

**Under Pressure: The Influence of Workload on Cognitive Fatigue, Moderated by Social
Support**

Evelyne Homan

s3662128

Department of Psychology, University of Groningen

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Group number: 14

Supervisor: prof. dr. Anita Keller

Second evaluator: Lisa Willemsen, MSc

In collaboration with: Ida Bergen, Lotte Krijt, Selma Rozemeijer, Nynke van der Kooi and

Paul Zwart

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Declaration of AI use

2. AI used for background/self-study only

“I acknowledge the use of <ChatGPT > to generate materials for background research and self-study in the drafting of this assessment.” In the Appendix the use of ChatGPT is explained.

Abstract

Work-related stress affects one in six Dutch employees, generating substantial organizational costs and leads to worse performance at work and health problems. Because modern workplaces continue to evolve, combined with previously mixed findings, more research on the influence of demands like workload and resources like social support is needed. This study examined whether workload influenced cognitive fatigue directly, and to what extent the availability of social support moderated this relationship, drawing from the Job Demands-Resources (JD-R) framework. Working adults were recruited through personal contacts using *snowball sampling*. This study used validated scales and aggregated data from a daily diary study. In Qualtrics, participants ($N=98$) completed the baseline survey measuring social support, followed up by 5 workdays of afternoon workload assessment and evening cognitive fatigue reports. The results of the multiple regression analysis showed no significant main effects. Workload did not predict cognitive fatigue, nor did social support. Also, no moderation effect emerged of social support for the relationship between workload and cognitive fatigue. The findings of this study add to existing JD-R model knowledge and imply methodological challenges in detecting buffering effects. Future research is recommended and should implement the proposed improvements.

Keywords: workload, social support, cognitive fatigue, moderation effect, buffer, JD-R model

Under Pressure: The Influence of Workload on Cognitive Fatigue, Moderated by Social Support

Recent data from the National Survey on Working Conditions (NEA; Centraal Bureau voor de Statistiek & TNO, 2025) conducted among 64,000 Dutch employees, reveal that 15.6% experience stressful jobs characterized by high workload demands and low autonomy, particularly in healthcare and education. These employees signal rising exhaustion risks by reporting higher absenteeism (60% vs. 52% overall), and more pessimistic expectations about future mental demands (50% anticipate increased strain) (Centraal Bureau voor de Statistiek & TNO, 2025). Acute fatigue typically recovers through rest, but higher absenteeism rates here suggest chronic patterns driving major costs. As workplaces continue to evolve (e.g., via digitalization and other changes), new sources of stress make an appearance that further amplify employees' perceptions of workload (Pavlista et al., 2024; Reif et al., 2021). Harvey et al.'s (2017) meta-review supports these findings by pinpointing high workload as a reliable predictor of fatigue and psychological problems, which carry major organizational costs (Henderson et al., 2011). Taking this into consideration, workload-related strain remains an area of concern in organizational research, warranting further investigation of mechanisms to counterbalance its negative consequences (Sauter et al., 1990).

The Job Demands-Resources (JD-R) model by Demerouti et al. (2001) provides a valuable framework for this investigation, positing that employees' well-being and work performance depend on balancing job demands (e.g., workload) and job resources (e.g., social support). Using the JD-R model, this study addresses the main research question: How does workload influence cognitive fatigue directly, and to what extent does the availability of social support moderate this relationship?

The purpose of this study by using a longitudinal design is to provide evidence-based insights into the dynamics between workload and cognitive fatigue, and to evaluate whether

the availability of social support in this relationship can reduce the negative effects of workload on cognitive fatigue. Moreover, adding to the existing knowledge of the JD-R theory, with the broader goal of contributing to improvements in occupational health psychology.

Workload as a Job Demand

A valuable framework for understanding the dynamics between workload, social support, and fatigue, is the Job Demands-Resources (JD-R) model by Demerouti et al. (2001), which proposes that the well-being and performance of employees are influenced by balancing two pivotal elements: job demands and job resources. According to this model, job demands such as workload indicate aspects of work that need sustained effort, mentally as well as physically and could therefore potentially play a role in causing stress and strain when the ongoing investment in job demands exceed someone's resources. In the health impairment process of this model, this occurs through progressive energy depletion: high demands lead to physiological strain (e.g., elevated cortisol levels), leading to fatigue which over time cascades into being emotionally exhausted, lower performance at work, and other health problems as recovery fails to match the ongoing drain (Bakker & Demerouti, 2007; Demerouti et al., 2001).

Building on this theoretical framework, workload is one of the commonly mentioned stressors by employees according to a meta-analysis by Bowling et al. (2015). Workload can be defined as having to do a lot of work, having to work rapidly, and in a certain amount of time (Ilies et al., 2015). A diary study involving office workers, done by Ilies et al. (2010) found that having a high workload can negatively influence both mental and physical health. They revealed that on days when people had more work to do (high workload), employees tended to feel more stressed and showed increases in blood pressure. According to Ilies et al. (2010) these changes are short-term signs of fatigue and stress, but if high workload continues

over a prolonged period, this could raise the risk of serious health problems such as heart disease and other negative health outcomes.

Sonnentag and Zijlstra (2006) also emphasize that the cognitive demands placed on employees in today's work environment have grown considerably, therefore playing a significant role in the development of fatigue. Building on this and previous empirical studies, Frone and Tidwell (2015) proposed that "work fatigue represents extreme tiredness and reduced functional capacity that is experienced during and at the end of the workday" (p. 274). They define it as a multidimensional construct that can manifest in physical, emotional, and mental (cognitive) domains. When resources are depleted because of meeting work demands, people experience tiredness and a reduced functional capacity, which necessitate rest and recovery to restore (Frone & Tidwell, 2015; Sonnentag & Zijlstra, 2006). In line with the JD-R theory and these previous findings that high workload depletes cognitive resources and manifests as fatigue across mental, physical, and emotional domains (Frone & Tidwell, 2015; Ilies et al., 2010; Sonnentag & Zijlstra, 2006), it is expected that high workload increases the level of cognitive fatigue employees will experience.

Hypothesis 1. Higher levels of workload predict higher levels of cognitive fatigue.

Social Support as a Moderator and the JD-R Model

On the other hand, job resources for example social support, are supportive elements for employees that help them diminish the impact of job demands such as workload while being beneficial for an employee's personal and professional goals (Bakker & Demerouti, 2007). Social support may counteract workload-induced fatigue through emotional and practical aid, thereby acting as a buffer (Beehr et al., 2000; Demerouti, 2023; Hobfoll et al., 2018). However, while the impact of workload on fatigue is widely researched, this buffering role of social support shows complex and inconsistent findings across studies.

Shumaker and Brownell (1984) describe social support as “an exchange of resources between two individuals perceived by the provider or the recipient to be intended to enhance the well-being of the recipient” (p. 11). By reviewing prior research, Cohen and Wills (1985) identified both main effects (social support is beneficial for wellbeing regardless of stress) and buffering effects (social support protects specifically under stress), especially when this support fits the explicit challenge someone faces. Similarly, through meta-analysis Mazzetti et al. (2023) corroborates this finding by confirming that social support can indeed lessen the negative effects of work demands, but the degree of effectiveness depends on alignment with the specific need and situational variables. Contrary to these positive findings regarding social support, Gray et al. (2020) found that unhelpful social support can even have neutral or even adverse effects when misaligned with recipient’s needs. They explain that certain support types can feel intrusive or undermining, or it can even lead to more work, therefore highlighting that social support is not universally beneficial. Hughes et al. (2022) extended this by showing that these effects vary by individual differences, such as self-esteem. Meta-analysis by Viswesvaran et al. (1999) confirms this complexity of social support, while social support independently lowers strain and perceived stressors, it only provides weak buffering effects. Therefore, supporting Gray et al. (2020) and Hughes et al. (2022) that effectiveness relies on support quality, context, timing, and individual differences.

Unlike Gray et al. (2020) who used more distant health outcomes and cross-sectional designs, our study employs a longitudinal diary design (10 workdays) measuring a proximal outcome, cognitive fatigue. Measuring fatigue as a proximal outcome captures immediate strain responses, aligning with Mazetti et al.’s (2023) findings, suggesting that buffering effects are strongest against acute work demands. Moreover, whilst using aggregated data, participants report workload and fatigue daily resulting in a more reliable overall score, rather than just one score with a cross-sectional design. Furthermore, instead of trying to remember

retrospective health in a study like Gray et al. (2020), our study relies on daily experience, which could be more accurate. Taking all of this into account our approach may reveal buffering effects previously missed by other studies. Therefore, leading to the second hypothesis we expect that the availability of social support will act as a buffer against cognitive fatigue.

Hypothesis 2. The positive relationship between workload and cognitive fatigue is moderated by the availability of social support, such that for employees who perceive higher levels of social support the relationship between workload and cognitive fatigue is weaker.

Method

The hypotheses were tested using a longitudinal design, specifically a daily diary design. Firstly, a baseline questionnaire was administered, participants then received an invitation to two daily assessments for two weeks (10 workdays). Prior to data collection, this study was registered at the Ethics Committee Psychology (ECP) of the Faculty of Behavioral and Social Sciences at the University of Groningen [PSY-2526-S-0062].

Participants

Two hundred participants clicked on the link directing them to the baseline questionnaire, 185 participants completed the baseline questionnaire, and 98 participants remained after also completing the daily questionnaires. The participants were asked to fill in two daily questionnaires: one in the afternoon (during their lunch break) and one in the evening (after work). The 98 participants in the final sample were on average 41.8 years old ($SD = 14.33$), 58.2% were female and 41.8% were male. The average of working hours per week was 37.4 ($SD = 8.62$). All participants live in Europe (E.g., The Netherlands or Germany). Education levels ranged from primary school 2%, secondary school 11.2%, (technical) secondary school diploma 16.3%, university degree 63.3%, doctorate degree 4.1% and, other 3.1%. Among the various sectors represented in the sample, participants mainly

work in health and social welfare (24.5%), education and instruction (12.2%), and industry and production (10.2%).

Study Procedure

Participants were recruited by 13 Psychology students from the University of Groningen. Invitations to this study were initially distributed via a Social Media platform, namely Instagram, and via email and WhatsApp to personal contacts, which eventually led to snowball sampling. Participants received an invitation in the form of a digital Flyer or anonymous link. The recruitment started on Monday 27th of October until Monday 10th of November 2025.

By scanning the QR-code on the digital flyer, or by clicking on the anonymous link, participants were redirected to an information sheet on Qualtrics with information about the study, rights and privacy, and the benefits of participating (e.g., chance to win money and getting feedback). On the second page participants were asked for their informed consent. When given consent, the screening criteria were being at least 18 years old and working at least 20 h per week. After this, participants were asked to make up a password for anonymity, provide an email address to receive the two daily questionnaires and answer some questions about demographics. Once this process was completed, the baseline questionnaire began and assessed social support among other variables. Participants then received the two daily questionnaires via email. The afternoon questionnaire was sent out at 11:30, measuring workload, and the evening questionnaire was sent out at 16:00, measuring cognitive fatigue.

Measures

This study was part of a broader study, however since not every measured construct is relevant for the purpose of this study, only three constructs will be mentioned and were measured using validated scales.

Social Support

Social support was measured using three items from Colbert et al. (2016). The items had a 4-point scale ranging from 1 = “never” to 4 = “very often”. A sample item is: “My coworkers help me get my work done.” Cronbach’s Alpha for these three items is .809.

Workload

Workload was measured using three items from Spector and Jex (1998). The items had a 5-point scale ranging from 1 = “strongly disagree” to 5 = “strongly agree”. A sample item is: “Today, my work required me to work really hard.” Cronbach’s Alpha for these three items is .753.

Cognitive Fatigue

Cognitive fatigue was measured using three items from Bono et al. (2013). The items had a 5-point scale ranging from 1 = “strongly disagree” to 5 = “strongly agree”. A sample item is: “How did you feel today? Felt tired or fatigued.” Cronbach’s alpha for these three items is .838.

Analytical Procedure

With the use of IBM SPSS Statistics 29.0.1.0 (171), we ran a multiple regression analysis. The main variables analyzed in this study were social support and workload as independent variables, and cognitive fatigue as the outcome variable. We used aggregated data from the questionnaires, representing the average score per item for the whole week (5 workdays). Then, the three items per variable were merged into one factor, creating one overall mean per variable. We centered our independent variables and multiplied them with one another to investigate a possible interaction-effect between social support and workload on cognitive fatigue.

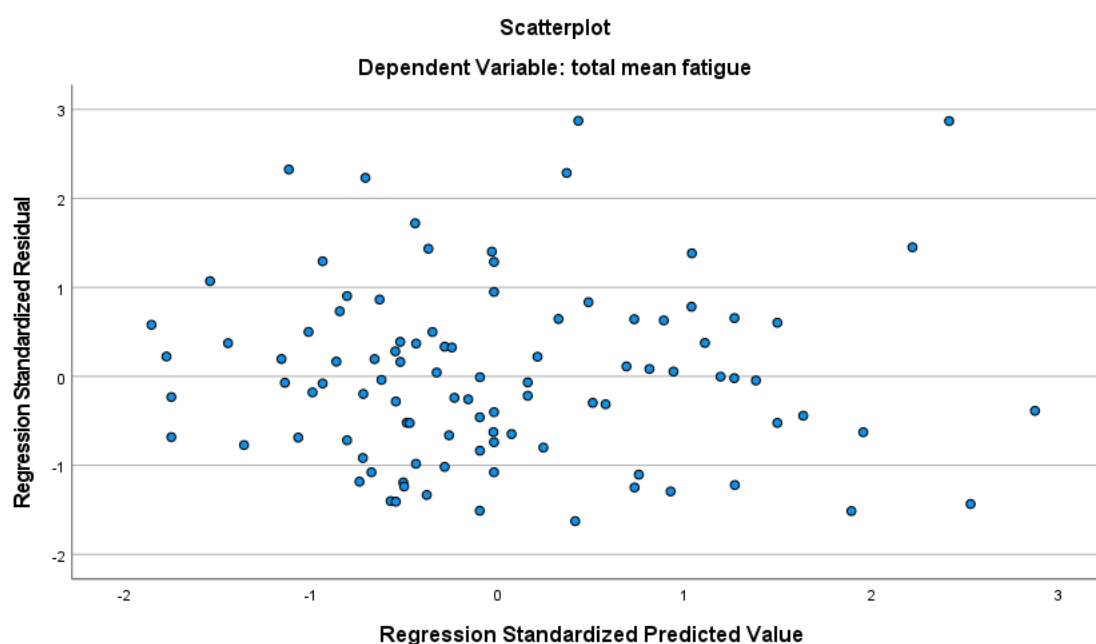
Assumptions for Multiple regression Analysis

Assumptions for multiple regression analysis were examined and there are no indications of major violations of the assumptions linearity, independence, homoscedasticity,

and normality. The Residualplot presented as Figure 1 shows no indication of serious violation of the assumptions linearity and homoscedasticity. The data points are randomly scattered, and no pattern is evident. The residuals appear randomly and evenly scattered across all predicted values.

Figure 1

Residualplot of Cognitive Fatigue

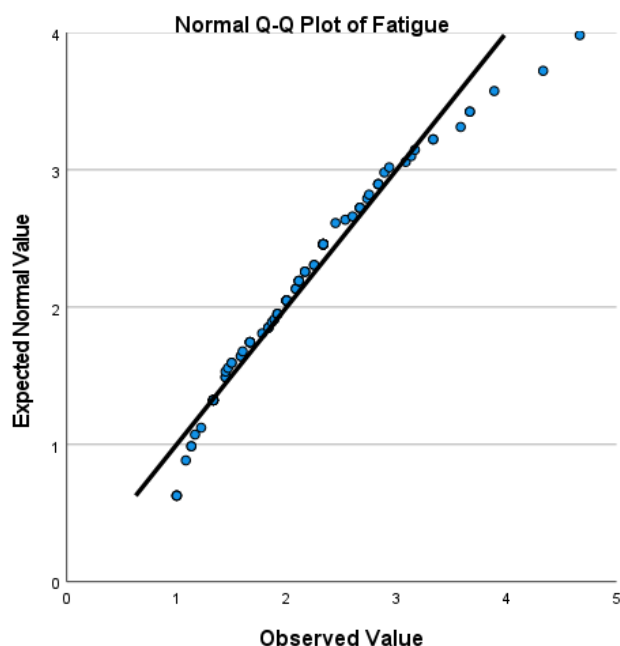


Note. The residuals were plotted against the predicted values.

The Quantile-Quantile plot presented as Figure 2 shows no major violations of the assumption normality, since the standardized residuals closely follow the diagonal line, with minor deviations in the upper tail. No substantial S-shape or curving appears, indicating that the residuals are approximately normally distributed ($n=98$).

Figure 2

Q-Q-plot of Cognitive Fatigue



Additionally, the statistics in Table 1 show that no outliers or influential observations were found, since the standardized residuals did not exceed the absolute threshold value of 3, and the Cook's Distance value did not exceed the threshold of 1 (Agresti & Finlay, 2018). Furthermore, multicollinearity was assessed using the Variance Inflation factor (VIF), with values below 4 considered acceptable. All VIF-values are below 4. The value of workload is 1.065, the value of social support is 1.025, and the value of the interaction term is 1.047. Therefore, there are no indications of violation of multicollinearity.

Table 1

Residual Statistics for Cook's Distance

	<i>Minimum</i>	<i>Maximum</i>
Std. Residual	-1.626	2.873
Cook's Distance	.000	.241

Results

The means, standard deviations, and correlations of the study variables are presented in Table 2. All bivariate correlations were positive, but weak in magnitude ($r = .137$ to $.188$) and nonsignificant ($ps > .064$).

Table 2

Means, Standard Deviations, and Correlations for Study Variables

Variable	<i>M</i>	<i>SD</i>	1	2	3
1. Workload	2.85	0.74	—		
2. Social support	2.85	0.73	.137	—	
3. Cognitive Fatigue	2.13	0.75	.188	.141	—

Note. $N = 98$. Workload and cognitive fatigue were rated on 5-point scales ranging from 1 = *strongly disagree* to 5 = *strongly agree*. Social support was rated on a 4-point scale ranging from 1 = *never* to 4 = *very often*.

* $p < .05$. ** $p < .01$.

Contrary to the first hypothesis, no significant effect was found when examining the multiple regression results in Table 3 (Model 2) ($\beta = .162$, 95% CI [$-.045$, $.371$], $p = .122$). Higher levels of workload did not predict higher levels of cognitive fatigue.

According to the results shown in Table 3 (Model 2), there is also no significant effect between social support and cognitive fatigue ($\beta = .121$, 95% CI [$-.083$, $.332$], $p = .237$). Higher levels of social support did not predict lower levels of cognitive fatigue.

Finally, no significant results were found in this study for the last hypothesis, which suggests a moderation effect of social support on the relationship between workload and fatigue ($\beta = .047$, 95% CI [$-.201$, $.322$], $p = .648$).

The R^2 value for the final model indicates that only 5.1% of the variance in the outcome variable is explained by the predictors in the model. However, the overall model is not statistically significant ($F(3,94) = 1.683, p = .176$).

Table 3

Results of the Multiple Regression Analysis Predicting Cognitive Fatigue

Model	Predictor	<i>b</i>	<i>SE</i>	β	<i>p</i>	95% CI	
						<i>LL</i>	<i>UL</i>
1	Workload	.173	.102	.172	.093	-.029	.376
	Social Support	.121	.104	.118	.247	-.085	.327
2	Workload	.163	.105	.162	.122	-.045	.371
	Social Support	.125	.105	.121	.237	-.083	.332
	Workload x Social support	.060	.132	.047	.648	-.201	.322

Note. N=98. CI = Confidence interval; LL = Lower limit; UL = Upper limit. Stepwise reporting: Model 1 = Main effects only; Model 2 = Main effects + Interaction term.

Discussion

The purpose of this study was to investigate how daily stress experiences at work influenced cognition. Particularly focusing on whether workload directly predicts cognitive fatigue and whether social support buffers this relationship using a longitudinal daily diary design. However, neither workload, nor social support were strong predictors of cognitive fatigue, and no moderation effect of social support was found contrary to expectation derived from the Job Demands-Resources (JD-R) model (Demerouti et al., 2001) and prior research (Cohen & Wills, 1985; Harvey et al., 2017).

Theoretical and Methodological Implications

The first hypothesis derived from the JD-R model and supported by prior studies (Harvey et al., 2017; Illies et al., 2010) expected that higher levels of workload would increase cognitive fatigue levels. However, a significant relationship between cognitive fatigue and workload was not detected in this study suggesting that either the mechanism linking workload to fatigue acts divergently than theorized, or aggregating the data removed the within-person variability necessary to measure a significant relationship, because spikes and dips are flattened. So, while some studies (e.g., Frone & Tidwell, 2015; Illies et al., 2010; Sonnentag & Zijlstra, 2006) were mostly about capturing *day-to-day* processes: days with higher workload led to feeling more fatigued. This study, by averaging five workdays into one overall mean, removed those daily deviations. Besides these methodological explanations, another possible explanation for not finding a significant result is about possible confounding variables and the sample context.

Three items from Spector and Jex (1998) were used to measure workload. While workload frequently has been mentioned as an important stressor (Bowling et al., 2015), this present study did not consider the possibility of confounding variables. It is therefore possible that our non-significant model ($R^2 = .051$, $F(3,94) = 1.683$, $p = .176$) may reflect these unmeasured confounders (e.g., sleep quality; Sonnentag & Zijlstra, 2006) that share variance with the outcome variable fatigue. Thus, suppressing workload's unique effect on fatigue.

Also, our final sample consists of on average middle-aged, highly educated employees, who are largely employed in professional sectors. In a relatively educated and experienced sample, participants may have more adequate coping strategies like improved emotional regulation (Carstensen et al., 2011) and greater resources, making workload more manageable and possibly stopping it from translating into elevated levels cognitive fatigue. According to Carstensen et al. (2011) emotional variability decreases linearly with age, with middle-aged adults generally showing less negative emotional variability than younger adults

(age 18-30). In our middle-aged sample, this reduced variability may be buffering workload's impact on cognitive fatigue by preserving emotional resources that are needed to cope with job demands (Bakker & Demerouti, 2007), thus explaining the non-significant relationship. This suggests that young employees especially (age 18-30) might show significant workload-cognitive fatigue relationships due to amplified stress responses leading to cognitive fatigue.

Furthermore, the initial sample is almost reduced by half. This could indicate that participants who were overloaded or fatigued dropped out, therefore leading to an underrepresentation in the final sample of the very individuals for whom the relationship between workload and fatigue might have been significant.

For the second hypothesis, we expected that the positive relationship between workload and cognitive fatigue would be moderated by social support, such that for employees who perceive higher levels of social support, the relationship between workload and cognitive fatigue is weaker. As previously mentioned, some prior studies suggest a main or buffering effect of social support (Beehr et al., 2000; Cohen & Wills, 1985; Demerouti, 2023; Hobfoll et al., 2018). Contrary to these findings, this present study did not find evidence supporting a moderation effect, nor a significant main effect. Therefore, the results partly align with Sanne et al.'s (2005) findings. Just like this study, Sanne et al. (2005) found no evidence supporting a buffering role of social support, when testing whether social support weakens the negative effects of job demands like high workload. Instead, their findings suggest that social support operates in a more additive way: Demands and resources individually influence the outcome without affecting each other's influence. High workload raises fatigue on its own, social support slightly lowers it on its own, but the effect of workload increasing fatigue remains the same, regardless of social support levels (Sanne et al., 2005). However, whereas Sanne et al. (2005) observed additive main effects, our sample

did not show a direct link between social support and cognitive fatigue, suggesting that social support may not be a uniformly beneficial resource.

This nuance is illustrated by Gray et al. (2020), who found that social support is not always beneficial whilst researching well-intended, but unhelpful social support. They found that unhelpful support types in the workplace can even result in unintended burden or stress, such as imposed help feeling controlling, undependable help creating more work, or partial help that adds to confusion. Hughes et al. (2022) build on this showing these types of unhelpful support can predict strain outcomes, which align with our task-focused support failing to mitigate the relationship between workload and cognitive fatigue. This suggests that the practical task support had a neutral effect or was perceived as unhelpful.

However, these results are different from meta-analytic work indicating that social support can buffer when well matched with an employee's specific need (Mazzetti et al., 2023), suggesting that not finding a buffering effect in this study may also reflect mismatching the type of support measured and demand experienced. This could also be a plausible explanation since this study only used the *task assistance* subscale (Colbert et al., 2016). Cohen and Wills (1985) emphasize that buffering needs functional matching between support provided and stressor experienced, which our narrow form of instrumental support may not have achieved. It could be that in the present study employees needed emotional support, while practical task assistance was given.

While the present study's findings did not reveal the expected buffering effect fitting with the JD-R's health impairment process (Bakker & Demerouti, 2007; Demerouti et al., 2001), they do not invalidate the model. The findings add to the existing literature and suggest a more nuanced view of the JD-R framework, indicating that the role of job resources like social support, are even more complex and depend on interpersonal differences and contextual factors (Cohen & Wills, 1985; Gray et al., 2020; Hughes et al., 2022; Mazzetti et al., 2023).

Moreover, instead of assuming that social support acts as a simple buffer, it may interact with other resources and indirectly influence cognitive fatigue or workload in an additive manner (Sanne et al., 2005).

Limitations

Even though this study had strong points such as longitudinal design, good ecological validity, and using validated scales, some limitations should be mentioned. The first limitation of this study is that a subset of items was used from the Relationship Function Inventory Items by Colbert et al. (2016) rather than the full instrument. The subscale we used focuses on task assistance, whereas the other subscale capturing emotional support was left out entirely. Consequently, the selected items may reflect important parts of the social support construct, but they might not fully capture the entire domain. An important aspect of social support that Shumaker and Brownell (1984) describe is sharing resources to boost the recipient's well-being. The emotional subscale (Colbert et al., 2016), including items like "My coworkers help me cope with stress" and "My coworkers allow me to vent my frustrations," is therefore also relevant by providing affective support rather than practical assistance. Thus, using only task assistance as a subscale may have limited the construct validity of our measure. Therefore, it is possible that the social support variable we used as a resource considering the JD-R theory was not entirely accurate.

The second limitation of our study is that the final sample might have been too small to find an effect ($N=98$), and it consisted mostly of higher educated employees in the Netherlands whom were recruited using *snowball sampling* via our own social network, limiting the generalizability to other populations. Finally, the third limitation, whilst using a longitudinal daily diary design, which is more dependable than a single measurement, the use of aggregated data within this design could also be a limitation. For each participant, the data of five workdays were aggregated into average scores per item and these scores per item were

merged into one overall mean per variable. While this approach made interpretation easier by providing a clear overview of the general levels per variable, it also removed the within-person variation that could show fluctuations over time. As a result, examining temporal dynamics (for example how workload and cognitive fatigue change within the same person across days) was not possible.

Conclusion

Overall, this study concludes that workload and social support were not strong predictors of cognitive fatigue. In addition, no evidence for a moderation effect was found in this study. Considering this study's strengths and limitations, it is recommended that future research should address the current limitations by analyzing raw daily data over a longer period to preserve temporal dynamics lost through aggregation. Furthermore, the sample size should be increased and more heterogeneous to boost power and improve external validity. Finally, future research should examine various sources of social support with improved construct validity, and control for confounding variables.

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Appendix

Use of ChatGPT

ChatGPT was used to obtain information on the formatting of the reference list and to check if all the mentioned referenced in text were also in the correct order in the reference list. ChatGPT was also used to obtain information regarding the meaning of Cronbach's Alpha in Psychology and instructions for SPSS. Prompts used for this purpose were for example: "What does a Cronbach's Alpha of .753 mean in Psychology?" The outcome of this was used for interpretation purposes and as a guideline for running the regression analysis.