04 | −.03 | −.09 | −.07 | −.14 | .22 | −.39** | (.70) | | | |
| 12. Emotional exhaustion | −.39** | .56** | −.32** | −.23* | .05 | −.33** | .17 | .03 | −.12 | −.25* | .24* | (.85) | | |
| 13. Job satisfaction | .17 | −.20* | .32** | .10 | .04 | .28** | −.18 | .01 | .17 | .31** | −.17 | −.42** | (.86) | |
| 14. OCB | .01 | −.03 | .48** | −.06 | .01 | −.19 | −.01 | .18 | −.05 | .25* | .06 | −.09 | .26** | (.87) |
| Grand mean | 3.54 | 2.55 | 3.00 | 2.01 | 3.67 | 2.42 | 0.29 | 0.50 | 4.19 | 3.39 | 1.30 | 2.41 | 4.27 | 4.03 |
| Between-person *SD* | 0.59 | 0.64 | 0.41 | 0.57 | 0.48 | 0.55 | 0.20 | 0.11 | 0.69 | 0.38 | 0.35 | 0.71 | 0.61 | 0.53 |
| Within-person *SD* | 0.86 | 0.47 | 0.58 | 0.92 | 0.71 | 1.17 | 0.41 | 0.45 | 2.13 | 0.51 | 0.29 | | | |
| Proportion within variance | 67% | 35% | 67% | 72% | 69% | 82% | 80% | 94% | 91% | 64% | 40% | | | |

*Note*. $N = 959$ break surveys (average 10 surveys per person). Person-level correlations are given below the diagonal; event-level correlations are given above the diagonal. Scale reliabilities are shown in parentheses along the diagonal. For outside the office, 1 = outside office, 0 = inside office. OCB = organizational citizenship behavior.
* $p < .05$. ** $p < .01$.



postbreak resources. However, we demonstrated support for Hypotheses 2 and 6 (see Figure 2). Preferred break activities were positively related to resources postbreak ($B = .16$, $p < .01$), and time of break was negatively related to resources postbreak ($B = -.10$, $p < .01$).

Hypothesis 7 predicted that resources postbreak would fully mediate the relationship between break characteristics and somatic symptoms. As mentioned above, the full mediation model fit well, but we also ran a partial mediation model that was just identified to compare indirect and direct effects (see Table 2). For direct and total effects, 95% confidence intervals (CIs) were calculated using normal approximation methods, whereas indirect-effect CIs were calculated using Monte Carlo methods (Preacher, Zhang, & Zyphur, 2011). Time of break demonstrated both a significant direct and an indirect effect on somatic symptoms, indicative of partial mediation. Preferred activities demonstrated only a significant indirect effect, suggesting full mediation. Thus, we supported Hypothesis 7 for preferred break activities only.

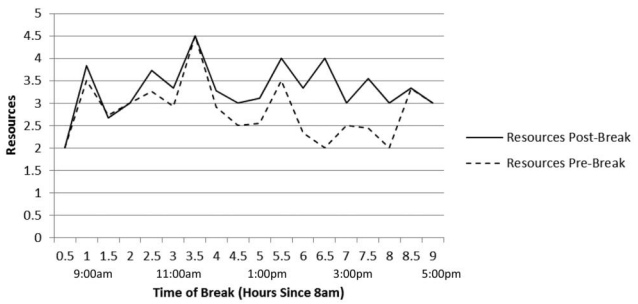


*Figure 1.* Variance in resource levels across the workday.

For outcomes at the person level predicted by Hypothesis 8, we found that resources postbreak aggregated to the person level were negatively associated with emotional exhaustion ($\beta = -.25$, $p < .05$) and positively associated with job satisfaction ($\beta = .31$, $p < .01$) and OCB ($\beta = .25$, $p < .05$; see Figure 2). Thus, Hypothesis 8 was supported.

## Post Hoc Analyses

To further probe the nonsignificant break activity predictors, we explored post hoc interactions among these predictors. None of these interactions was significant. However, based on a suggestion by an anonymous reviewer, we also explored the interaction between break length and number of breaks taken in a day. We modeled this interaction as a three-level multilevel SEM model in Mplus to add the day level, and we used as our criterion the postbreak resources after the last break of the day. Break length was analyzed at the event level (within), number of breaks per day and resources after the last break of the day were analyzed at the day level (between 2), and break length was allowed to also vary at the person level (between 3). The three-level model fit well, $\chi^2(3, N = 958) = 0.15$, *ns*; CFI = 1.00, TLI = 1.00, RMSEA = .00, SRMR for within = .02, SRMR for between 2 = .07, SRMR for between 3 = .01. The results in Table 3 demonstrate a significant interaction effect ($b = -1.71$, $p < .05$). We graph the interaction (Aiken & West, 1991) in Figure 3, which shows how the relationship between break length and resources is stronger for fewer breaks per day (although simple slopes were nonsignificant for both lines). However, for shorter average break length, more resources are associated with frequent short breaks per day than infrequent short breaks.

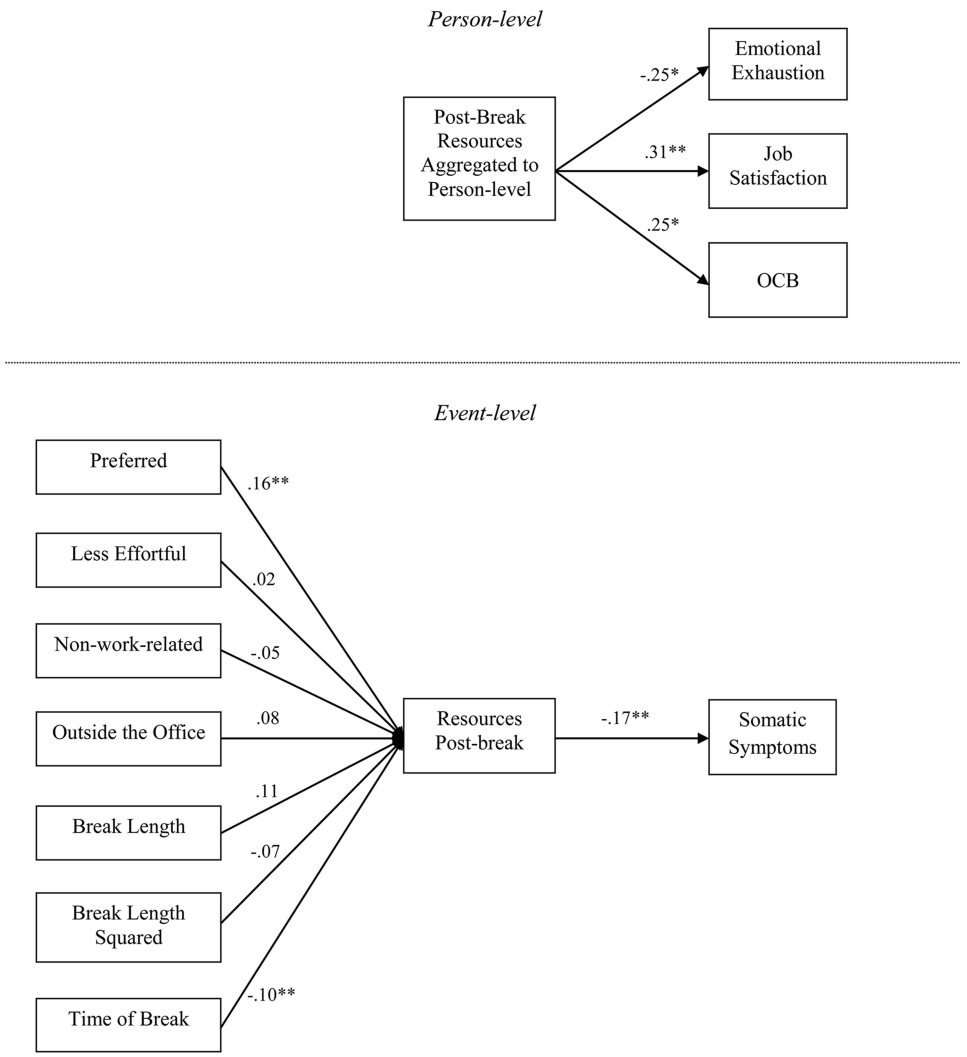


*Figure 2.* Multilevel SEM results for full mediation model. *Note.* Standardized coefficients presented. * $p < .05$. ** $p < .01$. OCB = organizational citizenship behavior; SEM = structural equation modeling.

## Discussion

Surprisingly little research investigates workday breaks, and even less research attends to the outcomes of specific break characteristics. Our overall goal was to provide greater understanding and prescriptive suggestions for workday breaks by determining when, where, and how break activities are most beneficial. In support of the effort–recovery model (Meijman & Mulder, 1998), we demonstrated that resources are often replenished by temporarily removing work demands during workday breaks (see Figure 1). Extending from this model, we also identified two key break characteristics that help recovery: activities that were preferred and breaks taken earlier in the work shift. Recovery of resources, in turn, led workers to experience less somatic symptoms (e.g., headache, eyestrain, lower back pain) after the break, as well as increased job satisfaction and OCB and decreased emotional exhaustion at the person level. Thus, we provide evidence that resource recovery over workday breaks can have a critical impact on employee health and work outcomes.

### Theoretical Implications

The effort–recovery model is a clear fit to depict the process behind workday break resource recovery, yet this is one of the first studies to empirically test this model with workday breaks. We demonstrate that the principles applied in previous research on resource recovery over longer respites such as weekday evenings, weekends, and vacations (e.g., Fritz & Sonnentag, 2006; Fritz, Sonnentag, Spector, & McInroe, 2010; Westman & Eden, 1997) are also applicable to breaks during the workday. Our research adds insight to what was known about lunch breaks (Trougakos et al., 2014) and institutionalized workday breaks (Trougakos et al., 2008).

To better assess resource recovery, we explicitly measured resources rather than using fatigue as a proxy for resources or focusing only on threats to or outcomes of resources (Rook & Zijlstra, 2006; Trougakos et al., 2014). In line with earlier research, activities that are more preferred better help resource recovery because they engage automatic cognitive processing that requires

Table 2
*Event-Level Mediation Results for Resources Postbreak Using Somatic Symptoms as Outcome*

| Independent variable | Indirect effect | Direct effect | Total effect |
|---|---|---|---|
| Controls | | | |
| Morning sleep | .00 [−.006, .006] | .01 [−.020, .033] | .01 [−.020, .034] |
| Morning fatigue | .01[a] [.000, .024] | .09[a] [.046, .143] | .11[a] [.057, .156] |
| Prebreak resources | −.03[a] [−.045, −.013] | −.07[a] [−.100, −.031] | −.10[a] [−.127, −.062] |
| Preferred | −.01[a] [−.015, −.004] | −.02 [−.050, .003] | −.03[a] [−.059, −.007] |
| Less effortful | −.00 [−.004, .002] | −.02 [−.036, .005] | −.02 [−.038, .004] |
| Non-work-related | .00 [−.001, .004] | −.01 [−.023, .009] | −.01 [−.021, .010] |
| Outside the office | −.01 [−.019, .002] | .04 [−.029, .100] | .03 [−.038, .092] |
| Break length | −.01 [−.025, .005] | −.08 [−.181, .025] | −.09 [−.192, .016] |
| Break length squared | .00 [−.003, .010] | .02 [−.026, .065] | .02 [−.023, .068] |
| Time of break | .00[a] [.001, .004] | .01[a] [.003, .020] | .01[a] [.005, .022] |

*Note*. Unstandardized coefficients presented. Ninety-five percent confidence intervals (CIs) reported. Estimates for direct and total effects were tested for significance with 95% CIs based on normal approximation. Estimates for indirect effects were tested for significance with Monte Carlo 95% CIs.
[a] Ninety-five percent CI does not include zero.



less resources than preference-inconsistent activities (Dhar & Gorlin, 2013). Our finding that breaks taken earlier in the shift are related to more resource recovery also supports the homeostatic view that sustained attention and concentration tend to decrease with time elapsed since awakening (Smith, 1992; Valdez et al., 2005).

Although the effort–recovery model was generally supported through adequate model fit, workday breaks also seem unique in several ways. First, effortful break activities were not significantly related to resource recovery. Previous research, however, also reported inconsistent findings. For example, one diary study found that effort expenditure at work was unrelated to either fatigue or vigor in the early evening (van Hooff, Guerts, Beckers, & Kompier, 2011). In another study, however, leisure-time physical and social activities were found to be negatively related to the need for recovery (Sonnentag & Zijlstra, 2006). These findings have led to the assertion that "it is better to be actively engaged in activities (social activities, physical activities) because this may help to switch off from work" (Sonnentag & Zijlstra, 2006, p. 346). Future research should further refine measures of effortful activities to identify their potential to facilitate psychological detachment from work.

Second, our nonsignificant findings regarding non-work-related break activities may be related to longer measurement intervals. Zacher, Brailsford, and Parker (2014) tested the effects of microbreaks (non-work-related break activities, such as going outside for fresh air, daydreaming) versus work-related strategies (e.g., making a to-do list, seeking feedback) by surveying participants every hour during the workday. They found that only microbreaks helped reduce fatigue and increase vitality. At the between-person level, however, consistent with Fritz (2012), only work-related strategies positively contributed to vitality. Zacher and colleagues (2014) thus contended that "micro-breaks have beneficial effects in the short term (i.e., on an hourly basis), whereas work-related strategies are beneficial in the long term (i.e., across days and weeks)" (p. 294). Given differential effects due to time spans between measurements, we encourage future research to further compare different measurement intervals and effects at multiple hierarchical levels.

Third, although we found that neither length of break nor the square term of break length was significantly related to resource recovery, post hoc analyses revealed that when employees take less frequent breaks, the positive relationship between break length and resource recovery becomes stronger. In contrast, when employees take more frequent breaks, this positive relationship is not as pronounced. Therefore, perhaps it is not the break length or break length squared per se that are of concern, but the relationship between break length and resource recovery should be considered in light of frequency of breaks per day. We encourage future research to further explore the interactions between break frequency, break length, and break activities.

Table 3
*Post Hoc Moderation Results at Day Level*

| Variable | Postbreak resources after last break of day |
|---|---|
| Intercept | 4.05** |
| Average break length | 13.25 |
| Number of breaks per day | .85 |
| Average break length × Number of breaks per day | −1.71* |

*Note*. Unstandardized coefficients presented.
* $p < .05$. ** $p < .01$.

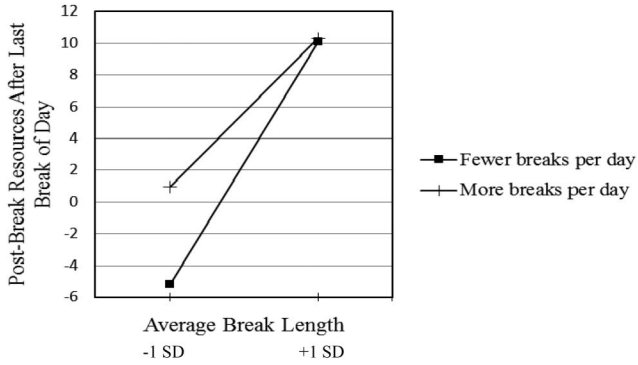


*Figure 3.* Number of breaks moderating average break length on resources at day level.

## Practical Implications

Our results suggest that computer workers can reap the most benefits from their workday breaks if they engage in break activities that they prefer and if they pay attention to the timing of their breaks. We found that when more hours had elapsed since the beginning of the work shift, fewer resources and more symptoms of poor health were reported after a break. Therefore, breaks later in the day seem to be less effective, so it is perhaps even more important for employees to make the most of their afternoon breaks via preferred activities.

We also found preliminary evidence that break length and number of breaks per day together are important for recovering resources. Although this test was post hoc, consistent with ergonomics research (Galinsky, Swanson, Sauter, Hurrell, & Schleifer, 2000), we found that more short breaks were associated with higher resources than few short breaks. This suggests that employees should be encouraged to take more frequent short breaks to facilitate recovery.

## Future Research and Study Limitations

In addition to the aforementioned future research suggestions, the inconsistent research findings from this study, as well as previous research (e.g., Rook & Zijlstra, 2006; Sonnentag, 2001; Tucker et al., 2008; van Hooff et al., 2011) on less effortful, non-work-related, and longer breaks being unrelated to recovery, may suggest the existence of moderators. We encourage future research to extend the effort–recovery model by exploring moderators such as intrinsic motivation in the effort–recovery relationship to identify under what circumstances these relationships may render significance. Furthermore, the unsupported hypothesized relationship between being outside of the office and improved resource recovery may suggest that although "being away" is one of the primary conditions for a restorative context (Kaplan, 1995), it is not sufficient enough for resource replenishment to be noticeably significant. We encourage future research on workday breaks to further examine other conditions proposed by Kaplan (1995) such as the compatibility between being away and one's natural inclination.

Among our limitations, all of our measures were self-reported. We aimed to reduce common method variance by controlling for individual dispositional influences through simultaneously estimating all variables at the person level in our multilevel analyses. Additionally, we measured one break activity characteristic using third-party coders.

We were also constrained to make causal inferences given that our break characteristics and outcome measures were collected at the same point in time. For instance, employees may choose break activities based on their prebreak resource levels, such as forgoing physical exercise on a lunch break if their resources are low. Furthermore, our prebreak resource measure was retrospectively assessed after the break occurred, and activities or perceptions on the break may have influenced this measure in addition to retrospective bias. However, there is some evidence that ESM measures assessed a brief time after an event are somewhat robust to retrospective bias (Schimmack, 2003).

Another limitation is that our sample consists of computer workers from a single organization, and we encourage future researchers to test these hypotheses on manual labor jobs, which may involve the measurement of physical energy (e.g., glucose) in addition to the resources measured here. We also encourage other extensions of our model. For example, some evidence suggests that meditation or other relaxation techniques can be used effectively on workday breaks, but further research is needed (Kennedy & Ball, 2007).

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