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BRIEF REPORT

The Combined Influence of Occupational Stressors and Individual Lifestyle Behaviors on Employee Stress Complaints: Additive or Interactive Effects?

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The topic of employee health and well-being is of significant interest to occupational health researchers and practitioners alike. In the present study, we assess the interrelationships between occupational stressors, measured as an index of various independent stressors (e.g., bullying, role ambiguity, workplace changes), lifestyle behaviors (i.e., sleep quality, healthy diet, and physical activity), and three types of stress complaints (i.e., emotional, physical, and cognitive). In doing so, we extend the debate about the buffering impact of job resources to include personal resources in the form of lifestyle behaviors, and ascertain whether the inclusion of such resourceful behavior explains employee stress complaints in an additive (main effects only) or interactive way. Data were collected from a large sample of employees from 10 organizations in Belgium (N = 2,251). Results from latent moderated structural equation modeling revealed that occupational stressors (positive effect) and lifestyle behaviors (negative effect) significantly explain the presence of emotional, physical, and cognitive stress complaints. However, these relationships were mainly additive as opposed to interactive. These results signify that there are two independent pathways associated with employee health and well-being, one under the direct control of the organization (occupational stressors) and one under the direct control of the person (healthy lifestyle behaviors). Moreover, both need to be separately attended to in order to attain the best outcomes in terms of reducing stress complaints.

Keywords: occupational stressors, lifestyle behaviors, sleep, diet, physical activity

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Managing stress in the workplace is crucial to maintain a healthy, happy, and productive workforce. Stress complaints are a key predictor of absenteeism and sickness presenteeism (Johns, 2010), early retirement (Rice et al., 2011), and impaired work performance (Collins et al., 2005). For every 1$ spent on medical costs related to suboptimal employee well-being, employers are believed to spend 2–4$ on health-related productivity costs (Loeppke et al., 2009). Improving the health of staff and alleviating stress is, therefore, paramount not only because it contributes to a vigorous and healthy workforce but also because it directly impacts bottom line measures of corporate profitability.

Past empirical work suggests that stress is a multifaceted construct consisting of emotional (e.g., depression), physical (e.g., neck and back problems), and cognitive (e.g., ability to concentrate) complaints (e.g., Ilies et al., 2015; Warr, 1990). Given the detrimental consequences of stress, the crucial question concerns which factors are potent in causing and curbing such complaints. In this regard, the job demands–resources (JD-R) model predicts that occupational stressors activate a health impairment process whereby employees' emotional, physical, and cognitive resources become depleted, thereby causing stress (Demerouti et al., 2001). Another central proposition of the JD-R model is that job resources can buffer against the detrimental effect of occupational stressors on employee stress (Bakker & Demerouti, 2007). However, the buffer hypothesis has received mixed empirical support in the literature to date (e.g., Flatau-Harrison et al., 2022; Hu et al., 2011). This, in turn, has raised important questions about which type of resources are truly effective in buffering the impact of occupational stressors on employee health and well-being (Schaufeli & Taris, 2014). In response, studies on the JD-R model have begun to consider the role of personal (i.e., non-job-related) resources in this process

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(e.g., self-esteem, optimism; Xanthopoulou et al., 2009). In this article, we examine the role of another class of personal resources largely overlooked in an occupational health context so far, that is, the lifestyle behaviors of sleep, dietary habits, and physical activity.

Specifically, we examine the interrelationships between occupational stressors (measured as an index of various independent work stressors); lifestyle behaviors (sleep, diet, and physical activity); and emotional, physical, and cognitive stress complaints. In doing so, we enrich our understanding of the buffer hypothesis in the JD-R model (Demerouti et al., 2001) by investigating how such resourceful behaviors, which essentially represent factors outside the work domain under the direct control of the employee, combine with occupational stressors to impact on employee stress complaints. Indeed, while the unique contribution of occupational stressors (e.g., Bakker & Demerouti, 2007) and lifestyle behaviors (e.g., Pluut & Wonders, 2020; Velten et al., 2014) to stress and well-being is abundantly clear, the extent to which these effects are additive or interactive in nature remains unclear. That is, studies that account for the impact of lifestyle behaviors on employee stress and well-being (e.g., Pluut & Wonders, 2020; Toker & Biron, 2012) have generally failed to investigate the interplay between job demands and lifestyle behaviors (for a recent exception, see Gerber et al., 2020). Moreover, these studies typically focus on one particular facet of stress (e.g., burnout symptoms; Toker & Biron, 2012) or one type of lifestyle behavior (e.g., physical activity; Gerber et al., 2020) only, thereby producing an incomplete picture of the wide range of possible interrelationships between occupational stressors, lifestyle behaviors, and employee stress complaints.

Theory and Hypotheses

Occupational Stressors, Lifestyle Behaviors, and Stress Complaints

It is long known that job stress peaks in work environments that are low on job resources (e.g., social support) and high on work hindrances (e.g., social conflict; Hackman & Oldham, 1980). In this regard, the JD-R model (Demerouti et al., 2001) predicts that occupational stressors result in elevated stress because they deplete employees' emotional, physical, and cognitive resources, and various meta-analyses (e.g., Häusser et al., 2010; Nixon et al., 2011), corroborate such a link between occupational stressors and various aspects of emotional (e.g., depressive symptoms), physical (e.g., musculoskeletal and gastrointestinal disorders), and cognitive (e.g., poor concentration) stress complaints.

In addition to the role of occupational stressors, lifestyle behaviors constitute personal resourceful behavior that is instrumental in safeguarding or improving health and well-being (Pluut & Wonders, 2020; Velten et al., 2014). Of these, good sleep quality, healthy dieting, and physical activity are among the most influential lifestyle behaviors (Byrne et al., 2016), as these support the optimal functioning of our cardiovascular and neuroendocrine systems. Psychologically, these systems are responsible for affective states, motivation, and attention (Akinola, 2010), and imbalances in these systems are commonly linked to vulnerabilities in physical and mental well-being (e.g., Mammen & Faulkner, 2013; Stevenson, 2017), and to impaired cognitive functioning (e.g., Lim & Dinges, 2010). For example, a loss of sleep disrupts the various restorative processes of the body and brain and changes our hormone secretion during the day (e.g., Barnes, 2012). An unhealthy diet contributes to musculoskeletal disorders, anxiety, and depression through the release of stress hormones and by triggering high blood pressure, bad cholesterol, and inflammations (e.g., Wirt & Collins, 2009). Finally, lack of regular physical activity increases the risk for musculoskeletal complaints, cardiovascular disease symptoms, and neuronal damage (e.g., Miles, 2007). Accordingly, we hypothesize the following:

Hypothesis 1: Occupational stressors are positively related to emotional (a), physical (b), and cognitive (c) stress complaints.

Hypothesis 2: Sleep quality is negatively related to emotional (a), physical (b), and cognitive (c) stress complaints.

Hypothesis 3: Maintaining a healthy diet is negatively related to emotional (a), physical (b), and cognitive (c) stress complaints.

Hypothesis 4: Physical activity is negatively related to emotional (a), physical (b), and cognitive (c) stress complaints.

Occupational Stressors and Lifestyle Behaviors: Additive or Interactive Effects?

The JD-R model (Demerouti et al., 2001) proposes that individuals are not entirely helpless when confronted with occupational stressors. More specifically, the buffer hypothesis of the JD-R model maintains that resources can help protect against the deleterious effects of job demands (Bakker & Demerouti, 2007). While scholars have found support for the role of some job resources (e.g., autonomy, support) in buffering against the impact of occupational stressors on strain-related outcomes (e.g., Demerouti et al., 2001), evidence for the buffer hypothesis in general has not always been consistent (e.g., Flatau-Harrison et al., 2022; Hu et al., 2011). Moreover, and only until a few years ago (Xanthopoulou et al., 2009), JD-R researchers have tended to neglect the role of personal resources in buffering the relationship between occupational stressors and employee well-being outcomes. Personal resources represent psychological characteristics or other aspects of a person that are related to the capability to effectively navigate, control, and impact one's environment (Schaufeli & Taris, 2014). One particular category of personal resources that can be expected to play a key role in combating stress is employee lifestyle behaviors.

In essence, occupational stressors and lifestyle behaviors could influence stress complaints in either an additive or an interactive way. The additive model proposes that occupational stressors and lifestyle behaviors have supplementary effects on employee stress complaints. By contrast, the interactive model proposes that the presence (absence) of healthy lifestyle behaviors can buffer (reinforce) the negative effect of occupational stressors on stress complaints. The relative merits of these models are not trivial (Pluut & Wonders, 2020). While interactive effects would provide support for the idea that the buffer hypothesis of the JD-R model can be extended to include personal resources outside the work environment and under the direct control of employees, support for the additive model would imply that occupational stressors and healthy lifestyle behaviors provide two independent pathways to employee health.

Building on conservation of resources theory (Hobfoll, 1989) and the effort–recovery model (Meijman & Mulder, 1998), we investigate the possibility for occupational stressors and lifestyle behaviors

to impact on employee stress complaints in an interactive way, as predicted by the buffer hypothesis of the JD-R model (Demerouti et al., 2001). The justification for testing these interactive effects follows from the insight that those who engage in healthy lifestyle behaviors also tend to have higher baseline levels of health and well-being (Byrne et al., 2016), meaning they should have greater health resources and therefore a higher tolerance to occupational stressors (Hobfoll, 1989). More specifically, lifestyle behaviors can be considered adaptive coping strategies that reduce reactivity to distress and loss of resources (Pluut & Wonders, 2020). For instance, those who have adequate sleep and engage in regular physical exercise require less recovery at the end of a working day (e.g., Coffeng et al., 2015), suggesting they can better deal with stressors. Recovery refers to the process of psychophysiological unwinding, during which suboptimal psychophysiological systems are rebalanced and depleted resources replenished (Geurts & Sonnentag, 2006), thereby preventing strain from building up long term (Meijman & Mulder, 1998). In this respect, high-quality sleep, a healthy diet, and engaging in regular physical activity are known to represent potent types of recovery activities that serve to restore mood and cognition, balance stress hormones, and stabilize over-activated psychophysiological systems (e.g., Miles, 2007). Conversely, failure to engage in healthy lifestyle behaviors suppresses our immune system (Miles, 2007) and impairs our ability to self-regulate cognition and affect (Barnes, 2012), which in turn increases our vulnerability to occupational stressors. Accordingly, we hypothesize the following:

Hypothesis 5: Sleep quality moderates the relationship between occupational stressors and emotional (a), physical (b), and cognitive (c) stress complaints such that the positive relationship between occupational stressors and stress is weakened under high rather than low levels of sleep quality.

Hypothesis 6: A healthy diet moderates the relationship between occupational stressors and emotional (a), physical (b), and cognitive (c) stress complaints such that the positive relationship between occupational stressors and stress is weakened under high rather than low levels of healthy dieting.

Hypothesis 7: Physical activity moderates the relationship between occupational stressors and emotional (a), physical (b), and cognitive (c) stress complaints such that the positive relationship between occupational stressors and stress is weakened under high rather than low levels of physical activity.

Method

Participants and Procedure

The data were collected from 10 companies from various industry sectors in Belgium, all of whom offered their employees the possibility to participate in an extensive web-based health risk assessment as part of a workplace lifestyle intervention (*N* target population = 9,969). A total of 2,251 respondents completed the anonymous survey, resulting in an overall response rate of 22.6%, which is comparable to previous studies with large samples and with a similar setup and research focus (e.g., Loeppke et al., 2009). The large majority of respondents are female (64.9%) and working full time (79.6%). The mean age is 36.9 years (*SD* = 9.2). White-collar workers (75.9%) make up the majority of the sample, followed by managers (20.3%) and blue-collar workers (3.9%). Most participants (83.9%) are highly educated (vs. 15.5% secondary education and 0.5% primary education only).

Measures

Occupational stressors (α = .75) were measured as an index of seven independent stressors in the social, organizational, and job domain. Examples of sample items are as follows: "I suffer from bullying" (social), "There have been quite a few changes" (organizational), and "I do not know what is expected of me" (job). The stressors that were selected for this study represent overall occupational stressors stemming from the social, organizational, and job domain, which cover the three broad spectrums of demands faced by employees (Jourdain & Chênevert, 2013). Participants were asked to indicate on a 7-point Likert scale ranging from 0 (*not applicable at all*) to 6 (*very applicable*) whether the items applied to their daily working situation during the past month.

Sleep quality (α = .77) was assessed with three items from Jenkins et al. (1988). Participants had to indicate during how many nights (0–7) in a typical week they experience the stated sleep complaints (e.g., "having troubles falling asleep"). Items were reverse scored such that a higher score indicates better sleep quality. The quality of participants' *diet* was assessed according to dietary recommendations formulated by the World Health Organization (2020a). Among other questions, participants had to report how many portions of water, fruit, vegetables, fish, sweets, and products rich in calcium and proteins they consume on a typical day. For each question, examples were given of what is understood with "one portion." Based on these self-reports, each participant was awarded a score between 0 (*no compliance with any dietary guidelines*) and 100 (*perfect compliance with all 11 dietary guidelines*). Finally, *physical activity* (time in minutes) was measured in line with the directives of the World Health Organization (2020b). Participants were asked to report how many hours and minutes they spend on intensive cardio exercise during a typical week (examples of intensive cardio exercise were given).

Stress complaints were measured by nine stress and seven mood items. Mood complaints (e.g., "'feeling worthless," "feeling sad") were measured on a 4-point Likert scale (0 = *seldom or never*, 3 = *often or always*) by asking respondents how often they have experienced these complaints over the past week. Stress complaints (e.g., "headache," "forgetfulness") were measured on a 5-point Likert scale (0 = *never*, 4 = *always*) by asking participants how often they experienced these complaints over the past month. A principal components analysis (Table 1 in Supplemental Material) revealed that emotional, physical, and cognitive complaints should be treated as separate factors. All seven mood items loaded on the emotional stress complaints factor (α = .86). The stress items were split across the physical (5 items, α = .72) and cognitive (4 items, α = .72) stress complaints factors. All components proved to be reliable with an eigenvalue above one and cumulatively explained 53.66% of the total variance in complaints.

Age (continuous), gender (0 = male, 1 = female), work regime (0 = part time, 1 = full time), and occupational status (dummy coded) were included as *control variables*.

Results

Descriptive Statistics and Confirmatory Factor Analysis

Descriptive statistics and correlations are reported in Table 2 of the Supplemental Material. A confirmatory factor analysis (CFA) revealed that our hypothesized model with occupational stressors; sleep quality; and emotional, physical, and cognitive stress complaints as five latent factors, $\chi^2(289) = 1643.50$, $p < .001$, comparative fit index = .91, Tucker-Lewis index = .90, root mean square error of approximation = .05, standardized root mean squared residual = .04, yielded a better fit to the data than any more parsimonious latent model (Table 3 in Supplemental Material). All items significantly ($p < .001$) loaded on their respective factors.

Hypothesis Testing

Analyses were conducted using latent moderated structural equation modeling with 95% confidence intervals (CIs) in Mplus. All independent variables were mean centered prior to being included in the analyses. The output of our analyses is reported in Table 1.

Gender was the only consistently significant control variable, with women reporting higher emotional ($\beta = .12$, $p \leq .001$), physical (.30, $p \leq .001$), and cognitive stress ($\beta = .07$, $p \leq .05$) complaints compared to men. Furthermore, occupational stressors were associated with higher emotional ($\beta = .36$, $p \leq .001$), physical ($\beta = .25$, $p \leq .001$), and cognitive ($\beta = .41$, $p \leq .001$) stress complaints, lending support for Hypotheses 1a–c. Lifestyle behaviors proved to be significantly related to most stress complaints, too. Sleep quality ($\beta = -.34$, $p \leq .001$), maintaining a healthy diet ($\beta = -.07$, $p \leq .001$), and physical activity ($\beta = -.06$, $p \leq .01$) were all negatively related to emotional stress complaints. Similarly, sleep quality ($\beta = -.44$, $p \leq .001$), healthy dieting ($\beta = -.10$, $p \leq .001$), and physical activity ($\beta = -.14$, $p \leq .001$) were negatively related to physical stress complaints, too. However, only sleep quality ($\beta = -.28$, $p \leq .001$) was significantly related to cognitive stress complaints. Overall, these results provide support for Hypotheses 2a–c, and support for Hypotheses 3a–b and 4a–b. Finally, and providing support for Hypothesis 5a, a significant interaction effect was found between occupational stressors and sleep quality for emotional stress complaints ($\beta = -.17$, $p \leq .001$). A test of the simple slopes revealed a significant interaction at both low ($\beta = .20$, $p < .001$) and high ($\beta = .11$, $p < .001$) levels of sleep quality. A two-way interaction graph was subsequently plotted to aid interpretation (Figure 1), which further indicated that when employees face occupational stressors together with poor sleep, their emotional stress is at its most vulnerable. Although two additional borderline significant ($p < .10$) interaction effects were detected, one for occupational stressors with physical activity (emotional stress complaints) and one for occupational stressors with healthy diet (cognitive stress complaints), on the whole, Hypotheses 5b–c, 6a–c, and 7a–c were not supported.

Overall, our model explains a significant amount of variance in emotional (35%), physical (45%), and cognitive (29%) stress complaints. Occupational stressors emerge as the most important predictor of emotional and cognitive stress complaints, while sleep quality was most predictive of physical stress complaints. Based on the 95% CIs, occupational stressors and sleep quality typically produce large effects on stress complaints. Gender yields medium effects on stress complaints, while healthy dieting and physical activity generate medium-to-small effects on stress complaints, with lower CI bounds nearing to zero.

Discussion

In the present study, we assessed the interrelationships between occupational stressors, measured as an index of various independent stressors (e.g., bullying, role ambiguity, workplace changes), lifestyle behaviors (i.e., sleep quality, healthy diet, and physical activity), and employee stress complaints. On the whole, our results indicate that occupational stressors (positive effect) and lifestyle behaviors (negative effect) significantly explain the presence of emotional, physical, and cognitive stress complaints. Moreover,

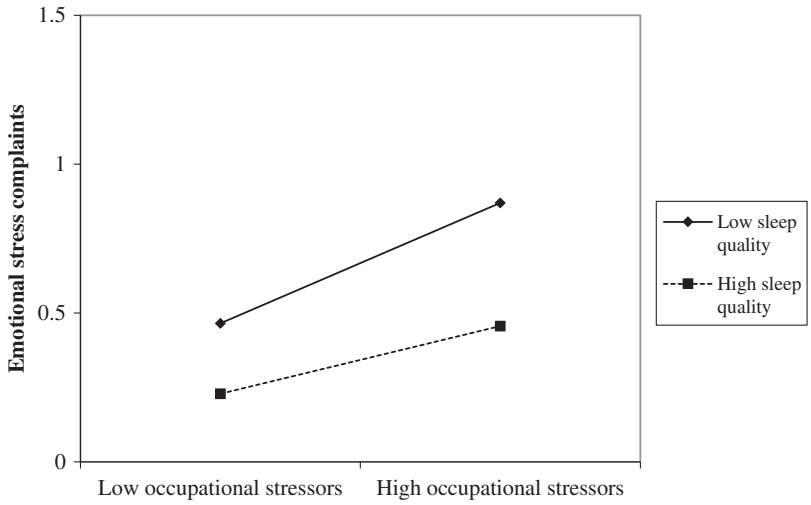
Table 1
Results of Latent Moderated Structural Equation Modeling on Stress Complaints

Predictors	Emotional		Physical		Cognitive	
	β	95% CI	β	95% CI	β	95% CI
Control variables						
Age	−.03	[−.08, .01]	−.06*	[−.11, −.01]	−.02	[−.07, .03]
Gender	.12***	[.08, .20]	.30***	[.25, .34]	.07*	[.02, .11]
Occupational status						
Blue collar	.01	[−.03, .05]	−.01	[−.06, .03]	−.01	[−.06, .03]
Management	−.03	[−.07, .02]	.002	[−.04, .05]	−.001	[−.05, .05]
Work regime	.01	[−.03, .05]	−.01	[−.06, .04]	−.01	[−.06, .04]
Occupational stressors	.36***	[.31, .40]	.25***	[.21, .30]	.41***	[.36, .45]
Lifestyle behavior						
Sleep quality	−.34***	[−.39, −.30]	−.44***	[−.48, −.40]	−.28***	[−.33, −.24]
Healthy diet	−.07***	[−.11, −.03]	−.10***	[−.14, −.05]	−.04	[−.08, .01]
Physical activity	−.06**	[−.10, −.02]	−.14***	[−.18, −.10]	−.01	[−.06, .03]
OS × Sleep Quality	−.17***	[−.22, −.12]	−.01	[−.06, .04]	−.02	[−.07, .03]
OS × Healthy Diet	−.02	[−.06, .02]	−.02	[−.06, .03]	−.04†	[−.09, .01]
OS × Physical Activity	−.04†	[−.09, .004]	−.02	[−.07, .03]	−.01	[−.06, .05]
Variance explained (R^2)	.35***		.45***		.29***	

Note. $N = 2{,}251$. Standardized estimates. CI = confidence intervals; OS = occupational stressors.
† $p < .10$. * $p \leq .05$. ** $p \leq .01$. *** $p \leq .001$.

Figure 1

Interaction Effect of Sleep Quality on Emotional Stress Complaints



these relationships were mainly additive as opposed to interactive. Below, we discuss the various implications of these findings.

Theoretical and Practical Implications

Our results indicate that the relationships between occupational stressors, lifestyle behaviors, and employee stress complaints should be seen as additive as opposed to interactive. While these results are in line with the health impairment process of the JD-R (Demerouti et al., 2001), they fail to provide support for its buffer hypothesis. One exception is sleep quality, which was found to moderate the effect of occupational stressors, but for emotional stress complaints only. However, this pattern of results did not extend to healthy dieting and physical activity. One potential explanation for the general absence of significant interaction effects may reside in the lack of interdependence between occupational stressors and lifestyle behaviors. Indeed, evidence for the buffer hypothesis has not always been consistent (e.g., Flatau-Harrison et al., 2022; Hu et al., 2011), and it is commonly believed this may be attributed to the irrelevance or mismatch between the specific demands and resource investigated (Schaufeli & Taris, 2014). This may suggest that the relationship between lifestyle behaviors and stress complaints is largely independent of the relationship between occupational stressors and stress complaints.

The implications of this finding for employers are twofold. First, it is imperative, from both a legal and moral point of view, that employers take the impact of occupational stressors on employee health and well-being serious. The broad absence of buffering effects indicates that there is very little employees can do themselves to combat the effects of a stressful work environment. The best way of coping with the impact of occupational stressors is by ensuring that these stressors are minimally present in the first place. Second, our findings also indicate that stress complaints can be represented as an amalgamation of its various predicting factors. This means that, even when occupational stressors are low, a lack of healthy lifestyle choices may still place substitutionary constraints on employee health and well-being. Thus, the potential of good job design to improve health and well-being may be capped at a specific level beyond which more investments in attempting to curb stress would appear to be less impactful or, indeed, pointless. Instead, these additional efforts should be directed toward stimulating employees to adopt healthier lifestyle behaviors, for instance by influencing food choices and eating habits at work (e.g., de Ridder et al., 2017). In addition, health promotion programs can also add a lot of value here. The workplace setting can be considered a particularly fruitful setting for such health promotion interventions because of the presence of natural social networks, the possibility of reaching a large population, and the amount of time people spend at work (Rongen et al., 2013).

Study Limitations and Directions for Future Research

One limitation pertains to the fact that our data are cross-sectional, meaning we are unable to draw definite conclusions about causality. Future research should rule out the presence of alternative explanations for the current findings. In addition, the self-reported nature of our data can be a source of common method variance and social desirability bias. However, these risks were mitigated by ensuring participation was voluntary and anonymous vis-à-vis employers. Moreover, the results of our CFA, which also includes a one-factor solution, provide clear evidence against the presence of an underlying common method factor. In addition, the results of a Harman single-factor test further confirmed that common method bias is unlikely to be present. Finally, interaction models are typically considered resistant to common method bias (Chan, 2009).

Second, our model is not necessarily complete, as we did not, for instance, include *unhealthy* lifestyle behaviors such as smoking or binge drinking, of which the literature suggests they may also have important implications for health and well-being (Rice et al., 2011; Velten et al., 2014). Likewise, stressors in the home or family domain (e.g., Pluut & Wonders, 2020) may also affect stress and well-being, and incorporating variables such as these in the present model could be a worthwhile avenue for future research. In addition, we also did not cover the whole spectrum of job demands inherent to

the social, organizational, and job domain. As a result, our chosen demands are by no means exhaustive and should form the focus of future research on the topic.

Finally, our findings single out sleep quality as a potentially potent personal resource in the JD-R model, capable of buffering (or exacerbating) the impact of occupational stressors. More work needs to be done to understand why the effects of physical activity and a healthy diet were more mixed. Possibly, these lifestyle behaviors are more domain-specific meaning they also have more of an isolated impact on emotional and physical stress.

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