Examining the inverted U-shaped relationship between workload and innovative work behavior: The role of work engagement and mindfulness

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Abstract

Is workload good or bad for employee innovation? Workload and innovative work behavior are widely studied research topics. However, the relationship between them is not well understood. As a result, there is a lack of evidence-based knowledge that could inform managers and organizations on how to boost workplace innovation in demanding work contexts. Building on the job demands–resources model, the present study posits that workload relates to innovative behavior through work engagement. Specifically, we argue that this indirect relationship exhibits an inverted U-shaped pattern in which workload is most likely to benefit innovative behavior when it is moderate. We further identify mindfulness as an important moderator that influences individuals' ability to manage stress. In support of these predictions, three studies –a two-wave time-lagged study of 160 employees from various Canadian firms, a three-wave time-lagged study of 153 employees from U.S. firms, and a two-wave panel study of 208 employees from U.S. firms – found work engagement mediated the inverted U-shaped relationship between workload and innovative behavior. Moreover, when mindfulness was high, intermediate levels of workload were associated with increased innovative behavior through enhanced work engagement (Studies 1 and 2). We discuss the implications of these findings for theory and practice.

Keywords: workload, innovative work behavior, work engagement, mindfulness, curvilinearity

To achieve and maintain a competitive advantage in today's uncertain and complex economic environment, organizations must create conditions that promote employee innovative behavior, i.e., the generation, promotion and realization of novel and useful ideas (Chen et al., 2015; Janssen, 2000). However, this task is challenging because the increased competition within business environments results in employees being exposed to more frequent job stressors (Bakker et al., 2004; Khedhaouria et al., 2017). Given the tension between the need for innovation and the prevalence of stressors in modern-day organizations, an important question is how employees can innovate in the context of stressful work conditions.

The present study contributes to this discussion by delving more deeply into the relationship between workload and innovative work behavior. Workload is defined as the feeling of having excessive role demands given the time and resources available to address them (Byrne, 1994). Meta-analytic research has reported non-significant relationships between workload and performance criteria (Bowling et al., 2015; Gilboa et al., 2008). However, researchers have argued that workload has both hindering (i.e., demands that threaten coping resources) and challenging (i.e., demands that promote personal growth) aspects that have opposite effects on performance (e.g., Eatough et al., 2011; LePine et al., 2005). These opposite influences may cancel each other out and explain the non-significant correlation reported between workload and performance (Gilboa et al., 2008). Thus, more work is needed to understand how workload relates to performance outcomes. Moreover, the present research considers a specific form of performance, i.e., innovative behavior, which has received little attention in its relation to workload. Innovative work behavior, which involves a high level of cognitive and emotional resources, may be sensitive to workload. Finally, from a practical perspective, scholars have noted a lack of effective management practices to cope with workload, one of the most frequent

work stressors (Bowling et al., 2015), which may detract from organizations' ability to boost employee innovativeness.

Using job demands–resources (JD-R) theory as an overarching framework, we draw insights from activation theory (Gardner and Cummings, 1988) to examine a complex moderated mediation model of the curvilinear effects of workload to explain both *how* and *when* workload is likely to be beneficial vs. harmful to innovative behavior. First, we contend that work engagement is a key mediator between moderate levels of workload and innovative behavior. Work engagement captures the reservoir of resources that employees need to perform their work (Schaufeli and Salanova, 2002). We argue that a moderate amount of workload exerts the optimal level of stimulation that, by enabling individuals to benefit from resource gains, enhances work engagement and, ultimately, innovative behavior (Gardner, 1986).

Second, we propose that mindfulness, which helps people be aware of the experiences that occur in the present moment (Brown and Ryan, 2003), moderates the links between workload and work engagement, and ultimately innovative behavior. Research suggests that mindfulness helps employees positively appraise and effectively cope with stressful situations by allowing them to decenter from the automatic thoughts and feelings associated with demanding work conditions and by promoting actions that are consistent with their values and needs. Hence, a high level of mindfulness may protect overloaded employees from a loss of resources and help them maintain work engagement and innovativeness. As such, mindfulness is identified as an important personal resource that is likely to preserve the motivational impact of a moderate workload on employee innovative functioning while reducing its health-impairing consequences.

The present paper contributes to the stress and innovation literatures in several ways. First, we answer recent calls for examining the non-linear effects of workload (e.g., Bowling et

al., 2015). The idea that workload contains both challenging and hindering aspects (e.g., LePine et al., 2005) may suggest a non-linear relationship between workload and employee attitudes and behavior, with positive effects (i.e., reflecting challenge stress) observed only when workload reaches moderate levels. We illustrate this phenomenon using work engagement as a resource-based mediator and innovative behavior as a resource-intensive outcome. This research is timely because it explores the mediating processes associated with workload (Gilboa et al., 2008) from an inverted U-shaped perspective. Second, thus far, previous research has mostly focused on the mediating role of work engagement in the relationship between favorable work conditions and work outcomes (e.g., Bakker and Bal, 2010). Our research extends this work by looking at how stressful situations (i.e., workload) can stimulate work engagement and, ultimately, innovative behavior. Third, by examining the moderating role of mindfulness, we address recent calls to clarify its influence as a protective factor against demanding work conditions (Glomb et al., 2011; Good et al., 2016). Our study expands the mindfulness literature by disclosing its key role in fostering the motivational potential of the moderate amount of workload that is necessary for maintaining work engagement and innovativeness.

Literature review and hypothesis development

Workload and innovative work behavior

Innovation research has used the challenge-hindrance framework (Cavanaugh et al., 2000; LePine et al., 2005) to conceptualize the relationship between workplace stressors and innovative behavior. That model categorizes workplace demands as (a) challenge stressors, i.e., job demands that promote mastery and personal growth and generate motivation and performance, and (b) hindrance stressors, i.e., job demands that detract from one’s personal development and reduce work performance. Innovation scholars have generally considered workload to be a

challenge stressor and studied its effects on innovative behavior in conjunction with, rather than separately from, other challenge stressors. Empirical studies suggest that challenge stressors foster innovativeness under specific conditions (e.g., Janssen, 2000).

We argue that considering workload exclusively as a challenge stressor may be misleading. Indeed, scholars have recently claimed that workload is a job demand that encompasses both challenging and hindering aspects (e.g., Eatough et al., 2011; Gilboa et al., 2008). As a challenge stressor, workload is related to increased responsibilities and more work challenges, thereby providing the motivational potential to mobilize effective performance (LePine et al., 2005). As a hindrance stressor, however, workload may detract from employee performance when it poses demands that individuals lack available resources to address (Crawford et al., 2010; Eatough et al., 2011). Meta-analytic reviews report non-significant relationships between workload and both in-role (Bowling et al., 2015; Gilboa et al., 2008) and extra-role (Eatough et al., 2011) performance. Thus, the existing findings are unclear regarding how workload may contribute to innovative behavior.

It is also worth noting that generating, promoting and realizing new ideas is thought to help employees cope with a heavy workload (Bunce and West, 1994), yet these are cognitively and emotionally demanding activities (Janssen, 2004). Indeed, unlike ordinary task performance, innovative behavior represents a resource-demanding endeavor that requires employees to invest significant resources in each phase of the innovation process. For example, the creative work associated with idea generation implies getting involved in a range of activities (e.g., problem definition, information gathering, and idea evaluation and refinement) that require sustained effort for prolonged periods of time (Mumford et al., 2002). Moreover, once creative ideas have been developed, further emotional efforts are required in the idea promotion phase to overcome

organizational members' potential resistance to new ideas as well as to obtain support from key decision-makers (Janssen, 2004). Finally, because unforeseen obstacles may occur while implementing innovations, people need to devote additional cognitive energy to problem-solving tasks in order to face unexpected barriers (Bledow et al., 2009). Thus, maintaining high levels of resources is essential to producing innovative efforts in response to an increased workload (Agarwal et al., 2012).

Importantly, the availability of resources has been shown to be altered by an individual's exposure to stressful work contexts (Hobfoll et al., 2018). Considering the importance of innovative behavior for organizational success, particularly in times of economic uncertainty (Shin et al., 2017), organizations improve their effectiveness by determining how they can facilitate the acquisition of resources and, thereby, the innovativeness of workers who face an increased workload. Relying on the JD-R model as a framework and drawing upon activation theory, we propose hypotheses related to the mediating role of work engagement and the moderating role of mindfulness in the relationship between workload and innovative behavior. These hypotheses relate to why and when workload enables the process of resource acquisition that is necessary to energize innovative actions and ultimately contribute to organizational performance.

A JD-R perspective on workload and innovative work behavior

The JD-R model suggests that exposure to job demands (i.e., the physical, social, or organizational aspects of the job requiring sustained effort; e.g., workload) leads to a health-impairment process that ultimately hinders work performance. However, recent evolutions of the JD-R model have adopted the challenge-hindrance framework to propose that job demands appraised as challenging might energize effective behaviors. Nonetheless, because workload

encompasses both challenge and hindrance components, its motivational benefits might be cancelled out by the lack of resources necessary to effectively cope with it. A workload increase might not necessarily be accompanied by a corresponding increase in innovative behavior if the motivational benefits of its challenge component are attenuated and the health-impairing effect of its hindrance component is maintained. Recognizing that job demands can act as both challenge and hindrance demands, JD-R scholars have recently emphasized the need to identify (a) the psychological processes (mediators) that transfer both the motivation and health-related consequences of such demands and (b) the boundary conditions (moderators) that might boost the motivational effects of job demands (Bakker and Demerouti, 2017). The revised version of the JD-R model (Schaufeli and Bakker, 2004) proposes that work engagement is a mediator in the relationship between job demands and work outcomes and suggests that personal resources play a key role in both buffering the health-impairing impact of job demands and boosting their motivational effect.

In line with the core assumptions of the JD-R model, we thus consider workload as a specific challenge-hindrance job demand whose effects are transferred to innovative work behavior through the mediating role of work engagement. Moreover, we identify mindfulness as a personal resource that may moderate the indirect effects of workload on innovative work behavior via work engagement. In this respect, the JD-R model assumes that high levels of job demands can have a positive, motivational effect on work outcomes when (personal) resources are high. However, in light of the dual nature of workload, we complement the assumptions of JD-R theory with the specific insights of activation theory to suggest that moderate, rather than high, levels of job demands may be most conducive to increased work engagement and innovative behavior, particularly in the presence of high levels of mindfulness. In the next two

sections, we provide a detailed rationale that describes the mediating role of work engagement in linking moderate amounts of workload to innovative behavior, and the moderating role of mindfulness in boosting the beneficial effects of workload.

The mediating role of work engagement

Work engagement is a work-related affective-motivational state characterized by vigor (i.e., high levels of energy and mental resilience at work), dedication (i.e., strong involvement in one's work and feelings of enthusiasm, pride and significance), and absorption (i.e., being fully focused and happily engrossed in one's work) (Schaufeli and Salanova, 2002). Unlike other positive psychological states that represent purely health-related outcomes (e.g., affective well-being, flourishing, stress symptoms) or motivation-related outcomes (e.g., intrinsic motivation, goal commitment, psychological empowerment), work engagement reflects a combination of both outcomes. Indeed, on the one hand, because work engagement involves an active allocation of personal resources toward the tasks associated with a work role (Rich et al., 2010), fundamentally it represents a motivational variable (Christian et al., 2011). Yet, on the other hand, engaged employees have a sense of affective connection to their work activities, which they experience as enjoyable rather than stressful (Vecina et al., 2011). As such, work engagement also indicates healthy functioning. Thus, work engagement captures the whole spectrum of consequences (i.e., challenge and hindrance) that stem from workload and, therefore, may explain the effects of workload on employee innovativeness.

To understand how workload relates to work engagement and, ultimately, innovative work behavior, the JD-R theory principles must be supplemented by the tenets of activation theory (Gardner and Cummings, 1988). Activation theory states that human beings possess an optimal level of activation reflecting "the degree of neural activity in the reticular activation

system, a major part of the central nervous system" (Gardner, 1986: 411). This level of activation allows the central nervous system to operate most efficiently, thereby enhancing positive affective states and behavioral performance. When the level of activation exceeds or falls below the optimal level, the efficiency of the central nervous system is weakened, decreasing both positive affective states and performance (Gardner, 1986; Gardner and Cummings, 1988). Following this framework, job demands "differ in terms of the resulting experienced level of activation of the job performer" (Gardner and Cummings, 1988: 87). When the activation resulting from job demands is moderate, people experience increased alertness and positive emotions. In contrast, when the activation is lower or higher, people experience boredom and mental overload, respectively, which both result in decreased performance (Gardner, 1986). Thus, activation theory points to an inverted U-shaped perspective on stressors.

Similarly, we argue that work engagement is sensitive to the level of activation prompted by workload. Low activation levels may cause boredom, draw one's attention away from the task, impinge on the level of concentration, and reduce interest in task activity (Fisherl, 1993), which results in the loss of emotional resources and lower work engagement (Gorgievski and Hobfoll, 2008). Likewise, high activation levels may lead to high arousal and associated strain (Carver, 1996), thereby leading to resource loss and, in turn, reduced engagement. In contrast, moderate activation levels provide employees with optimal resources and prevent them from feeling tired as they attempt to cope with their workload, thus enabling them to stay vigorous in the face of job demands. Moreover, when the activation level provided by the workload is optimal (i.e., moderate), employees feel more confident in their ability to cope with the stressful condition and, thereby, perceive a greater likelihood of achieving personally valued work-related outcomes as a result of their coping efforts (Webster et al., 2010). Consequently, such employees

are more likely to experience meaningfulness in relation to their job (Bunderson and Thompson 2009), which is reflected in a heightened sense of dedication. Finally, a moderate, rather than low or high, amount of workload enhances the individual's information-processing capacity (Gardner and Cummings, 1988), which allows them to become absorbed in their ongoing activities (Bledow et al., 2011). As such, a moderate workload is an optimal condition that triggers resource gains and fosters work engagement. Research has reported evidence that job stressors may exert curvilinear effects on work engagement. For instance, Schmitt et al. (2015) found a curvilinear relationship between time pressure and work engagement.

Given the optimal activation associated with a moderate workload, work engagement is in turn expected to provide the energy needed to stimulate innovative behavior. Indeed, the JD-R model (Bakker and Demerouti, 2017) has been adopted to propose that work-related positive psychological functioning (i.e., high work engagement) enhances employee innovation (e.g., Huhtala and Parzefall, 2007). First, the positive affective states associated with dedication induce flexible thinking, which helps produce creative solutions (Madrid et al., 2014). Likewise, the positive affective experiences associated with dedication promote positive expectations about the outcomes of one's actions (Wegener and Petty, 1997). These favorable expectations enhance the personal initiative necessary to self-start the promotion and implementation of creative ideas (Bledow et al., 2009). Furthermore, the sense of significance that dedicated employees experience in relation to their job motivates them to expend extra efforts in seeking to understand a problem from various perspectives and to connect diverse sources of information. Such endeavors have been found to facilitate creativity and innovation at work (Gilson and Shalley, 2004).

Second, absorbed employees, because they are fully immersed in their work, should be able to concentrate on their work-related tasks and efficiently use their attentional resources (Chang et al., 2013). As such, work engagement, through absorption, helps employees use their cognitive resources to seek out new perspectives, information, and knowledge, and to combine them into new, creative conceptions (Zhang and Bartol, 2010). In addition, absorption enables people to remain concentrated on their work activity as long as necessary to achieve the goals set (Lewis, 1996). As a result, people feel motivated to persevere in achieving their work goals in spite of potential obstacles and difficulties (Aubé et al., 2014). Such persistent effort is a key condition to enhance the odds of converting creative ideas into effective, implementable innovations (Bledow et al., 2009). Third, when people are vigorous, their ability to attend to and consider different arrays of choices and actions is enhanced (Barsade, 2002). This augmented cognitive flexibility is an important precursor of creativity and innovation because it allows people to build new associations of ideas (De Dreu et al., 2008) as well as to consider and use multiple plans and pathways to translate new conceptions into usable innovations (Hunter et al., 2012). Supporting these arguments, research has provided evidence for a positive association between work engagement and innovative work behavior (Agarwal et al., 2012).

In line with the above discussion, we propose an inverted U-shaped relationship between workload and work engagement. We further suggest that the pattern of this relationship will extend to the indirect relationship between workload and innovative behavior through work engagement. We therefore hypothesize the following:

> *Hypothesis 1*: Workload has an inverted U-shaped relationship with work engagement such that work engagement is highest when workload is moderate and lower when workload is either low or high.

Hypothesis 2: Workload has an indirect, inverted U-shaped relationship with innovative work behavior through work engagement such that this relationship is strongest when workload is moderate and weaker when workload is either low or high.

The moderating role of mindfulness

Following the JD-R model, personal resources that help people deal effectively with demanding conditions may prevent the impairing effect of hindrance stressors and boost the motivational effect of challenge stressors (Bakker and Demerouti, 2017; Xanthopoulou et al., 2007). Supporting these assumptions, research has suggested that the ability to cope with stress is influenced by individual difference variables (LePine et al., 2005).

Drawing from the JD-R model, we argue that, because workload comprises both hindrance and challenge components, this demanding condition, even when occurring at moderate levels, might not benefit work engagement and innovative work behavior unless people possess adequate personal resources to successfully cope with it. Scholars have identified mindfulness as an important individual characteristic that enables people to use adaptive coping responses to deal with workload (Brown and Ryan, 2003). Mindfulness refers to nonjudgmental attention and awareness of the experiences that occur in the present moment (Brown and Ryan, 2003). The literature has investigated mindfulness either as a stable, dispositional trait that varies across individuals, or as a state that is subject to intra-individual fluctuations (Brown and Ryan, 2003). In the present study, we operationalize mindfulness as a dispositional tendency, and, in line with a JD-R perspective, consider it as a personal resource that, at high levels, enhances the beneficial effects of a moderate workload on work engagement and innovative work behavior.

Two mechanisms may explain why mindfulness can exert such a moderating function: decentering (i.e., a primary mechanism) and reappraisal and value clarification (i.e., secondary mechanisms) (Baer, 2003; Garland et al., 2015; Good et al., 2016; Shapiro et al., 2006). Decentering is the process by which mindful individuals are able to observe rather than identify with the content of consciousness (i.e., thoughts and feelings) and external events (i.e., stressful situations). Research suggests that through decentering, mindfulness disrupts automatic conditioned reactions and enables a conscious reflection of the appraised stressor (Garland et al., 2015). As such, mindfulness clears working memory and provides opportunities for perspective taking and cognitive flexibility, thereby laying the foundation for reappraisal as an important secondary mechanism (Garland et al., 2015).

Through reappraisal, the scope of attention is broadened, and the attentional system is shifted toward the positively valenced aspects of the stressful event, which is then reframed as meaningful and growth-promoting (Garland et al., 2015). Accordingly, when mindful employees are exposed to a moderate workload, they are able to decenter from negative judgments that would lead to appraising the stressor as threatening (Kiken and Shook, 2011). In doing so, these employees broaden their attention in ways that allow them to attend to previously unnoticed information, which they use to reappraise their workload as beneficial to the attainment of valued outcomes. By promoting such a positive reappraisal, mindfulness generates increased resilience, hope, and optimism (Garland et al., 2015), which are key resources for coping with workload (Xanthopoulou et al., 2007).

The decentering effects of mindfulness lead to the activation of another secondary mechanism, i.e., value clarification, which likely affects the coping process in response to workload. Decentering allows people to adopt the values that are most meaningful in their own

life (Shapiro et al., 2006). This way, mindfulness improves self-regulation by promoting actions that are authentic and concordant with one's values (Brown and Ryan, 2003; Shapiro et al., 2006). As a result, individuals will likely use available opportunities to cope with an increased workload (Parker et al., 2010). Following a JD-R theory interpretation, mindfulness prevents employees from experiencing the impairing consequences of a moderate workload and, correspondingly, allows them to derive motivational benefits to stay engaged and innovative.

Conversely, these positive reactions are less likely to occur when mindfulness is low because the mechanisms sustaining coping resources are undermined. In this case, employees may be less able to step back from their automatic response patterns and, consequently, to distance themselves from appraising workload as threatening. The scope of attention is narrower, thereby preventing individuals from accessing information that would positively alter the meaning of the stressor. Consequently, individuals with low mindfulness may develop negative expectations about their ability to cope with workload. Moreover, by weakening decentering activities, low mindfulness makes it difficult for individuals to act in accordance with the values that are meaningful in their lives. This difficulty would lead to increased sensitivity to external contingencies and less perceived control over one's workload. Therefore, individuals low in mindfulness may be less resilient to workload, hence less able to achieve work engagement and innovativeness. Empirical research has shown that mindfulness can buffer the hindering effects of stressors (Kirk et al., 2011). In line with the above discussion, we hypothesize the following.

> *Hypothesis 3*: Mindfulness moderates the inverted U-shaped relationship between workload and work engagement such that the relationship between moderate levels of workload and work engagement will be weaker (vs. stronger) when mindfulness is low (vs. high).

Hypothesis 4: Mindfulness moderates the indirect, inverted U-shaped relationship between workload and innovative work behavior through work engagement such that the indirect relationship between moderate levels of workload and innovative work behavior will be weaker (vs. stronger) when mindfulness is low (vs. high).

Overview of the Studies

We conducted three studies to test our hypotheses, namely two time-lagged studies (Study 1 and Study 2) and a panel study (Study 3). To reduce common method bias (Podsakoff et al., 2012), we used a 3-month time lag between measurements in Studies 1 and 2, and a 2-month interval in Study 3. Empirically, a one-month time lag has been shown to be long enough for average correlations to be lower than in concurrent conditions (Podsakoff et al., 2012). Yet, because innovative behaviors are highly dependent on promotion and implementation-related activities (e.g., coordination, planning, or implementation meetings), which likely require several weeks to be executed (Madrid et al., 2014), a time lag between two and three months was adopted. Study 1 tested Hypotheses 1-4 using a 2-wave design with workload and mindfulness measured at Time 1 and the mediator (i.e., work engagement) and the dependent variable (i.e., innovative work behavior) assessed at Time 2. Since the inclusion of work engagement and innovative behavior at the same time might increase the likelihood of method bias, Study 2 aimed to replicate the findings from Study 1 by using a 3-wave design in which work engagement and innovative behavior were measured at Time 2 and Time 3, respectively.

Moreover, because the non-longitudinal nature of the research design used in Studies 1 and 2 did not afford causality inferences, Study 3 attempted to replicate the results pertaining to the curvilinear effect of workload on work engagement (Hypothesis 1) and the sequential relationships from workload to innovative behavior through work engagement (Hypothesis 2)

using a 2-wave panel design where all variables were measured at both Time 1 and Time 2. This research design allowed a more rigorous exploration of the causal ordering of workload, work engagement, and innovative behavior, and the examination of potential reverse causation effects. Overall, the replication logic followed across the studies is consistent with recent recommendations from method experts to test theoretical models, or a portion of them, via improved, or at least different, independent empirical attempts (Cortina et al., 2017).

Study 1

Method

Sample and procedure. Data were collected from employees affiliated with French-Canadian firms from a variety of industries (i.e., architecture and design, communication and marketing, leisure, technology). Upon agreeing to participate in the study, the firms' senior executives sent an email to their employees on behalf of the research team that asked them to complete an online survey of job attitudes and behavior at two separate times. The introductory message described the study goals, asserted that responses would be confidential, and provided a hyperlink that directed participants to the first survey. Responses to the questionnaires were matched across time using an anonymous code generated by the respondents at Time 1. Completed questionnaires were stored in a common online database to prevent individual responses from being matched to participants' names. At Time 1, 480 employees were contacted, and 397 completed the online survey (response rate = 82.71%). Of these, 184 did not enter the requested anonymous code, which yielded a sample of 213 individuals who were contacted for the Time 2 survey. Among them, 53 did not respond or provided incomplete responses, resulting in a final sample of 160 employees with matched data across time (i.e., response rate = 33.33%). In this

sample, 52% of the participants were male, average age was 33.44 years (*SD* = 8.15), average organizational tenure was 4.15 years (*SD* = 3.95), and 60% held at least an undergraduate degree.

To examine whether respondent attrition across time led to non-random sampling, we used multiple logistic regression to test whether Time 1 variables significantly predicted the probability of remaining in the sample at Time 2. The dependent variable was a binary outcome classifying participants as those who remained in the final sample (*N* = 160) (coded 0) vs. those who responded only at Time 1 (*N* = 397) (coded 1). The predictors were workload, mindfulness and demographics. The logistic regression model was non-significant (χ^2 [6] = 31.21, *ns*), and none of the predictors was significant. Thus, attrition across time was randomly distributed.

Measures

Workload. Workload was measured using the 6-item scale from the Job Content Questionnaire (Karasek et al., 1998). Sample items are "I am asked to do an excessive amount of work" and "My job involves extremely hard work." In the present study, the reliability of this scale was .70.

Mindfulness. We used Brown and Ryan's (2003) Mindful Attention and Awareness Scale (MAAS) to measure mindfulness. The MAAS assesses dispositional mindfulness across a wide range of domains, including the work context (Dane and Brummel, 2014). Participants were asked to indicate the extent to which each of the 15 statements reflected their own experience on a scale ranging from 1 (*almost always*) to 5 (*almost never*). Sample items include "I could be experiencing some emotion and not be conscious of it until some time later" and "I rush through activities without being really attentive to them." The reliability of this scale was .77.

Work engagement. Work engagement was measured using the short version of the Utrecht Work Engagement Scale (UWES) (Schaufeli et al., 2006). This scale comprises 9 of the 17 original items of the UWES, with three items per dimension, namely, vigor (e.g., "At my work, I feel

bursting with energy"), dedication (e.g., "I am proud of the work that I do"), and absorption (e.g., "I am immersed in my work"). The items were measured on a 5-point Likert scale ranging from 1 (*never*) to 5 (*always*). The reliability of this scale was .88.

Innovative work behavior. We assessed innovative work behavior using Janssen's (2000) 9-item scale, which measures the frequency with which employees report being involved in the generation (e.g., "Generating original solutions for problems"), promotion (e.g., "Mobilizing support for innovative ideas") and realization (e.g., "Transforming innovative ideas into useful applications") of new ideas ($\alpha = .93$). Responses were assessed on a 5-point scale ranging from 1 (*never*) to 5 (*always*). The unidimensionality of this scale has been empirically demonstrated in a number of studies (e.g., Leung et al., 2011).

Control variables. We controlled for age, gender, education and organizational tenure, since they have been found to be related to work engagement (Schaufeli et al., 2006) and innovative behavior (Hammond et al., 2011).

Results

Confirmatory factor analysis

We used confirmatory factor analysis (CFA) with the maximum likelihood method in Mplus (Version 7.4; Muthén and Muthén, 1998-2015) to examine the dimensionality of our variables. The parceling method was used to maintain a favorable indicator-to-sample-size ratio (Little et al., 2002). We followed the high-to-low loadings procedure outlined by Little et al. (2002) to assign items to parcels. As shown in Table 1, the four-factor model yielded a good fit to the data (χ^2 [48] = 47.72, CFI = 1.00, RMSEA = .00, SRMR = .05) and outperformed any alternative, more parsimonious model ($p < .01$). This suggests our variables measured distinct constructs.

INSERT TABLE 1 ABOUT HERE

Hypothesis testing

Descriptive statistics and correlations are reported in Table 2. Hypotheses were tested using polynomial regression analyses in SPSS Version 22. The results of analyses predicting work engagement are reported in Table 3. Predictors were mean-centered prior to calculating the linear and quadratic interactions between workload and mindfulness and workload squared (Cohen et al., 2003). Consistent with common practice in examining moderating effects in the context of curvilinear relationships (e.g., Sui et al., 2015), predictors were entered into the regression equation for work engagement in the following order: (a) control variables, (b) workload, (c) the quadratic term of workload squared, (d) mindfulness, (e) the linear interaction between workload and mindfulness, and (f) the interaction between workload squared and mindfulness.

INSERT TABLE 2 AND TABLE 3 ABOUT HERE

As shown in Table 3 (Model 2), the linear, main effect of workload on work engagement was non-significant (β = .02, *ns*). However, the quadratic term of workload squared added significant variance to work engagement, over and above workload (β = –.19, $p < .05$, $\Delta R^2 = .03$; Table 3, Model 3). Given the negative sign of the coefficient, the result is consistent with an inverted U-shaped relationship between workload and work engagement. We followed Aiken and West's (1991) procedure to graph and interpret the results. As shown in Figure 1, supporting Hypothesis 1, work engagement increased as workload increased up to an inflection point, after which work engagement diminished as workload further increased. Based on Weisberg (2005), we estimated the standardized inflection point of workload to be .29.

INSERT FIGURE 1 ABOUT HERE

Table 3 also shows the results of regression analysis for innovative work behavior. Using gender, age, educational level and organizational tenure as covariates and workload and its quadratic term as other predictors, we found that work engagement was positively related to innovative work behavior (β = .30, p < .01; Table 3, Model 7). As shown in Table 3 (Model 3), we already know that workload squared was significantly related to work engagement (β = –.19, p < .05). We followed Hayes and Preacher's (2010) guidelines and MEDCURVE macro to test the curvilinear indirect relationship between workload and innovative work behavior via work engagement. Based on 5,000 bootstrap samples, we calculated the instantaneous indirect effect of workload on innovative work behavior through engagement at different values of workload (i.e., −1*SD*, +1*SD*). The results indicated that this indirect effect was significantly positive for low (.14, 95% bias-corrected CI [.02, .33]) but not for high (−.07, 95% bias-corrected CI [−.23, .01]) levels of workload. This result suggests that at low levels of workload, any increase was associated with greater innovative work behavior via increased work engagement. In contrast, at high levels of workload, any increase had no further effect on innovative work behavior via work engagement. This pattern of findings supports Hypothesis 2.

Moreover, as shown in Table 3 (Model 5), the linear interaction between workload and mindfulness was unrelated to work engagement (β = .08, *ns*). However, the interaction between workload squared and mindfulness was significant (β = –.42, p < .05, ΔR^2 = .03; Model 6), over and above the linear interaction. As shown in Figure 2, when mindfulness was high, the relationship between workload and work engagement displayed an inverted U-shaped pattern. In contrast, when mindfulness was low, workload had a flat relationship with work engagement. To examine the moderating role of mindfulness more closely, we performed a simple curve test by examining this relationship at high (+1*SD*) vs. low (–1*SD*) levels of mindfulness (Dawson,

2014). The results indicated that when mindfulness was high (+1*SD*), the second step added significant variance ($\Delta R^2 = .06$, $p < .01$), and workload had a significant curvilinear relationship with work engagement ($\beta = –.47$, $p < .01$). Conversely, at low values of mindfulness (–1*SD*), the second step did not add variance ($\Delta R^2 = .00$, *ns*), and the curvilinear relationship between workload and work engagement was non-significant ($\beta = .02$, *ns*). These findings support Hypothesis 3.

INSERT FIGURE 2 ABOUT HERE

We then estimated the conditional indirect relationship between workload and innovative behavior via work engagement by calculating the product of the instantaneous relationship between workload and work engagement and the relationship between work engagement and innovative work behavior under different values of mindfulness, and obtained a 95% bias-corrected CI around the population values for the estimate. The results indicated that when mindfulness was high (+1SD), increasing workload was positively and indirectly related to innovative work behavior via work engagement for low (.29, 95% bias-corrected CI [.10, .59]) but not for high (–.17, 95% bias-corrected CI [–.47, .04]) levels of workload. When mindfulness was low (–1SD), the instantaneous indirect relationship was non-significant at low (.01, 95% bias-corrected CI [–.26, .26]) and high (.02, 95% bias-corrected CI [–.12, .21]) levels of workload. Therefore, Hypothesis 4 was supported.

Study 2

Method

Sample and procedure. Participants were recruited through Prolific Academic, an online crowdsourcing research platform allowing researchers to recruit subjects for applied and experimental research projects from a large and diverse workforce. Research has provided

evidence that the reliability and diversity of the data collected through such online platforms are at least comparable to those obtained through traditional methods (e.g., Cheung et al., 2017). Additionally, recent findings have reported a higher level of naivety (i.e., unfamiliarity with commonly used research materials) and a lower propensity to engage in dishonest behaviors among Prolific Academic users compared with the users of alternative, renowned online platforms such as Mechanical Turk and CrowdFlower (Peer et al., 2017). Respondents were paid $1.60 at each time point upon completion of the survey questionnaire.

Participants were employees affiliated with a large range of U.S. industries (e.g., education, finance, and manufacturing). As in Study 1, participants generated their own anonymous code so that responses could be matched across time. At Time 1, all employees who were contacted provided useful responses (N = 411). Among them, 309 returned the Time 2 questionnaire, but 22 did not enter the requested anonymous code. Thus, 287 participants were contacted to complete the Time 3 survey. Among them, 162 completed the Time 3 questionnaire, although 9 did not enter the anonymous code. This resulted in a sample of 153 employees (response rate = 37.22%) with matched data across time. In this sample, 64.70% were male, average age was 34.22 (SD = 10.61), average tenure was 5.08 years (SD = 4.57), and 47.70% had at least an undergraduate degree. We used logistic regression to examine whether sample attrition across time was randomly distributed. The models predicting the probability of remaining in the sample at Time 2 (χ^2 [6] = 4.57, *ns*) and Time 3 (χ^2 [6] = 7.20, *ns*) using Time 1 variables as predictors were non-significant, and none of the variables was significant. Thus, there was no attrition bias.

Measures

We used the same scales as in Study 1 to measure *workload* (6 items; α = .75), *mindfulness* (15 items; α = .92), *work engagement* (9 items; α = .91) and *innovative work behavior* (9 items; α = .93). As in Study 1, we controlled for age, gender, educational level and organizational tenure.

Results

Confirmatory factor analysis

We used CFA with the maximum likelihood method in Mplus Version 7.4 to assess the distinctiveness of the variables. To save degrees of freedom, we created three parcels for each of the variables. As shown in Table 1, the hypothesized four-factor model yielded a good fit to the data (χ^2 [48] = 67.71, CFI = .98, RMSEA = .05, SRMR = .06) and outperformed any alternative, more parsimonious model ($p < .01$). These analyses indicate that our variables were distinct.

Hypothesis testing

Descriptive statistics and correlations are reported in Table 2. We used the same analytical strategy (polynomial regression analyses in SPSS Version 22) as in Study 1 to test our hypotheses. Table 3 reports the results of the analyses for work engagement. The linear relationship between workload and work engagement was non-significant (β = .09, *ns*; Table 3, Model 2). Next, the quadratic term of workload squared was negatively related to work engagement (β = –.22, $p < .05$, $\Delta R^2 = .03$, $p < .05$; Model 3), over and above workload. The negative sign associated with workload squared indicates an inverted U-shaped relationship between workload and engagement. As shown in Figure 1, the relationship between workload and engagement was positive up to an inflection point (standardized value = .39) after which the relationship became negative. Hypothesis 1 was thus supported.

Table 3 also reports the results for the regression analysis predicting innovative work behavior. We found work engagement to be positively related to innovative work behavior (β =

.42, $p < .01$; Table 3, Model 7). Table 3 (Model 3) also shows that workload squared was negatively related to work engagement ($\beta = –.22$, $p < .05$). Based on 5,000 bootstrap samples, the instantaneous indirect effect of workload on innovative work behavior via work engagement was positive and significant at low (.22, 95% bias-corrected CI [.07, .43]) but not at high (−.09, 95% bias-corrected CI [−.25, .05]) levels of workload. These results support Hypothesis 2.

Table 3 shows that the linear interaction between workload and mindfulness did not predict work engagement ($\beta = –.07$, *ns*; Model 5).[1] However, the quadratic interaction between workload squared and mindfulness was significant ($\beta = –.45$, $p < .01$, $\Delta R^2 = .07$; Model 6), over and above the linear interaction. As shown in Figure 2, at high levels of mindfulness, the relationship between workload and work engagement followed an inverted U-shaped pattern, with work engagement reaching its highest level at intermediate levels of workload. In contrast, at low levels of mindfulness, workload was unrelated to work engagement. Further testing of the simple slopes revealed that, at high values of mindfulness (+1*SD*), workload and its squared term added significant variance after inclusion of the other terms ($\Delta R^2 = .11$, $p < .01$) and that the inverted U-shaped relationship between workload and work engagement was significant ($\beta = –.55$, $p < .01$). However, at low values of mindfulness (–1*SD*), workload and its squared term did not add significant variance ($\Delta R^2 = .00$, *ns*), and the workload-work engagement curvilinear relationship was non-significant ($\beta = .08$, *ns*). Therefore, Hypothesis 3 was supported.

Finally, the test of conditional indirect effects revealed that, when mindfulness was high, increasing workload was positively and indirectly related to innovative work behavior via work engagement (.68, 95% bias-corrected CI = [.35, 1.11]) at low levels of workload, while it was negatively and indirectly associated with innovative work behavior (–.46, 95% bias-corrected CI [–.78, –.17]) at high levels of workload. In contrast, when mindfulness was low, the

instantaneous indirect relationship was non-significant at low (–.06, 95% bias-corrected CI = [–.39, .24]) and high (.05, 95% bias-corrected CI = [–.18, .29]) levels of workload. Hypothesis 4 was thus supported.

Study 3

Method

Sample and procedure. As in Study 2, we used Prolific Academic to recruit a sample of U.S. employees from various industries (e.g., education, finance, hospitality, and logistics). We adopted the same procedures as in Studies 1 and 2 to match participants across time. At Time 1, 444 employees out of the 466 who were contacted provided usable responses. Among them, 265 returned completed questionnaires at Time 2, although 17 did not enter the requested anonymous code and 40 provided uncompleted responses. Thus, the final sample consisted of 208 employees (response rate = 44.63%) with usable and matched responses across time. We used logistic regression to examine the likelihood of subject attrition across time. The result for the equation predicting the probability of remaining in the sample at Time 2 using Time 1 variables as predictors was significant (χ^2 [10] = 40.04, $p < .01$), with workload increasing the likelihood of leaving the sample ($B = .68$, $p < .01$). This effect is consistent with prior research reporting a positive association between workload and turnover intention (e.g., Vandenberghe et al., 2011). Thus, Time 1 predictors had small effects on data attrition.

Measures

We used the same scales as in Studies 1 and 2 to measure *workload* (6 items; Time 1 $\alpha = .70$; Time 2 $\alpha = .72$), *work engagement* (9 items; Time 1 $\alpha = .88$; Time 2 $\alpha = .88$) and *innovative work behavior* (9 items; Time 1 $\alpha = .95$; Time 2 $\alpha = .94$). We similarly controlled for age, gender, educational level and organizational tenure. We also controlled for three job resources

that have been found to be related to work engagement (Akkermans et al., 2013) and relevant to most employees in organizational settings (Bakker, 2008): *opportunities for professional development*, which was measured with Bakker et al.'s (2003) three-item scale (α = .85); *job autonomy*, which was assessed via Bakker et al. (2004)'s three-item scale (α = .89); and social support, which was captured by House's (1981) three-item scale (α = .87).

Results

Confirmatory factor analysis

As in Studies 1 and 2, we used CFA with the maximum likelihood method in Mplus Version 7.4 to assess the distinctiveness of the study variables and created three parcels for all variables to preserve an optimal indicator-to-sample-size ratio. As shown in Table 4, the hypothesized four-factor model yielded a good fit to the data (χ^2 [288] = 597.72, CFI = .92, RMSEA = .07, SRMR = .06) and significantly outperformed any more parsimonious model ($p < .01$). These analyses indicate that our variables were empirically distinct.

INSERT TABLE 4 ABOUT HERE

Hypothesis testing

Descriptive statistics and correlations are reported in Table 5. We used the same analytical strategy (polynomial regression analyses in SPSS Version 22) as in Studies 1 and 2 to test Hypotheses 1 and 2. The results are reported in Table 6. As can be seen, the linear relationship between Time 1 workload and Time 2 work engagement was non-significant (β = –.08, *ns*; Model 2). Next, Time 1 workload squared had an incremental effect on Time 2 work engagement (β = –.15, $p < .01$, ΔR^2 = .02, $p < .01$; Model 3), over and above Time 1 workload, work engagement, and innovative work behavior. As shown in Figure 1, the relationship between Time 1 workload and Time 2 work engagement followed a curvilinear trend similar to that

observed in Studies 1 and 2 (standardized inflection point = –.05). Thus, Hypothesis 1 is supported.

Moreover, results reveal that Time 1 work engagement (β = .13, p < .05; Model 4) had an incremental effect on Time 2 innovative work behavior, after controlling for Time 1 innovative work behavior. We then tested the curvilinear indirect effect of Time 1 workload on Time 2 innovative work behavior through Time 2 work engagement, controlling for Time 1 work engagement and innovative behavior. Based on 5,000 bootstrap samples, the results indicated that this indirect effect was significantly positive for low levels of Time 1 workload (.09, 95% bias-corrected CI [.01, .20]) and significantly negative for high levels of Time 1 workload (−.07, 95% bias-corrected CI [−.21, −.04]). This suggests that, at low levels of Time 1 workload, any increase of workload was related to increased Time 2 innovative behavior via increased Time 2 work engagement. In contrast, at high levels of Time 1 workload, workload increases led to lower Time 2 innovative behavior via Time 2 work engagement. Thus, Hypothesis 2 is further supported.

Finally, we found that Time 1 work engagement (β = .05, *ns*) and Time 1 innovative work behavior (β = .03, *ns*) were both unrelated to Time 2 workload, after controlling for Time 1 workload. Likewise, Time 1 innovative behavior did not predict Time 2 work engagement, after controlling for Time 1 work engagement (β = .03, *ns*; Model 1). Taken together, these panel analyses indicate that: (a) the curvilinear effect of workload on work engagement and, indirectly, innovative work behavior, is significant when controlling for the baseline levels of work engagement and innovative behavior; and that (b) workload is the antecedent of work engagement, which in turn is the antecedent of innovative work behavior.

INSERT TABLE 5 AND TABLE 6 ABOUT HERE

Discussion

The results of the three studies provided support for our hypotheses. As expected, when employees were exposed to intermediate levels of workload, they were more engaged and consequently more involved in innovative activities. Notably, the effects of moderate levels of workload were stronger when employees displayed high rather than low levels of mindfulness. Below, we discuss how these findings contribute to research and practice.

Theoretical implications

Our findings have implications for research on workload and employee innovativeness. First, scholars have previously suggested that workload has non-linear effects on work outcomes, partly because it encompasses challenging and hindering aspects (e.g., Eatough et al., 2011; Gilboa et al., 2008). The present research addressed this issue and found that moderate levels of workload provide optimal stimulation (Gardner and Cummings, 1988) of innovativeness through work engagement. While prior work has found curvilinear effects of job demands on employee creativity and innovation (e.g., Janssen, 2001), our results extend this research by highlighting that work engagement, as a resourceful state, transfers the effect of workload to innovative behavior. From a theoretical perspective, this suggests that it is the combination of the activation engendered by a moderate workload (as predicted by activation theory) and the accumulation of resources necessary for work engagement (as predicted by the JD-R model) that allows workload to stimulate innovative behavior.

As such, our finding significantly contributes to JD-R-based research. Indeed, prior studies have started to apply the tenets of the JD-R model to understand how the process of resource gain vs. loss leads to task performance (Demerouti et al. 2014), absenteeism (van Woerkom et al., 2016), safety behaviors (Halbesleben 2010), and turnover (Marchand and

Vandenberghe, 2016). Yet, the present set of studies extends this logic to innovative work behavior, i.e., a key driver of organizational effectiveness that is heavily dependent on the availability of resources. Additionally, separate JD-R studies have suggested that job demands involving challenge components (i.e., workload) can exert a positive, energizing effect on work engagement (Schaufeli and Taris, 2014) and that the latter in turn boosts innovation at work (Agarwal et al., 2012). Our study integrates these separate research streams to show for the first time that work engagement acts as a crucial mechanism whereby the positive effects of moderate levels of workload are transferred to innovative work behavior. Importantly, results indicated that workload did not influence employee innovation directly but only indirectly through the mediating role of work engagement. Accordingly, our study uniquely demonstrates how different amounts of workload can be more vs. less beneficial for innovative behavior and elucidates why employees exposed to moderate levels of workload can have greater odds of expressing their innovative potential than those facing low or high levels of this job demand.

Moreover, the present findings in regard to the mediating role of work engagement are particularly valuable given the robust research designs adopted across three independent studies. Another major contribution of our set of studies is that the mediating role of work engagement exhibits an inverted U-shaped pattern, an unusual form of relationship in this literature, which is known to be very difficult to replicate. From a theoretical perspective, this pattern of mediated relationship has important implications for our understanding of the nature and effects of workload. Indeed, a debate emerged years ago as to whether work stressors enhance or impede innovative work behavior (Janssen, 2000). Our findings are consistent with the view that workload comprises challenge and hindrance components, with its inverted U-shaped mediated relationship to innovation through work engagement being indicative of how the two

components play out. Specifically, moderate, as opposed to low or high, levels of workload are most beneficial to employees' ability to develop, promote and implement creative ideas. Presumably, this is because moderate levels of workload allow for the challenge component to dominate employees' subjective experience of workload.

As such, these results significantly contribute to research based on activation theory. Indeed, as Muse et al. (2003) reported in their meta-analysis, the inverted U-shaped effects of job demands on employee behavioral performance have received very limited empirical support. In line with such research evidence, our study also found a non-significant curvilinear relationship between workload and innovative work behavior. Yet, in line with our expectations, we showed that the energizing effects of the optimal activation levels provided by moderate job demands were transmitted indirectly to innovative work behavior through the mediating effect of work engagement. Thus, our study suggests that, in order to illustrate plausible inverted U-shaped effects of stressful demands on work performance, one needs to identify and examine the psychological processes that may play a key role in conveying the experienced level of activation to the behavior of the job performer. Accordingly, we hope that our findings will encourage researchers to further test the assumptions of activation theory using mediated inverted U-shaped models to understand how the non-linear consequences of job demands are transferred to different dimensions of work performance.

By providing evidence for an indirect, inverted U-shaped effect of workload on innovative behavior, our study also challenges the core assumption of the JD-R model that "job demands and resources instigate two very different processes, namely a health-impairment process and a motivational process" (Bakker and Demerouti, 2017), respectively. Indeed, our findings suggest that job demands encompassing both challenge and hindrance aspects *can*, at

moderate levels, activate a positive motivational process. This also indicates that the distinction between health-impairing and motivational effects may depend on the level of job demands. As such, our findings provide new and important knowledge that clarifies the extent to which job demands exert a motivating and energizing, rather than health-impairing, effect on work outcomes. The present study represents a meaningful input for future research to theorize and investigate the positive, motivational consequences of job demands on employee functioning in the workplace.

However, our research additionally reveals that among employees who are exposed to moderate workload, those with high levels of mindfulness are more likely to be engaged and, ultimately, to be innovative. This finding is relevant to the stress and innovation literatures because it suggests that the accumulation of resources necessary to enhance work engagement and innovative behaviors is fostered not only by the optimal activation of workload but also by individual differences (LePine et al., 2005). This finding is consistent with previous research on mindfulness (Garland et al., 2015; Kirk et al., 2011) and suggests that, by reducing automatic response patterns to stressors, mindfulness decreases threat appraisal and strengthens expectations of control over job demands. As such, mindfulness is a key resource that enables employees to benefit from moderate levels of workload.

The findings related to the moderating effect of mindfulness extend the JD-R literature by highlighting the critical role of personal resources in optimizing employee functioning under demanding job conditions. Some studies have shown that personal resources may buffer the relationship between job demands and work engagement (e.g., Brenninkmeijer et al., 2010). However, despite this preliminary evidence, research has provided limited support for the proposition from the JD-R model that personal resources buffer the impairing impact of job

demands and boost the latter's motivational potential. This suggests "more research is needed to test the Job Demands X Personal Resources interaction" (Bakker and Demerouti, 2017: 275). Likewise, the effects of job demands experienced as both challenge and hindrance need to be further explored, particularly in regard to when job demands are experienced as hindrances vs. challenges (Bakker and Demerouti, 2017). Our set of studies addressed these gaps and revealed that, by moderating the inverted U-shaped relationships among workload, work engagement, and innovative behavior, mindfulness was a key personal resource that fosters the resource-enhancing benefits of the challenge component of workload and neutralizes the health-impairing effect of its hindrance component. As such, findings related to the moderating role of mindfulness help refine a key assumption of the JD-R model, namely that job resources are more likely to influence motivation when job demands are high (Bakker and Demerouti, 2017). Our study actually suggests that, in the case of workload, it is the combination of high (personal) resources (i.e., mindfulness) and moderate, rather than high, demands that has the strongest influence on motivation. Therefore, mindfulness should be added to the list of personal resources (e.g., self-efficacy, optimism, and self-esteem) traditionally examined in JD-R-based studies. The inclusion of mindfulness in future research would help increase our understanding of the role of individual resources in the relationship between challenge-hindrance demands and work outcomes.

Our set of studies also adds to the emerging body of research on the beneficial effects of mindfulness on work outcomes in general, and work engagement and innovative behavior in particular. Past studies have provided evidence for these beneficial effects separately. For example, Leroy et al. (2013) reported a positive relationship between mindfulness and work engagement, while Montani et al. (2018) found that mindfulness promoted higher levels of

innovative behaviors among employees experiencing deactivating negative affect. The present study innovates by examining mindfulness, work engagement and innovative work behavior within an integrated model that describes an optimal, indirect effect of moderate workload on innovative behavior when mindfulness is high.

Finally, the moderating effect of mindfulness on the indirect relationship between moderate workload and innovative work behavior offers new insights into the interactionist perspective on employee innovation. Prior studies have demonstrated that innovation-supportive contextual factors interact with individual characteristics to positively affect employee innovative behaviors (e.g., Chen et al., 2016). Yet, much less knowledge has been obtained regarding the individual boundary conditions associated with the effects of potentially innovation-thwarting contexts. Accordingly, Zhou and Hoever (2014) recently recommended the adoption of an interactionist perspective to develop an in-depth understanding of what personal factors may facilitate vs. hinder innovation-related behaviors. Our study addressed this call and as such contributes to an interactionist approach to innovation by highlighting that mindfulness is an important personal condition that influences how an otherwise 'neutral' work-related contextual factor – i.e., workload – may, at moderate levels, be ultimately beneficial to innovative behavior.

Practical implications

The present findings have implications for practice. First, managers should monitor the level of workload experienced by employees and ensure that a reasonable quantity of demands is set for them. Managers should also pay attention to controlling the flow of demands in such a way that sufficient activation is reached and should be aware that both low and high levels of demands generate counterproductive effects on innovative behavior. Second, managers should monitor

and possibly survey employees about their work engagement, as such insight will provide useful feedback regarding the resources they perceive themselves as possessing for engaging in innovative activities.

Third, our findings indicate that the potentially harmful consequences of a moderate workload essentially arise among low mindfulness employees, suggesting that managers should pay particular attention to such employees and the amount of workload they face by seeking to minimize repetitive exposure to demanding tasks. Yet, these findings also indicate that organizations might benefit from promoting mindfulness in order to protect employees against the demotivating and health-impairing consequences of workload. Indeed, although our study focused on mindfulness as a trait, research has indicated that trait and state mindfulness are highly correlated, suggesting that mindfulness skills can be fostered through management strategies such as delivering training and information about mindfulness, rewarding mindful conducts, and introducing specific mindfulness-based exercises (Grégoire and Lachance, 2015). However, it is worth recalling that the beneficial effects of mindfulness occurred only for low to moderate amounts of perceived workload. Conversely, high levels of workload were associated with reduced work engagement and innovative behavior among highly mindful employees. Accordingly, an important implication of our findings is that taking actions to enhance mindfulness at work would be unlikely to help employees stay engaged and innovative under highly demanding job conditions, unless the tasks assigned to them were kept at low or moderate levels. As such, these results warn against overly emphasizing personal resources (i.e., mindfulness) as key drivers of engagement and innovative behavior in stressful contexts. Rather, they indicate that it is the combination of high personal resources and moderate levels of

demands (i.e., workload) that provides the optimal condition to energize employees and bring out their innovative potential.

Limitations and directions for future research

The present research has some limitations that provide opportunities for future research. First, we used self-report measures to assess our variables, which may lead to common method bias (Podsakoff et al., 2012). Yet, we sought to address this issue by temporally separating the variables, which is recommended as a relevant procedural remedy (Podsakoff et al., 2012). Moreover, our statistical analyses indicated that common method bias is unlikely to explain the pattern of relationships among our variables. Additionally, it is worth noting that the use of other-reported assessments of innovative behavior is not common or recommended because employees are in a better position than their supervisors and peers to rate their engagement in innovative activities (Janssen, 2000). Moreover, research has reported evidence for the validity of self-ratings of employee innovation (e.g., Janssen, 2000).

Second, although the inclusion of a panel design allowed us to rule out potential reverse causation relationships among workload, work engagement and innovative work behavior, we were unable to examine whether and how such relationships are subject to fluctuations over time. Since workload, work engagement and innovative work behavior have been shown to fluctuate within individuals across time (e.g., Liu et al., 2017; Madrid et al., 2014), future research should use experience sampling methodology and diary approaches to examine the relationships among these constructs at the within-person level (Fisher & To, 2012). For example, as job demands experienced in the morning have been found to impact daily work-related affective states and behaviors (e.g., Liu et al., 2017), future research could explore how job demands in the morning influence changes in daily work engagement and innovative work behavior.

Third, we drew from JD-R and activation theories to reason that workload displays an inverted U-shaped relationship with innovative behavior via work engagement and that mindfulness moderates this relationship. However, the neural activation stemming from intermediate levels of workload was not measured. Likewise, our theorizing suggested that mindfulness shapes motivational and behavioral reactions to workload by determining whether employees appraise their stressful experience as a challenge or as a hindrance. However, we did not empirically measure the challenge-hindrance mechanisms that are elicited by perceptions of workload. A more inclusive test of our framework would thus benefit from incorporating direct measures of these constructs in future research.[2] Finally, our results reveal a negative and significant correlation between mindfulness and workload. One possibility is that, over time, mindfulness shapes perceptions of workload, independently of the moderating effects observed in our studies. Research using the JD-R model indeed suggests that personal resources may have cross-lagged effects on the way people perceive their job context (i.e., job demands), which in turn may affect employee attitudes and behaviors (Xanthopoulou et al., 2007). Future researchers may thus want to examine whether mindfulness indirectly benefits work engagement and innovative behavior by influencing perceptions of one's workload.

Footnotes

[1] As a sensitivity check, we examined the workload X mindfulness linear interaction without inclusion of workload squared in Study 1 and Study 2. Results from regression analyses indicated that, controlling for gender, age, education, and organizational tenure, workload did not significantly interact with mindfulness in predicting work engagement in Study 1 (β = .10, *ns*) and Study 2 (β = –.07, *ns*).

[2] We thank an anonymous reviewer for suggesting this research avenue.

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