

Emotional exhaustion and innovation in the workplace—a longitudinal study

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Abstract: Emotional exhaustion and innovation at work are two major topics of interest to organization researchers, employees and employers. However, working conditions that foster innovation may also heighten employees' emotional exhaustion. By conducting a two-wave, longitudinal online study among the German working population (N=320), we analyzed the longitudinal impact of qualitative overload, unreasonable tasks, social support from a supervisor, and task variety on emotional exhaustion and innovation based on the categorization approach from the job demands-resources model research. Longitudinal structural equation modeling revealed that unreasonable tasks predicted emotional exhaustion ($\gamma=0.111$, $p<0.01$) and that task variety predicted individual innovation ($\gamma=0.126$, $p<0.01$) over time. Social support from a supervisor and qualitative overload, however, did not have any longitudinal influence on either emotional exhaustion or individual innovation. Rather unexpectedly, and in contrast to our hypotheses, no diverging effects from working conditions on emotional exhaustion or innovation could be found. The results demonstrate that the presence of unreasonable tasks impairs employees' psychological well-being and that a high task variety at work leads to innovation. Implications for practice and future studies are discussed.

Key words: Emotional exhaustion, Innovation, Working conditions, Job demands, Job resources, Longitudinal study

Introduction

Two of the most important topics in organizations nowadays are psychological well-being and innovation. Reduced psychological well-being can lead to reduced job performance, higher turnover rates, mental disorders, physical illness, and even morbidity in the long run^{1, 2)}. Therefore, because impaired mental health affects employees' performance, reduced psychological well-being is not only relevant for the employee but also for the organizations. Furthermore, innovation is a source of competitive advantage that is crucial for surviving in today's

competitive environment³⁾. Hence, there is a need for studies to evaluate mental health related and performance aspects simultaneously because organizational culture and structure, individual beliefs and behaviors are intertwined, influence each other and therefore those two aspects cannot be regarded as independent.

One of the chief causes of impaired psychological well-being and innovation in the workplace are working conditions. Even though working conditions can also be referred to as characteristics of the physical working environment, within the present study we concentrate on the psychological aspects according to the Joint German Occupational Safety and Health strategy. Working conditions can promote or inhibit employees' well-being and innovation^{4, 5)}. However, psychological well-being and innovation-goals in organizations might conflict. Two of the few studies that

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have explored the topic of psychological well-being and innovation-goals came to different conclusions. Gunkel *et al.*⁶⁾ on the one hand conducted a cross-sectional case study within the pharmaceutical industry, interviewed 20 employees, explored working conditions that support the development of creativity, and examined the relationship of these working conditions and employees' health. They did not find diverging effects. Hüttges and Moldaschl⁷⁾ on the other hand found evidence within a cross-sectional study of 332 employees from six different companies in the service industries that innovation and psychological well-being-oriented goals in organizations might indeed conflict. We believe that fostering working conditions to attain psychological well-being or innovation should not happen at the expense of either.

Therefore, in order to create work design strategies that enable managers to foster both psychological well-being and innovation, it is important to evaluate the effects that working conditions have on psychological well-being and innovation when they are present simultaneously. Research on this topic lacks systematic grounding in theory, longitudinal evidence and the concurrent inclusion of psychological well-being and innovation. Thus, our research contributes to the literature by examining the simultaneous longitudinal influence of working conditions on psychological well-being and innovation adopting a categorization approach from the job demands-resources (JD-R) model research context⁸⁻¹⁰⁾.

Theory

Research from work and organizational psychology provides a range of theoretical frameworks to study the impact of working conditions on several work-related outcomes.

The job demands-resources (JD-R) model, which builds on earlier theoretical models of industrial psychology research¹¹⁻¹³⁾, structures and simplifies the study of a wide range of working conditions and outcomes regardless of professions^{8, 9)}. In contrast to other theoretical frameworks, within the JD-R model, working conditions and outcomes are not limited to specific factors and the focus is mainly on an individual level. Recent research postulates that "besides providing an evidence-based account for understanding the relationships between resources, demands and work and organisational outcomes, this model provides a paradigmatic approach to the study of organisational variables that influence employees' attitudes and behaviours ..."¹⁴⁾. The core assumptions within the

model are that working conditions can be categorized into job resources and job demands. Job demands may be burdensome when they exceed employees' capabilities^{15, 16)}. Job resources are defined as "...physical, psychological, social, or organizational aspects of the job"⁹⁾ and can support employees' attainment of job goals and personal growth⁹⁾. Furthermore, recent research shows that demands and resources can be further differentiated into social job resources, task-related job resources, challenge job demands and hindrance job demands^{10, 17-19)}. Those different categories of working conditions are supposed to have specific effects on work-related outcomes. Hence, the JD-R model can provide a lens to study effects of working conditions that are relevant for (impaired) well-being as well as performance at the workplace. This will allow researchers to harmonize job resources and job demands to enhance employee well-being and performance.

Similar to the JD-R categorization approach, we focus on four different working conditions within the present study: social support from supervisor, task variety, qualitative overload, and unreasonable tasks. As an indicator for impaired psychological well-being we captured employees' emotional exhaustion. Emotional exhaustion describes a feeling of being emotionally drained by different reasons relevant to work²⁰⁾. However, it has to be noted here that the study's focus is not on mental health in terms of clinically diagnosed mental disorders. Innovation in the present study is defined as "the intentional introduction and application within a role, group or organization of ideas, processes, products or procedures, new to the relevant unit of adoption, designed to significant benefit the individual, the group, the organization or wider society"²¹⁾ and consists of three facets: idea generation, idea promotion, and idea realization.

Job resources in general can promote employees' attainment of job goals and personal growth⁹⁾. According to the conservation of resources theory (COR)¹¹⁾ employees are motivated to protect their resources and acquire new ones. The loss of resources at work in turn is associated with symptoms of burnout and depression²²⁾. In addition to factors related to well-being, COR can also be applied to various aspects of work performance. Several studies have examined the relationship between resources and different forms of job performance²³⁾. Regarding job demands, we expect the different types of job demands to exert diverging effects on well-being and innovation. Challenge job demands are supposed to be instrumental for employees to attain desired performance outcomes because they address employees' competence and curiosity even though

they are energy depleting^{17, 18, 24}). Furthermore, according to the job demand-control-model¹²), the absence of challenges within work may lead to frustration and therefore to reduced performance and quality and to reduced innovation. In the following, the hypotheses relating to the four individual categories of working conditions are derived separately.

Task variety

Task-related job resources such as task variety are presumed to have beneficial effects on innovation because—in terms of job enrichment—an employee has more opportunities to work on different tasks and to use different skills, which is motivating and creates a form of autonomy that is known to raise intrinsic motivation and support identification with a company. Varied tasks are one core aspect of good work and therefore an integral part of occupational safety norms²⁵). Higher task variety, which is defined as work requiring the performance of a wide range of different tasks, should lead to higher innovation²⁶). With regard to mental health it is also assumed that the variety of tasks has a positive influence, because stress and thus the possible risk of emotional exhaustion, according to COR occurs when resources are threatened or lost. Empirical results support these assumptions. Task-related job resources (e.g., task variety) and social job resources (e.g., social support from supervisors) are positively related to psychological well-being and innovation at work^{4, 10, 15, 27–36}). Hence, we postulate the following hypothesis:

H1: Task variety at time point one (a) fosters innovation at time point two and (b) hinders emotional exhaustion at time point two.

Social support

Besides task variety, also social interactions are a core aspect of good work and therefore an integral part of occupational safety norms³⁷). According to work on perceived organizational support, social support from the supervisor represents the extent to which organizations as represented by the supervisor value their employees, which in turn has beneficial effects on performance and well-being³⁸). Empirical studies support this assumption: Studies show that high social support is associated with better mental and better physical health, such as more positive cardiovascular, neuroendocrine and immunological functions^{39, 40}). Regarding innovation, social support is supposed to be important because if supervisors are supportive of and encourage their employees' ideas, the employees are likely

to feel supported and are more likely to be innovative due to a sense of positive reinforcement^{4, 27, 29, 33, 41}). Hence, we postulate the following hypothesis:

H2: Social support at time point one (a) fosters innovation at time point two and (b) hinders emotional exhaustion at time point two.

Qualitative overload

Development opportunities are referred to within criteria for good work²⁵). Qualitative overload is present when there are tasks that are too complicated for an employee. This opens up the opportunity to acquire new skills to address this issue, and as a result, employees achieve personal growth and performance such as innovation. Hence, we believe qualitative overload to be beneficial for innovation^{10, 28, 42}). Although challenge job demands are supposed to be motivational in terms of achieving goals, they are energy depleting over time, which drains psychological resources and therefore fosters emotional exhaustion, burnout, and anxiety^{18, 43–46}). Hence, we postulate the following hypothesis:

H3: Qualitative overload at time point one fosters (a) innovation at time point two and (b) emotional exhaustion at time point two.

Unreasonable tasks

In contrast to challenge job demands, hindrance job demands such as unreasonable tasks are supposed to restrict personal growth and achievement^{5, 18}). Unreasonable tasks are a prevailing example for hindrance job demands. Unreasonable tasks are tasks that an employee believes go too far and should not be expected from the employee and therefore imply a threat to the employee's professional identity^{47, 48}). In contrast to extra role behavior, which originates mainly from an intrinsic motivational component, illegitimate tasks are brought to the employees from the outside; for example by the supervisor. Employees do not independently search for such tasks on their own initiative. Research shows that this fairly new stressor concept explains variance beyond established stressors⁴⁹). Employees are likely to believe that very little in terms of personal effort could help them to overcome these hindrances because they are not within the employees' sphere of influence. Furthermore, unreasonable tasks predicted low self-esteem and feelings of resentment towards one's organization⁴⁹). Therefore, the motivating nature of challenge job demands does not apply to hindrance job demands and therefore hindrance job demands inhibit performance⁵⁰). Regarding psychological well-being,

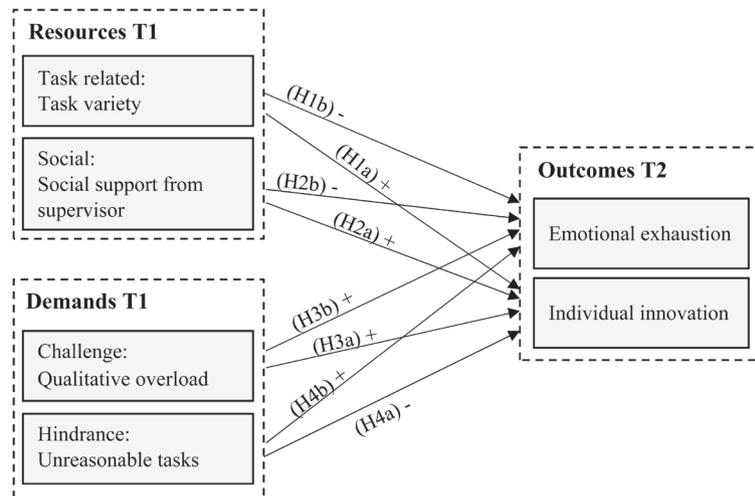


Fig. 1. Research model.

challenge job demands and hindrance job demands are both presumed to be detrimental. Research that simultaneously differentiated challenge job demands, hindrance job demands, and job resources underpins those assumptions: challenge job demands and hindrance job demands were positively related to emotional exhaustion, whereas job resources had a negative relationship with emotional exhaustion⁵¹). Hence, we postulate the following hypothesis:

H4: Unreasonable tasks at time point one (a) hinder innovation at time point two and (b) foster emotional exhaustion at time point two. Figure 1 illustrates the hypotheses of this study.

Method

Participants and procedure

We collected data at two time points (T1 and T2) 12 months apart, by a panel data institute within the context of the project “Innovation capacity within demographic change” via two online surveys. The present study was a non-interventional survey and approved by the ethical committee of the German Psychological Society (DGPs, application EB_052013). Participants were told they were free to withdraw at any time. The panel data institute provides a heterogeneous sample from various industries (e.g., information technology, media and advertising) and guarantees data quality according to recent ESOMAR standards.

ESOMAR guidelines set ethical and professional conduct standards with strict adherence to regional, national and local codes of conduct, laws or regulations. It ensures that researchers adhere to their ethical, professional and

legal responsibilities regarding all processes involved in research, regarding research participants’ data as well as regarding their clients and organizations. Both of the surveys contained the same scales, and the participants were matched using an anonymous code created by the participants themselves. The participants received a small payment as reward in the form of later redeemable credit points, which can be converted into money or voucher. At T1, 781 people participated in the study, and at T2, 354 people participated. Only people who took part in both surveys were included in the analyses. Due to the lack of supervisors at work, some participants had to be excluded from further calculations. The final sample included 320 workers. T-tests revealed that the samples at T1 and T2 did not exhibit significant differences regarding sociodemographic aspects (age and gender), industry sectors or working conditions (task variety, social support, qualitative overload, illegitimate tasks). We therefore concluded that no selective dropout had occurred. Of the final sample, 170 workers were female (53.1%) and 150 were male (46.9%). The average age was 44.88 yr (SD=11.10). Regarding the highest educational background, seven participants were untrained (2.2%), 200 had completed vocational training (62.5%), 107 had attained a university education (33.5%), and five had earned a PhD (1.6%). One participant did not provide information about education (0.3%). The companies involved differed in size as follows: 57 participants worked in companies with fewer than 20 employees (17.8%), 29 worked in companies with between 21 and 50 employees (9.1%), 85 worked in companies with between 51 and 250 workers (26.6%), 36 worked in companies with between 251 and 500 (11.3%)

workers, and 113 worked in companies with more than 500 employees (35.3%). The industries in which the participants worked differed widely, from trading (15.6%), social services (13.4%), processing trade (12.5%), insurance (7.2%), logistics (6.9%), information technology (5.9%), construction business (4.4%), hotel and restaurant industry (3.8%), education (2.8%), civil service (2.5%), research (1.3%), publishing industry (1.3%), health and marketing (0.6%), housing (0.6%), and energy supply (0.3%) to others (20.9%).

Measures

All working conditions, outcome measures and control variables included in the present study are recorded using validated scales and described below. Task variety (task-related job resource) was measured using four items from the Work Design Questionnaire (WDQ)^{52, 53}. An example item is “The job requires the performance of a wide range of tasks”. Answers could be given on a five-point scale from 1= I don’t agree at all to 5= I totally agree. Social support from supervisor (social job resource) was measured using the social support scale of the Salutogenic Subjective Work Analysis (SALSA)⁵⁴. Because of economic reasons and based on best item selectivity, we chose three items. An example item is “How much is your supervisor willing to listen to your work related problems?” Answers could be given on a five-point scale from 1= not at all to 5= totally. Qualitative overload (challenge job demand) was measured using a three-item scale of the SALSA⁵⁴. The response options used a five-point scale ranging from 1= almost never to 5= almost always, and an item example is “There are tasks at work that are too complicated”. Unreasonable tasks (hindrance job demand) were measured using the Bern Illegitimate Tasks Scale (BITS)^{47, 48}. The scale includes four items that are answered on a five-point scale (1= never; 5= frequently). An example is “Do you have work tasks to take care of, which you believe are going too far, and should not be expected from you?”. Innovation was measured using a nine item scale^{34, 55, 56}. It consists of three facets: idea generation, idea promotion, and idea realization. An item example is “Please indicate how often you generate original solutions for problems?” (1=never; 5=always). Emotional exhaustion was measured using nine items of the Maslach Burnout Inventory (MBI)^{57, 58}. Answers could be given on a scale ranging from 1= several times per year or less to 6= every day. An example item is “I feel used up at the end of the workday”. We included sex and age as control variables. In the preliminary analyses, we also controlled

for working hours but did not include them further because they were not substantially related to the outcome variables ($p>0.05$). In general, we prefer a rather limited approach to using control variables, because recent research showed that the overuse of control variables might lead to misinterpreted results⁵⁹.

Analyses

To obtain basic insight into our data, we conducted descriptive and correlational analyses. Before we tested our hypotheses, we tested for measurement invariance to ensure that the second-order factor structure is equivalent across the two time points and that it was feasible to apply longitudinal structural equation modeling to our sample. Testing for measurement invariance involves four steps and three additional aspects when testing for measurement invariance of higher order constructs^{60, 61}.

1. First, the test for configural invariance. This test is a qualitative rather than a quantitative step. The relations between the indicators and constructs should have the same pattern at each time point.

2. Second, the test for weak factorial invariance. Within this step, one tests whether the corresponding loadings across the time points are equal by constraining them to be equal and checking the model fit.

3. Third, within the test for strong factorial invariance, the corresponding intercepts of the indicators are constrained to be equal across the time points.

4. The fourth test is for strict factorial invariance, in which the residual variances of the indicators are constrained to be equal across the time points.

5. Three additional aspects should be considered when testing for measurement invariance of higher order constructs such as individual innovation in this study⁶¹: weak factorial invariance (loadings equal across measurement occasions) needs to be tested for the first-order factors and for the second-order factors. Additionally, the strong invariance needs to be tested for the first-order factors as well as for the measured variables (intercepts equal across measurement occasions). The third aspect is the need to test for the invariance of the disturbances of the first order factors.

To test our hypotheses, we used longitudinal structural equation modeling (SEM) and adapted the procedure recommended by Little⁶⁰ and de Lange *et al*⁶². We tested a baseline model versus three competing nested models, which were as follows:

1. Stability model (M1). In this model, estimates from the T1 variables onto their related T2 counterparts were

Table 1. Range, mean, standard deviation and Cronbach's α of the study variables

	Range	T1			T2		
		M	SD	α	M	SD	α
Task variety	1–5	3.67	0.85	0.89	3.66	0.81	0.88
Social support supervisor	1–5	3.44	1.03	0.91	3.44	1.00	0.90
Qualitative overload	1–5	2.32	0.89	0.86	2.29	0.87	0.85
Unreasonable tasks	1–5	2.29	0.85	0.88	2.23	0.88	0.90
Individual innovation	1–5	2.65	0.72	0.94	2.61	0.77	0.95
Emotional exhaustion	1–6	2.53	1.24	0.93	2.42	1.19	0.93
Age	20–75	44.88	11.10	-	45.82	11.10	-
Sex			170 female, 150 male				

N=320; M: mean; SD: standard deviation; α : Cronbach's α ; T1: time point one; T2: time point two.

calculated. This model is used as the reference model.

2. Causation model (M2). Cross-lagged structural paths from the T1 working conditions to the T2 outcomes (emotional exhaustion and individual innovation) are specified.

3. Reversed causation model (M3). Cross-lagged structural paths from the T1 outcomes (emotional exhaustion and individual innovation) to the T2 working conditions are specified.

4. Reciprocal causation model (M4). Both cross-lagged structural paths specified in Model 2 and Model 3 are entered into one Model.

The models were evaluated using different fit indices: the Satorra-Bentler scaled chi-square (χ^2)⁶³, the comparative-fit-index (CFI), the Tucker-Lewis-index (TLI), the root mean square error of approximation (RMSEA), and the Akaike information criterion (AIC). We used the Satorra-Bentler corrected χ^2 difference test to compare the different models. The χ^2 should not be significant, the RMSEA should be smaller than 0.06 to indicate good fit, and the CFI and TLI should be above 0.95 to indicate a good fit⁶⁴. One should bear in mind that the cut-off criteria for the fit indices are guidelines rather than rules and the χ^2 test in particular is sensitive to sample size⁶⁵. This is also true for the performance of the χ^2 difference test. Additionally, goodness-of-fit indexes should be used to evaluate the models because the χ^2 is affected by large sample sizes. The control variables were entered following the procedure advocated by Little⁶⁰: the direct effects of age and sex were estimated only for the T1 constructs because “this way of including covariates has some appeal for longitudinal models because it assumes that once the initial differences in the covariates are accounted for, the downstream effects begin to dissipate as time continues to pass...”⁶⁰. Furthermore, control variables were included only when they exhibited a significant effect. For param-

eter estimation, we used the maximum likelihood estimator (MLM) with robust standard errors and Satorra-Bentler scaled test statistics^{63, 66}. All the reported estimates are standardized. We used the statistics program *MPlus* (Ver. 7.0)⁶⁷ for the analyses.

Results

Means, standard deviations, and internal consistencies (Cronbach's α) are presented in Table 1. Table 2 shows the correlation of all the study variables. All the working conditions at T1 correlate significantly with individual innovation at T2: Task-related job resources (task variety) at $r=0.31$, $p<0.001$, social job resources (social support supervisor) at $r=0.14$, $p<0.05$, challenge job demands (qualitative overload) at $r=0.25$, $p<0.001$, and hindrance job demands (unreasonable tasks) at $r=0.16$, $p<0.01$. Except for hindrance job demands, the correlations are in the expected pattern. Regarding emotional exhaustion at T2, all the working conditions at T1, except task variety, correlate significantly and in the expected direction (task variety at $r=-0.05$, n.s., social support supervisor at $r=-0.31$, $p<0.001$, qualitative overload at $r=0.42$, $p<0.001$, and unreasonable tasks at $r=0.47$, $p<0.001$). We performed a confirmatory factor analysis (CFA) comparing a two-factor model (items load on one main job resource factor and one main job demands factor) against a four-factor model (items load on two different job resource factors and two different job demands factors). The results indicate a substantially better fit for the four-factor model (χ^2 (322)=715.79, $p<0.001$, RMSEA=0.06, TLI=0.92, CFI=0.93) than for the two-factor model (χ^2 (349)=2933.34, $p<0.001$, RMSEA=0.15, TLI=0.52, CFI=0.58, $\chi^2_{diff}=1994.37$, $\Delta df=27$, $p<0.001$), which confirms the theoretical assumption of four independent categories of working conditions.

Longitudinal testing of the hypotheses

Measurement invariance

In comparing the fit of the different measurement invariance models, the χ^2 difference test, the change in the CFI and the AIC are used. Little⁶⁰⁾ proposed that change in the CFI is the best way to evaluate measurement invariance because the χ^2 difference test is too sensitive. A change in the CFI of less than 0.01 indicates that the assumption of invariance is tenable. All the models reveal a good fit (Table 3). Model 7, which displays the strongest invariance, fits the data well ($\chi^2=2587.766$, $df=1811$, $p<0.001$; CFI=0.950; RMSEA=0.037). The χ^2 value is significant, but as mentioned above, this should not result in rejection of the model. Instead, other fit indices should be taken into account to differentiate the models. The comparison of model 1 to model 6 shows that the CFI change is less than 0.01 and that the AIC is the smallest for model 7 (AIC=43889.624). Therefore, we are confident in assuming factorial invariance.

Model testing

Next, we tested the hypotheses following the procedure advocated by de Lange *et al*⁶²⁾. We tested four competing models as described in the Method section. First, the stability model (Model 1) was specified. This model is used as the reference model. Second, we tested the causation model (Model 2), then the reversed causation model (Model 3), and finally we tested the reciprocal model (Model 4). Table 4 displays the model fit indices of the structural equation models.

The results indicate that all the models exhibit a good fit (Table 4). The stability estimates range between 0.646 for unreasonable tasks, 0.656 for qualitative overload, 0.690 for task variety, 0.704 for social support, 0.707 for emotional exhaustion, and 0.705 for individual innovation. To evaluate which model best fits the data, we once again conducted difference tests for the competing models (Table 5). Every model is tested against the stability (baseline) model (M1). The results show that the χ^2 difference tests are significant. However, the changes in CFI are <0.01 for every comparison. Because the AIC is the smallest for the causality model (M2; AIC=43842.899), we considered the causality model as our final model ($\chi^2=2826.523$, $df=1951$, $p<0.001$; CFI=0.945; RMSEA=0.037).

Hypothesis 1a stated that task-related job resources, specifically task variety, foster innovation. This hypothesis can be supported ($\gamma=0.126$, $p<0.01$, Fig. 2). Hypothesis 1b stated that task-related job resources hinder emotional exhaustion. This hypothesis cannot be supported. Task

Table 2. Correlations between study variables

	1	2	3	4	5	6	7	8	9	10	11	12	13
1 Task variety T1													
2 Task variety T2	0.64***												
3 Social support: Supervisor T1	0.20***	0.16**											
4 Social support: Supervisor T2	0.11*	0.17**	0.67***										
5 Qualitative overload T1	0.16**	0.15**	-0.21***	-0.14*									
6 Qualitative overload T2	0.13*	0.22***	-0.12*	-0.13*	0.62***								
7 Unreasonable tasks T1	0.12*	0.11	-0.29***	-0.26***	0.68***	0.48***							
8 Unreasonable tasks T2	0.09	0.10	-0.20***	-0.29***	0.49***	0.65***	0.63***						
9 Individual innovation T1	0.29***	0.29***	0.20***	0.12*	0.21***	0.11*	0.14*	0.08					
10 Individual innovation T2	0.31***	0.34***	0.14*	0.18*	0.25***	0.15**	0.16**	0.13**	-0.65***				
11 Emotional exhaustion T1	-0.04	-0.03	-0.38***	-0.32***	0.53***	0.40***	0.57***	0.43***	-0.02	0.08			
12 Emotional exhaustion T2	-0.05	-0.02	-0.31***	-0.38***	0.42***	0.49***	0.47***	0.55***	0.02	0.10	0.69***		
13 Age	0.08	0.12*	0.02	0.08	-0.06	-0.07	-0.17**	-0.19**	0.11	0.09	-0.24***	-0.22***	
14 Sex ^a	0.00	-0.06	0.09	0.09	0.04	-0.03	-0.05	-0.08	0.14*	0.19**	-0.11**	-0.08	0.17**

T1: time point one, T2: time point two. ^a 1: female; 2: male. N=320.

* $p<0.05$, ** $p<0.01$, *** $p<0.001$.

Table 3. Model fit indices for testing measurement invariance of the longitudinal model

Model	χ^2	Df	Model comparison	$\Delta\chi^2$	Δdf	CFI	ΔCFI	TLI	RMSEA	RMSEA CI	PCI	RMSEA (90%)	AIC
MI-Model 1: configural invariance	2,501.397	1,726				0.950	---	0.945	0.037	0.034-0.041		1.00	43,960.444
MI-Model 2: first-order factor loadings invariant	2,437.746	1,701	M1 vs. M2	65.9395***	25	0.952	0.009	0.947	0.037	0.033-0.040		1.00	43,945.141
MI-Model 3: first- and second-order factor loadings invariant	2,532.106	1,751	M2 vs. M3	96.5726***	50	0.949	0.003	0.945	0.037	0.034-0.040		1.00	43,939.540
MI-Model 4: first- and second-order factor loadings and intercepts of measured variables invariant	2,548.239	1,774	M3 vs. M4	15.2208	23	0.950	0.001	0.947	0.037	0.034-0.040		1.00	43,908.440
MI-Model 5: first- and second-order factor loadings and intercepts of measured variables and first-order factors invariant	2,548.480	1,776	M4 vs. M5	0.0035	2	0.950	<0.001	0.947	0.037	0.034-0.040		1.00	43,904.480
MI-Model 6: first- and second-order factor loadings, intercepts, and disturbances of first-order factors invariant	2,547.067	1,779	M5 vs. M6	0.3385	3	0.950	<0.001	0.947	0.037	0.033-0.040		1.00	43,899.101
MI-Model 7: first- and second-order factor loadings, intercepts, disturbances of first-order factors, and residual variances of measured variables invariant	2,587.766	1,811	M6 vs. M7	41.6286	32	0.950	<0.001	0.948	0.037	0.033-0.040		1.00	43,889.624

All χ^2 values are significant at $p < 0.001$; χ^2 difference values are Satorra-Bentler corrected because an MLM estimator was used; M: measurement invariance; χ^2 : Satorra-Bentler scaled χ^2 ; df: degrees of freedom; $\Delta\chi^2$: difference in χ^2 values; Δdf : difference in degrees of freedom; CFI: comparative fit index; ΔCFI : difference in comparative fit index values; TLI: Tucker-Lewis index; RMSEA: root mean square error of approximation; CI: confidence interval; AIC: Akaike information criterion; N=320.

*** $p < 0.001$.

Table 4. Fit indices for nested sequence of longitudinal models

Model	χ^2	df	CFI	TLI	RMSEA (CI 90%)	PCI	RMSEA (90%)	AIC	R ²
SEM-Model 1 (M1): Stability Model (baseline model)	2,848.501	1,960	0.944	0.942	0.038 (0.035-0.041)		1.00	43,847.293	II: 49.7 EE: 49.9
SEM-Model 2 (M2): Causality Model	2,826.523	1,951	0.945	0.943	0.037 (0.034-0.040)		1.00	43,842.899	II: 51.7 EE: 51.0
SEM-Model 3 (M3): Reversed Causation Model	2,822.289	1,947	0.945	0.943	0.037 (0.034-0.040)		1.00	43,847.088	II: 50.4 EE: 52.8
SEM-Model 4 (M4): Reciprocal Model	2,813.987	1,943	0.945	0.943	0.037 (0.034-0.040)		1.00	43,846.536	II: 52.1 EE: 53.3

All χ^2 values are significant at $p < 0.001$; SEM: structural equation model; χ^2 : Satorra-Bentler scaled χ^2 ; df: degrees of freedom; CFI: comparative fit index; TLI: Tucker-Lewis index; RMSEA: root mean square error of approximation; CI: confidence interval; AIC: Akaike information criterion; R²: total amount of variance of specific variable explained by the model; II: individual innovation; EE: emotional exhaustion. We controlled for age and sex. N=320.

Table 5. χ^2 difference tests of the competing longitudinal models

Model		$\Delta\chi^2$	Δdf	ΔCFI
M1 vs. M2	Stability Model vs. Causality Model	22.5645**	9	---
M1 vs. M3	Stability Model vs. Reversed Causation Model	26.7742*	13	0.001
M1 vs. M4	Stability Model vs. Reciprocal Causation Model	35.2009**	17	<0.001

χ^2 difference values are Satorra-Bentler corrected because an MLM estimator was used; $\Delta\chi^2$: difference in χ^2 values; Δdf : difference in degrees of freedom; ΔCFI : difference in comparative fit index values; N=320.

* $p < 0.05$, ** $p < 0.01$.



Fig. 2. Final longitudinal structural equation model (Model 2: Causality model). Residual variances among the corresponding indicators at time points 1 and 2 were allowed to associate but are not shown here for reasons of clarity. T1: time point one; T2: time point two. N=320.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$, n.s.: not significant.

variety does not hamper emotional exhaustion ($\gamma = -0.033$, *n.s.*). Hypothesis 2a stated that social job resources, specifically social support from a supervisor, foster innovation. This hypothesis must also be rejected ($\gamma = 0.008$, *n.s.*). Hypothesis 2b stated that social job resources hinder emotional exhaustion. This hypothesis must be rejected as well ($\gamma = -0.050$, *n.s.*). Hypothesis 3a stated that challenge job demands, respectively qualitative overload, foster innovation. The results show that this hypothesis cannot be supported ($\gamma = 0.112$, *n.s.*). However, there are effects on the 10% level. Hypothesis 3b stated that challenge job demands foster emotional exhaustion. This hypothesis cannot be supported either ($\gamma = 0.006$, *n.s.*). Furthermore, hypothesis 4a stated that hindrance job demands, specifically unreasonable tasks, hinder innovation. This hypothesis must be rejected ($\gamma = -0.019$, *n.s.*). Finally, hypothesis 4b suggested that hindrance job demands foster emotional

exhaustion. As shown in Fig. 2, this hypothesis is supported ($\gamma = 0.111$, $p < 0.01$).

To summarize, unreasonable tasks positively predict emotional exhaustion, and task variety positively predicts individual innovation. Therefore, hypotheses 1a and 4b are supported. The other hypotheses have to be rejected.

Discussion

Summary

Psychological well-being and innovation are two important topics within organizational research^{2, 3}). Therefore, identifying working conditions that promote psychological well-being and innovation is relevant. Research on this topic lacks longitudinal evidence and the concurrent inclusion of psychological well-being and innovation. Our research contributes to the literature by examining the

simultaneous longitudinal influence of social support from a supervisor, task variety, qualitative overload, and unreasonable tasks on emotional exhaustion and innovation.

First, our results confirm the theoretical assumption of four independent categories of working conditions (social job resources, task-related job resources, challenge job demands and hindrance job demands). Consistent with our hypotheses, longitudinal structural equation modeling shows that unreasonable tasks increase emotional exhaustion and that task variety enhances innovation. In contrast to our assumption, there are no significant effects of qualitative overload on either emotional exhaustion or innovation. The influence of qualitative overload on innovation has effects at a 10% level only. Furthermore, also in contrast to our hypotheses, social support from a supervisor does not exert any effects on emotional exhaustion or innovation, and no diverging effects from working conditions on emotional exhaustion and innovation are found.

It might be that challenge job demands such as qualitative overload exert a negative influence on psychological well-being only when resources are too low or only on employees with a specific disposition; for example, those with low self-esteem. Personal resources—like self-esteem—might affect the perception of job demands and their handling by the employee⁶⁸). Personality traits such as honesty-humility were also examined as potential moderators in this context. The authors' hypotheses could be confirmed: In individuals with high levels of honesty-humility, job demands are more likely to produce negative consequences such as emotional exhaustion than in individuals with little or no such personality traits⁶⁹). Mediation effects have also been described in this context: Ceschi *et al.*⁷⁰) found that resources such as resilience mediated the relationship between job demands and emotional exhaustion. This is an interesting starting point for future studies: do employees make a virtue out of necessity and in certain circumstances, as a consequence of high job demands, develop qualities (like resilience) that allow them to better handle the requirements? Alternatively, it may be that qualitative overload exerts a positive influence only until a certain level of challenge is achieved, and therefore non-linear effects would need to be evaluated. Adler and Koch¹⁰) also in contrast to their assumption, found that qualitative overload did not influence innovation. As hypothesized, social support seems not to be less in the present study, not at all important to innovation than task variety. It might be that social aspects are relevant for innovation only in the absence of stimulating task-related working conditions. The result that only task

variety influences innovation and only unreasonable tasks influence emotional exhaustion, however, is consistent with the assumptions included in a previous version of the JD-R model. This version of the JD-R model postulates two paths through which work relevant criteria can be influenced: the motivational path and the health-impairing path. The motivational path is presumed to promote positive outcomes such as innovation. The health-impairing process is presumed to lead to negative outcomes such as (ill) health⁸). Even though recent research postulates that those two paths are not mutually exclusive, this is not the case for the present study. It may be that when statistically evaluated together, these initially postulated paths suppress other potential effects, which explains why no diverging effects could be found.

Furthermore, no reversed or reciprocal effects were found. When comparing different longitudinal SEM-models, one tests different types of models against each other: a causality model, a reversed causation model and a reciprocal causation model. In the present study, the simple causality model without reversed or reciprocal effects fitted slightly better than the others. To decide which of those models fits the data best, common fit indices are used such as the χ^2 test, the χ^2 difference test, AIC, CFI, and the RMSEA. The interpretation of these fit indices within longitudinal structural equation modeling, however, can be problematic. Cut-off criteria for the fit indices appear to be guidelines rather than rules. Therefore, a combination of different fit indices are the method of choice. However, the different fit indices can be contradictory, and the χ^2 test and the χ^2 difference test are particularly sensitive to sample size⁶⁵). One must choose the most adequate indices to interpret the results. In the present study, we chose the CFI as recommended by Little⁶⁰) as the most adequate indicator of model fit. This led us to choose the normal causality model as the best fitting model. However, the two competing models (reversed causation and reciprocal causation) fit only slightly worse. This finding, however, is consistent with most of the longitudinal research on the JD-R model: causal effects could be found, but there was no evidence of reversed effects^{71, 72}). However, de Lange *et al.*⁶²) found evidence for reciprocal relationships, but the reversed crossed-lagged effects were weaker than the normal cross-lagged effects.

As a time lag, we chose one year as advocated by de Lange *et al.*⁶²), who compared different time lags for studying causal relationships between work characteristics and psychological well-being. Innovation involves the development of new ideas, processes, products or

procedures²¹⁾, which may take a relatively long time to unfold. This means that for conducting research on the longitudinal effects of working conditions on innovation, a long time lag may be suitable. There is a paucity of longitudinal research on the link between working conditions and innovation, resulting in little specific information about suitable time lags for studying these possible causal relationships. Therefore, we use a time lag of one year to obtain knowledge about the temporal effects between working conditions and innovation. However, a potential reason for the absence of reversed or reciprocal effects is that psychological well-being and innovation may occur within different time lags. Regarding psychological well-being working conditions—especially job demands—might accumulate over time and in the long run lead to burnout. Furthermore, job demands and job resources might differ concerning this matter, and effects therefore might be under- or overestimated. Future studies regarding working conditions, psychological well-being, and innovation therefore should evaluate other time lags and might even capture the relevant variables during more than two time points to investigate this issue.

Strengths and Limitations

One of the main strengths of the present study is its longitudinal study design and the use of longitudinal structural equation modeling, which allows us to make causal assertions. Longitudinal structural equation modeling has advantages when analyzing longitudinal data: it is a combination of a measurement and a structural model, it is robust against the violation of non-normality, measurement errors can be included, fit indices are provided and control variables can be included⁶⁴⁾. The longitudinal SEM enables us to identify the effects of task variety on individual innovation and of unreasonable tasks on emotional exhaustion even after controlling for the initial state. The concurrent inclusion of emotional exhaustion and innovation in a longitudinal study design is another benefit of this study.

Our chosen sample is a double-edged sword: On the one hand, the sample consists of many job types, ages and educational backgrounds, and therefore the results are not restricted to a specific category of workers. On the other hand, our data are based on online self-report data. This leads to a higher risk of self-report bias and common method bias. However, most of the problems related to using self-report-data occur in cross-sectional study designs, whereas this is negligible in the present study⁷³⁾, and a meta analysis shows that subjective and objective

measures of innovation do not exhibit differences in correlations with working conditions⁴⁾. Nonetheless, it must not go unmentioned. Furthermore, we conducted this study within the German working population and selected a set of working conditions. Future studies should investigate whether our results can be replicated in other nations; they should also analyze different working conditions than those in the present study because even though we are confident that we selected working conditions that are relevant to psychological well-being and innovation, there are of course other working conditions of interest. Last but not least, people who are truly suffering from emotional exhaustion might not fill in online questionnaires. The healthy worker effect (employees have to be relatively healthy to be employable; therefore, the actual excess in morbidity might be concealed⁷⁴⁾) is a well-known problem within occupational research and might lead to an underestimation of the relationships between working characteristics and emotional exhaustion.

Practical implications

To eliminate potential threats for employees' psychological well-being, managers should attempt to eliminate hindrance job demands such as unreasonable tasks. Unreasonable tasks can be decreased by work design strategies. If there is no way to avoid unreasonable tasks (for example, when an employee is ill and a co-worker has to assume her/his duties), managers should acknowledge this situation and display their awareness of the inappropriate but nonetheless inevitable situation. This may help to avoid offense. By doing so, the employee feels that he/she is taken seriously, and the potential threat of unnecessary tasks can be reduced or even eliminated^{75, 76)}. To promote innovation, managers should increase task-related job resources such as task variety. Task variety can be strengthened by job design techniques such as job enlargement. But to avoid only pumping up the workload, supervisors have to ensure they simultaneously enlarge employee' autonomy at work. This also enables employees to craft their own resources by practicing job crafting⁷⁷⁾. Job crafting is a promising technique to change workplace attributes. It means self-initiated change behaviors at work in order to align jobs with personal preferences and skills. Hence, job crafting yields potential to individualize job redesign. Employees can be supported to exhibit job crafting by training that reflects past job crafting behavior and forces goals for future job crafting, and employee coaching⁷⁸⁾. Of course, this can only happen against the background of the necessary structures provided by the organization and must not

be seen as the sole responsibility of the employee. In contrast to former studies' conclusions¹⁷⁾, we cannot advise managers to increase challenge job demands because there were no significant effects from qualitative overload on either emotional exhaustion or innovation. The effect from qualitative overload on innovation is significant at the ten percent level only. Social support from a supervisor also did not have an effect on emotional exhaustion or innovation. Therefore, we cannot provide any advice in terms of how to manage social job resources.

Implications for future research

In the present study, we were not able to assess the underlying phenomena causing job demands and job resources to influence emotional exhaustion and innovation. The JD-R model aims to explain what influences different criteria and not why. To understand the underlying mechanisms causing those influences, an integrative approach to the JD-R model and other theories that provide more arguments to explain the reasons underlying those processes—for example, the expectancy value theory²⁴⁾—might be fruitful. Future studies should pay attention to this point and integrate different theories. Furthermore, we acknowledge that employee well-being does not only mean the absence of ill-being. Future studies should include a positive indicator for psychological well-being and assess whether this indicator uncovers different effects. Also, future research should also evaluate whether industry-specific effects exist, because, for example, even if there were no correlations in this study, other working conditions could be relevant in fields of the social context than, for example, in the manufacturing industry. Furthermore, consideration of working conditions should be broadened from the micro to the macro level, and working conditions should be considered not only at the individual level but also, for example, at the organizational level.

Additionally, there are some issues of a methodological nature: future studies should test for non-linear effects regarding challenge job demands and evaluate whether different time lags influence the effect of job demands and job resources on psychological well-being and innovation. Furthermore, it may be that job demands and job resources exert effects over different time spans. The appropriate use of fit indices in longitudinal structural equation modeling is another issue which has yet to be resolved.

To conclude, further in-depth research is needed to explain the longitudinal influences of working conditions on psychological well-being and innovation.

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