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Individual health status as a resource: Analyzing associations between perceived illness symptom severity, burnout, and work engagement among employees with autoimmune diseases

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Abstract

Epidemiological data suggest that the prevalence of autoimmune diseases is increasing. Although evidence implies that people with chronic illnesses experience higher levels of burnout, there are few available insights for developing preventative interventions. This paper builds on the conservation of resources (COR) and the job demands–resources (JD-R) framework to investigate the association between impaired health, burnout, and work engagement. In two studies, we research the role of health status as a resource, respectively, autoimmune illness symptom severity as a diminished resource, and investigate its variance explanation in burnout and work engagement above and beyond the effects of job demands and resources. Study 1 investigated the hypotheses among 87 employees with inflammatory bowel diseases. Controlling for job demands and resources, symptom severity was positively associated with (exhaustion) burnout and negatively associated with work engagement. In Study 2, we applied mixed model analyses using a sample of 129 employees with multi-

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ple sclerosis. We found significant associations of symptom severity on burnout and vigor work engagement above and beyond the effects of job demands and social support. Our studies provide important insights for employees with chronic illnesses and the organizations in which they work and give indications for theory development, future research, and the development of interventions.

KEYWORDS

burnout, chronic illness, job demands, job resources, work engagement

HEALTH AS A RESOURCE: ANALYZING ASSOCIATIONS BETWEEN PERCEIVED ILLNESS SYMPTOM SEVERITY, BURNOUT, AND WORK ENGAGEMENT AMONG EMPLOYEES WITH AUTOIMMUNE DISEASES

When I raised concerns about how I was doing, my doctor told me, “This may just be how it’s going to be. You may always feel like you’re eighty per cent.” She intended, I think, to help me adjust to a new reality, but the effect was the opposite. The prospect was unbearable. I began to deflate like a punctured pool float.

(O’Rourke, 2013)

In her 2013 essay “What’s wrong with me?” the author Megan O’Rourke describes how she experienced the onset and diagnosis of Hashimoto’s, an autoimmune thyroid disease. She elaborates how symptoms of the illness, such as fatigue and “brain fog,” impact seemingly mundane activities, such as sitting upright at a birthday party or taking the subway (O’Rourke, 2013). The author’s description represents the reality of many people living and working with a chronic medical condition. Population-based estimates indicate that the incidence and prevalence of autoimmune illnesses have steadily increased in the past 30 years and that the incidence and prevalence rates of many autoimmune diseases are still increasing world wide (Lerner et al., 2016). Autoimmune diseases are characterised by high activity of the human immune system, which attacks “one or more tissues or organs, resulting in functional impairment, inflammation, and sometimes permanent tissue damage” (National Research Council, 1992, p. 2).

People with autoimmune illnesses may experience work difficulties. Depending on the exact disease and the severity, autoimmune diseases are associated with outcomes such as reduced work effectiveness and productivity, presenteeism, and absenteeism (Allen et al., 2012; Boussaid et al., 2021; De Boer et al., 2016), causing a socioeconomic burden (Jacobs et al., 2011). Employees with chronic diseases are generally more likely to leave the workforce early, leading to personal financial strain, reduced quality of life, and the possible loss of a sense of normality and identity (De Jong et al., 2015). Substantive insights into ways and means to improve or maintain the well-being of employees with chronic illnesses are vital for organizations and managers to plan effective, adequate, and accessible interventions and measures. As existing chronic conditions

are rarely accounted for in intervention studies on employee health and empiric research on the effects of work on well-being (Boelhouwer et al., 2020; Feltner et al., 2016), it is crucial to investigate how healthy work can be facilitated for people with impaired health. Current evidence indicating associations between illness-related distress and work-related strain, as well as somatic complaints and work engagement (Cook & Zill, 2021; Sautier et al., 2015), provide a good starting point for investigations.

The job demands–resources (JD-R) model attempts to explain how the combination of job demands and resources leads to employee well-being, conceptualised by the two core outcomes of job strain (i.e. burnout) and motivation (i.e. work engagement) (Demerouti et al., 2001). Both outcomes are essential predictors of job performance, job satisfaction, and turnover intentions (Borst et al., 2020; Schaufeli & Taris, 2014; Swider & Zimmerman, 2010). However, the inclusion of health within the JD-R framework has been almost exclusively focused on health as the main outcome, and considerations on different health statuses (e.g. chronic illnesses) have not taken place.

This paper investigates health status, respectively health impairments as a predictor of burnout and engagement. Referring to the conservation of resources (COR) theory (Hobfoll, 1989; Hobfoll & Freedy, 1997; Holmgreen et al., 2017), we state that health is an energetic individual resource that explains variance in well-being outcomes above and beyond the working conditions outlined in the JD-R model. This view of impaired health as a diminished resource is not unique to academic theory but can also be found in lay theories and metaphors used in chronic illness communities (Kattari & Belrán, 2022; Miserandino, 2003).

This paper adds to theory and research on occupational health and employee well-being by extending the view of employee health from an outcome to a relevant input or predictor and emphasising the relevance of individual differences in baseline health status. At the same time, we contribute to the conversation about inclusion and diversity at work and in society. We argue that viewing health solely as an outcome of work falls short as it fails to consider the fact that not every person enters the workforce or a job with the same baseline health and evidence that implies that past health is one of the strongest predictors of future health. Omitting pre-existing health problems in research on employee well-being runs the risk of promoting an ableist view of occupational health and a sole focus on interventions that may not be appropriate, accessible, or effective for a significant amount of the workforce. Thus, we argue that the inclusion of people with existing health impairments, such as employees with autoimmune illnesses, has to occur very early in developing evidence-based interventions, namely at the stage of theory development and empiric research.

HEALTH, ILLNESS, BURNOUT, AND WORK ENGAGEMENT

Burnout and work engagement are two crucial outcomes of employee well-being and motivation (Boelhouwer et al., 2020). The concept of burnout includes feelings of (emotional) exhaustion and cynicism or disengagement toward work, whereas work engagement is a state of high activation in which the employee feels excited, energised, and enthusiastic at work (Bakker et al., 2011, 2014). The JD-R model (Demerouti et al., 2001) explains the underlying processes leading to burnout and work engagement through the effects of job characteristics, particularly the combination and interplay of job resources and job demands (Schaufeli & Taris, 2014). Within the JD-R model, burnout is a (negative) well-being outcome mainly predicted by job demands, that is “physical, social, or organizational aspects of the job that require sustained physical or mental

effort” (Demerouti et al., 2001, p. 501) in the *health impairment process*. Parallel to the effects of job demands, job resources help the employee achieve goals, have a health-protecting effect, and predict work engagement. In the so-called *motivational process*, job resources predict work engagement (Bakker & Demerouti, 2008; Demerouti et al., 2001).

In research on burnout and work engagement, issues relating to health and illness have been included several ways. The core strain component of burnout, emotional exhaustion, is often conceptualised as a health outcome in itself, with studies investigating associations between burnout and general or physical health or health complaints (Bakker & Demerouti, 2014). Researchers often conceptualise health problems (e.g. general ill health, depressive symptoms, musculoskeletal disorders, somatic problems, and type 2 diabetes) as a distal outcome of job characteristics and burnout (Ahola & Hakanen, 2014). Although it is also assumed that the association between burnout and (physical) health and illness is not one-sided (Ahola & Hakanen, 2014), the effects of health status on burnout have been investigated to a far lesser degree to this point (Cook & Zill, 2021). A longitudinal study showed that burnout at baseline predicted a decrease in self-rated health status at follow-up (Vinokur et al., 2009), and there is evidence showing higher burnout levels among people with health impairments compared with employees without chronic diseases (Armon et al., 2014; de Boer et al., 2018; Ozkur et al., 2019). Regarding work engagement, research focusing on people with chronic health conditions is sparse. A cross-sectional study conducted in the Netherlands found that the combination of chronic physical diseases and mental disorders was associated with lower work engagement (Boelhouwer et al., 2020).

Although there is limited research into the associations between chronic health conditions, burnout, and work engagement, insights into the difficulties of employees with autoimmune illnesses do exist. Although the exact nature of the experienced work difficulties may vary depending on the specific diagnosis, common problems among working people with autoimmune illnesses include fatigue, pain, but also depression, and anxiety symptoms that affect productivity and sickness absence (Enns et al., 2018).

INCLUDING HEALTH STATUS AS A RESOURCE—A COR APPROACH

Viewing health status or “good health” as a resource can help explain how a chronic illness may also directly impact well-being and motivation. According to the COR theory (Hobfoll, 1989; Hobfoll & Freedy, 1997), resources are “entities that either are centrally valued in their own right, or act as means to obtain centrally valued ends” (Hobfoll, 2002, p. 307). COR states that humans generally try to accrue or maintain their resources as much as possible. A loss of resources weighs heavier than a resource gain, and resources need to be invested “to protect against resource loss, recover from losses, and gain resources” (Hobfoll, 2001, p. 349). Problems arise when there are few or diminished resources in the first place, as “those with fewer resources are more vulnerable to resource loss and less capable of resource gain” (Hobfoll, 2001, p. 349), which can lead to loss spirals. Loss spirals are exacerbated when individuals with a predisposing lack of resources may not be able to manage upcoming potentially stressful events (Holmgreen et al., 2017).

Personal health has been included as a resource in research based on COR (Hobfoll, 2001) and can be categorised as an energy resource. Energy resources (e.g. well-being, time, and money) facilitate access to other types of resources and are volatile (Russell et al., 2022), which means that they deplete when used (Ten Brummelhuis et al., 2011). Evidence supports this categorisation as the perceived illness symptom severity affects the experience of a loss of other resources such as financial security, confidence, intimate relationships, and sense of self and identity

(Dischinger et al., 2019). Impaired health due to an autoimmune illness has been conceptualised as diminished or lack of resources in previous studies (Cook & Zill, 2021; McGonagle et al., 2015). Several potential reasons support this rationale and provide arguments for linking health status to burnout and work engagement.

First, in people with chronic autoimmune illnesses, the physiological reactions to stressors can be impaired, which increases the risk of experiencing more stress-related symptoms (Leidy Kline, 1989). The subjective perception of illness symptoms can also affect the overall level of energy and stamina, for example due to fatigue. Fatigue is, by definition, a lack of energy that is not relieved by periods of rest (Nocerino et al., 2019) and is a central symptom of many autoimmune disorders (AARDA, 2015; Zielinski et al., 2019). As a commonly stated work difficulty (Honan et al., 2012), fatigue may lead to a higher risk of work-related exhaustion as resources cannot be used to manage work demands.

Second, COR posits that not only the actual loss of resources is stressful but also the threat of such a loss (Hobfoll, 1989). Even when illness symptoms are not immediately or currently present, for example in an illness such as MS that is characterised by episodic progression, there may be an ongoing threat perception, especially when the condition is “characterized by uncertainty” (Beatty & McGonagle, 2018, p. 19), which is the case for several autoimmune illnesses.

Third, the necessity to allocate time and energy differently compared with people without chronic illnesses may cause a resource depletion in employees with autoimmune illnesses. According to COR theory, individuals invest resources in a way that protects them against future resource losses. For many people with chronic autoimmune illnesses, disease management is a vital part of their life and requires the interaction of clinical, social, and personal resources (Ørtenblad et al., 2018). The *burden of treatment* concept describes the self-management of chronic medical conditions as *workload*. The workload of a chronic illness includes all self-care and self-monitoring activities, management of treatments, and the organisation of meetings with physicians and other healthcare providers. As neglecting these activities can lead to severe consequences such as hospitalisation (Eton et al., 2012), employees with chronic conditions often need to invest enough resources into illness management to avoid future loss of resources due to a worsened medical status.

Health impairments due to a chronic health condition can lead to diminished energy and time resources, which should be most pronounced when the individual experiences many or more severe symptoms. A depletion of resources can directly affect workability but also cause interferences between work and illness management (McGonagle et al., 2015, 2020). Therefore, high symptom severity is a resource loss that may lead to a higher level of exhaustion, depletion, and withdrawal from work (McGonagle et al., 2020), which could manifest in lower levels of work engagement. We posit that employees with an autoimmune illness and high symptom severity experience a resource lack, which makes them vulnerable to resource loss, which heightens the risk of experiencing burnout due to a loss spiral. As energy resources are located on the individual level, their depletion should explain incremental variance burnout above and beyond working conditions.

Hypothesis 1. Autoimmune illness symptom severity explains variance in employee burnout above and beyond the effects of job demands and resources.

Moreover, the experienced resource lack can prevent employees experiencing high autoimmune illness severity from investing resources into their occupation to receive a potential resource gain. Experiencing more severe symptoms may diminish the personal capacity to invest

in engagement. It may lead to a higher likelihood to “exit engagement processes in favor of meeting survival demands, or even the demands of a serious challenge” (Hobfoll, 2010, p. 17).

Thus, we hypothesise:

Hypothesis 2. Autoimmune illness symptom severity explains variance in work engagement above and beyond the effects of job demands and resources.

OVERVIEW OF STUDIES

We conducted two studies among employed people with autoimmune illnesses to test our hypotheses. Each study focuses on one illness, respectively group of illnesses, to gain detailed insights into the specific effects of the symptom severity. Both studies apply longitudinal research designs with two measurement points. To investigate the effects of autoimmune illness symptom severity above and beyond the effects of the working conditions, we included specific job demands and resources as covariates in the analyses.

STUDY 1

In Study 1, we analyzed the associations between symptom severity, burnout, and work engagement in a sample of employed adults with chronic inflammatory bowel diseases (IBD). We included participants with Crohn's disease (CD) or ulcerative colitis (UC). IBD affects around 1.5 million Europeans and a similar number of people in the United States (Sans & Figueroa, 2008). Whereas CD is more frequent in women, the sex ratio among people diagnosed with UC is relatively equal. UC is frequently diagnosed between the ages of 30 and 40, and CD is frequently diagnosed somewhat earlier, between the ages of 20 and 30 (Burisch & Munkholm, 2015). IBD are characterised by long-lasting inflammation in the large intestine and rectum (UC), respectively, the lining of the digestive tract (CD). Both CD and UC are very heterogeneous in their clinical manifestations and symptomology. Symptoms include diarrhea, abdominal pain, fever, weight loss, and hematochezia (bleeding in the colon), which mostly manifest in so-called flares, which are episodes of high symptom intensity (Sans & Figueroa, 2008).

Methods

Procedure

We recruited German adult employees with a CD or UC diagnosis with the help of the German Crohn's and Colitis Society (DCCV e.V.), which published our call for participants both online and in the printed member's magazine. The study included a baseline measurement point (T0) and a follow-up measurement after 6 months (T1). Both assessments were carried out using the online survey tool LimeSurvey. After finishing the baseline questionnaire, participants could register an email address for the invitation to the follow-up assessment. The email addresses were stored in a separate database, so no connection between the questionnaire data and the email address was possible. To merge the data of measurement points, we asked the participants to generate a unique code. Participants received no compensation for their participation but could participate in a raffle to win

gift certificates for an online shop. All participant email addresses were deleted after the completion of the dataset. The study design and all study documents were reviewed by the Ethics Review Board of the Faculty of Social and Behavioral Sciences at Chemnitz University of Technology and received a positive vote. Before starting the baseline questionnaire, participants had to confirm that they fulfilled the following inclusion criteria: They had to be at least 18 years old, have a medical diagnosis of CD or UC, and must be working as an employee with at least 20 h per week. Participants were excluded from participation if they were suspected of having an IBD but did not receive a diagnosis from a medical professional, if they were unemployed, mostly self-employed, on maternity leave, or on long-term sick leave.

Data and sample

After recruiting $N = 137$ participants at T0, $N = 123$ people took part in the follow-up assessment (T1). Only $N = 112$ data entries from T1 could be allocated to the baseline data using the code. We omitted another 25 participants from the dataset because they had experienced a change in their employment situation (e.g. retirement and job change) in the preceding 6 months, leading to a final sample of $N = 87$. Of the final sample, $N = 60$ participants had a CD diagnosis, and $N = 27$ reported having a UC diagnosis. Most of the sample identified as female ($N = 64$, 73.6%), with the rest identifying as male. The mean age was 39.6 years ($SD = 10.15$). Thirty-four participants (39.08%) reported being employed in public or other, and 17 (19.54%) did not specify their field of work. The rest of the participants were distributed between other fields of work, namely manufacturing ($N = 11$), trade, logistics, real estate, and hospitality ($N = 7$); business and financial services ($N = 13$); and information and communication ($N = 5$). The mean age at diagnosis was $M = 24.91$ ($SD = 9.11$). More than half of the participants ($N = 73$, 83.91%) reported taking medication to treat or manage their IBD.

Measures

We assessed the perceived *illness symptom severity* of the IBD at baseline (T0) using items of the German Short Inflammatory Bowel Disease Questionnaire (Rose et al., 2000). The 10-item questionnaire includes items regarding problems with bowel function, systemic problems (e.g. fatigue), emotional problems, and functional problems regarding the illness in the last 2 weeks. Following the recommendations by the authors, we calculated a mean score instead of using the subscales separately. Participants were asked to rate the frequency of the described symptoms and problems within the past 2 weeks on a scale from 1 (= never) to 7 (= always). The scale showed good internal consistency, with $\alpha = .88$ and $\omega_{RT} = .91$.

We assessed *quantitative and cognitive job demands* and two job resources, namely *control over working time* and *social support* at T0, using the eponymous subscales from the Copenhagen Psychosocial Questionnaire (COPSOQ, Nübling et al., 2005). We chose the respective job resources and quantitative job demands based on previous research on working with chronic illnesses (Cook & Zill, 2021; De Jong et al., 2015; McGonagle et al., 2015) and added cognitive demands to gain more detailed insights. The quantitative job demands scale (seven items) showed good internal consistency, with $\alpha = .89$ and $\omega_{RT} = .93$. A sample item is “Do you have to work very fast?”. The cognitive demands scale (six items) also showed good reliability, with $\alpha = .87$ and $\omega_{RT} = .92$. An example item is “Do you have to keep your eyes on lots of things while you

work?”. Control over working time was assessed with four items: for example “If you have some private business, is it possible for you to leave your place of work for half an hour without special permission?”. The internal consistency of the scale was good, with $\alpha = .83$ and $\omega_{RT} = .85$. The social support scale assesses perceived support from colleagues and the immediate supervisor. An example item is “How often do you get help and support from your colleagues if needed?”. The four-item scale showed good internal consistency, with $\alpha = .82$ and $\omega_{RT} = .94$. Participants responded to both scales using a 5-point Likert scale from 1 = never/hardly ever to 5 = always.

At follow-up (T1), we assessed *burnout* and *work engagement*. We assessed burnout with the German translation of the Oldenburg Burnout Inventory (OLBI; Demerouti et al., 2003; Reis et al., 2015), which assesses exhaustion and disengagement burnout. Both subscales consist of eight items; each answered on a 4-point Likert-type scale from 1 = strongly disagree to 4 = strongly agree. The internal consistency of the exhaustion scale was good, with $\alpha = .85$ and $\omega_{RT} = .89$. The internal consistency of the disengagement scale was also good, with $\alpha = .82$ and $\omega_{RT} = .87$. In addition to the subscales, we computed a total burnout scale with the items of both subscales. The internal consistency of the total burnout scale was also in the good range, with $\alpha = .88$ and $\omega_{RT} = .92$.

We used the nine-item form of the Utrecht Work Engagement Scale (UWES; Schaufeli et al., 2006) to assess *work engagement*. The scale assessed three forms of work engagement, namely vigor, dedication, and absorption, in three-item subscales. An example item assessing vigor is “At my work, I feel bursting with energy,” and an example item for dedication is “I am enthusiastic about my job,” and an example item assessing absorption is “I am immersed in my work.” All items were answered on a Likert-type scale from 0 = never to 6 = always. The subscales showed good internal consistencies, with $\alpha = .84$ and $\omega_{RT} = .84$ (vigor), $\alpha = .86$ and $\omega_{RT} = .86$ (dedication), and $\alpha = .80$ and $\omega_{RT} = .80$ (absorption). In addition to the three subscales, we calculated a total work engagement scale, including all items. The internal consistency of the total work engagement scale was excellent, with $\alpha = .94$ and $\omega_{RT} = .98$.

Results

Preliminary analyses

Because of the high drop-out rates between T0 and T1, we tested for differences in baseline variables between the drop-out group and the participants participating in the follow-up. The results of the *t*-tests for the numeric variables (Appendix A) indicated no significant differences between the participants included in the final sample and the participants not included in the final sample (lost-to-follow-up, changes in the employment situation). We also tested for differences in age, outcomes, and predictors between participants with UC and CD (Appendix B). We did not find any statistically significant differences between the groups and thus did not control for the specific diagnosis in the further analyses.

Descriptive analyses

We used the psych package (Revelle, 2021) for the R data analysis environment (R Core Team, 2022) for all analyses in Study 1. The bivariate correlations of the study variables are reported in Table 1. Male participants reported both higher quantitative work demands and

TABLE 1 Study 1 descriptive statistics and bivariate correlations between the study variables.

	<i>M</i> (<i>SD</i>)	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
1. Gender													
2. T0 Quantitative demands	3.14 (.83)	-.05											
3. T0 Cognitive demands	3.90 (.76)	-.27*	.41**										
4. T0 Control over working time	3.44 (1.01)	-.07	-.28*	-.02									
5. T0 Social support	3.05 (1.00)	-.04	-.14	.10	.51**								
6. T0 Symptom severity	3.85 (1.08)	.03	.15	-.01	-.19	-.16							
7. T1 Exhaustion	2.86 (.54)	-.04	.35**	-.08	-.20	-.30**	.57**						
8. T1 Disengagement	2.22 (.54)	-.22*	-.02	-.32**	-.16	-.32**	.16	.53**					
9. T1 Burnout	2.54 (.47)	-.15	.18	-.22*	-.21	-.36**	.42**	.88**	.88*				
10. T1 Vigor	3.19 (1.10)	.12	.03	.26*	.05	.18	-.29*	-.56**	-.79**	-.77**			
11. T1 Dedication	3.71 (1.11)	.12	.09	.34**	.07	.22*	-.16	-.44**	-.79**	-.70**	.83**		
12. T1 Absorption	3.28 (1.11)	.21	.05	.23*	.12	.21	-.20	-.46**	-.76**	-.70**	.85**	.81**	
13. T1 Work engagement	3.25 (1.07)	.19	.04	.25*	.10	.21	-.24*	-.51**	-.80**	-.75**	.93**	.84**	.98**

Note: *N* = 87. Gender coded 1 = male, 2 = female.

**p* < .05.

***p* < .01.

higher disengagement burnout. Participants identifying as female reported higher levels of cognitive demands at baseline, $r = .37$, $p = .01$, and reported higher levels of disengagement burnout, $r = .22$, $p = .04$. Perceived severity of the IBD at baseline was significantly correlated with exhaustion burnout, $r = .57$, $p < .01$; the total burnout score, $r = .42$, $p < .01$; vigor, $r = -.29$, $p = .01$; and total work engagement, $r = -.24$, $p = .03$ at follow-up. There were no significant correlations between perceived symptom severity and the other two types of work engagement, job demands, and job resources.

Hypotheses testing

We conducted stepwise regression analyses for exhaustion burnout and the dimensions of work engagement, regressing the outcomes on the control variables in models 1a to 7a and adding the perceived symptom severity in models 1b to 7b. Table 2 shows the results of the regression analyses of the burnout outcomes.

When controlling for job demands and resources, perceived symptom severity was significantly related to exhaustion burnout 6 months later $\beta = .51$, $p < .001$. Perceived symptom severity explained 25% of the variance of exhaustion burnout, which is more than the joint explanation of variance of all control variables. Perceived symptom severity was not related to disengagement burnout. However, regarding the total burnout score, we found a significant association with symptom severity, $\beta = .35$, $p < .001$, explaining 12% of the variance in general burnout. Thus, our results confirm Hypothesis 1, but not for the disengagement dimension.

Table 3 shows the results of the regression analyses of the work engagement outcomes. Baseline perceived symptom severity had a significant negative effect on the vigor dimension of work engagement, $\beta = -.27$, $p = .008$, and the total work engagement score at follow-up, $\beta = -.21$, $p = .04$. There was no significant effect on the dedication dimension, and a negative effect the absorption dimension was not significant, $\beta = -.18$, $p = .08$. Therefore, we found some support for Hypothesis 2 but only for the vigor dimension of work engagement and total work engagement, explaining 6% of the variance in vigor and 3% of the variance in total work engagement.

TABLE 2 Study 1 regressing standardised burnout and work engagement on the standardised covariates and symptom severity.

Variable	Outcome: T1 Exhaustion		Outcome: T1 Disengagement		Outcome: T1 Burnout	
	Model 1a	Model 1b	Model 2a	Model 2b	Model 3a	Model 3b
Intercept	.15	.16	.58**	.58**	.42*	.42*
Gender	-.21	-.22	-.78**	-.79**	-.57*	-.58**
T0 Quantitative demands	.42**	.35*	.08	.07	.29*	.24*
T0 Cognitive demands	-.25*	-.22*	-.42**	-.41**	-.38**	-.36**
T0 Control over working time	.03	.08	-.04	-.02	-.01	.03
T0 Social support	-.24*	-.19*	-.26*	-.25*	-.29*	-.26*
T0 Symptom severity		.51**		.11		.35**
R ²	.19	.44	.25	.26	.23	.35

Note: $N = 87$. Gender coded 1 = male, 2 = female.

* $p < .05$.

** $p < .01$.

TABLE 3 Study 1 regressing standardised burnout and work engagement on the standardised covariates and symptom severity.

Variable	Outcome: T1 Vigor		Outcome: T1 Dedication		Outcome: T1 Absorption		Outcome: Work engagement	
	Model 4a	Model 4b	Model 5a	Model 5b	Model 6a	Model 6b	Model 7a	Model 7b
Intercept	-.35	-.36	-.39	-.39	-.50*	-.51*	-.44*	.45*
Gender	.48	.49*	.53*	.53*	.69**	.69**	.60*	.61*
T0 Quantitative demands	-.09	-.06	-.04	-.02	-.02	<.01	-.05	-.03
T0 Cognitive demands	.34**	.33**	.40**	.40**	.31**	.30**	.37**	.36**
T0 Control over working time	-.03	-.06	-.01	-.03	.06	.04	.01	-.02
T0 Social support	.26	.13	.19	.18	.16	.14	.18	.16
T0 Symptom severity		-.27**		-.14		-.18		-.21*
R ²	.09	.15	.15	.16	.12	.14	.14	.17

Note: $N = 87$. Gender coded 1 = male, 2 = female.

* $p < .05$.

** $p < .01$.

Whereas quantitative demands had a significant positive effect on exhaustion burnout and the total burnout score, they were not significantly associated with the work engagement subdimensions. Cognitive job demands were negatively associated with burnout and positively associated with all three work engagement dimensions, and baseline social support was significantly and negatively associated with all burnout outcomes.

Discussion Study 1

In Study 1, baseline symptom severity was a strong predictor of exhaustion burnout at follow-up, explaining the more variance in burnout as job demands, job resources, and gender. This result implies that the perceived severity of the symptoms of an existing health impairment plays a crucial role in the health impairment process above and beyond the effects of job characteristics. However, we could not find the same associations between symptom severity and disengagement burnout in the sample. Regarding work engagement, we found a significant impact of symptom severity on the vigor dimension only. This result implies that the perceived symptom severity impacts the motivational process of employees with an IBD above and beyond the effects of job demands and job resources. Employees experiencing more IBD symptoms feel less energised and perceive lower degrees of mental resilience.

STUDY 2

In Study 2, we aimed to replicate the findings from Study 1 among employed people with multiple sclerosis (MS). MS is an inflammatory disease that affects the central nervous system and

is “the most common, primary neurogenic cause of disability among young adults” (Koziarska et al., 2018, p. 1). The inflammations cause demyelination, axonal loss, and the formation of plaques. Many people with MS experience a relapsing–remitting course where the symptoms develop within hours or days. They can persist for several days to weeks before gradually subsiding but can leave residual symptoms. Approximately 15% of people with MS experience a primary progressive course with a gradual worsening of symptoms. Over time, a relapsing–remitting course can change into a gradually progressing course. The illness usually manifests between 20 and 40 years of age and is more common among women than men. Initial symptoms often include sensory problems, weakness in one or more limbs, and visual problems (Milo & Miller, 2008). However, the symptoms of MS vary strongly, both on the interpersonal and intrapersonal levels, over time. Compared with the general working population, employed people with MS rate their work ability and physical work functioning lower (van Gorp et al., 2018). Employed people working with MS can experience problems at work related to physical barriers (e.g. problems with movement and mobility, and bladder and bowel difficulties) and psychological and cognitive barriers (e.g. cognitive difficulties, fatigue, and memory difficulties (Honan et al., 2012).

Methods

Procedure

We recruited a sample of adult employees with an MS diagnosis. We assessed longitudinal data using online questionnaires with the online survey tool Qualtrics. We advertised the study on social media and online discussion boards to acquire the sample. All questionnaires were available in English, German, and Dutch. When a translation of the surveys was unavailable, we translated the items using a two-step process by two native speakers. The study included a baseline measurement point (T0) carried out in April 2020 and a follow-up measurement after 1 month (T1).

The study was carried out in the scope of a larger project on the topic of working with MS. After finishing the baseline questionnaire, participants could register an email address for the invitation to the follow-up assessment. Contrary to Study 1, we used the participants' email addresses to connect the data from both measurement points. Participants were informed about the process in the participant information and gave consent to the storage of the email address in the dataset. All email addresses were permanently deleted from the dataset after a descriptive analysis of the data was sent to all participants. The study design, study documents, and the data storage protocol were reviewed by the Ethics Review Board of the Faculty of Behavioral and Movement Sciences at the VU Amsterdam before the data assessment and received a positive vote.

Before participating in the study, participants had to confirm that they fulfilled the following inclusion criteria: They had to be at least 18 years old, have a medical diagnosis of MS, and must be working as an employee with at least 20 h per week. Participants were excluded from participation if they did not receive a diagnosis from a medical professional (yet), if they were unemployed, mostly self-employed, on maternity leave, or on long-term sick leave.

Data and sample

Of $N = 213$ participants that took part in the baseline assessment (T0), $N = 139$ took part in the follow-up 1 month later. Ten of these participants reported a significant change in their job since the baseline assessment (e.g. change of employer) and were omitted from the dataset, leaving a final sample of $N = 129$. The mean age was 40.05 years ($SD = 10.15$), and 76.7% of the sample

identified as female ($N = 99$), with the rest of the sample identifying as male ($N = 30$). Sixty-one participants (47.29%) answered the English version of the survey, $N = 55$ (25.82%) the Dutch version, and $N = 13$ (6.10%) the German version. The largest group of participants stated living in the Netherlands ($N = 53$, 41.08%), followed by the United States ($N = 34$, 26.36%). The rest of the participants stated living in Germany ($N = 9$), Canada ($N = 8$), Belgium ($N = 5$), England ($N = 6$), Australia ($N = 4$), New Zealand, Slovenia, South Africa, Brazil, Switzerland, Finland, Portugal, and Austria ($N = 1$ each). Two participants did not specify the country in which they lived.

Thirty-three participants (25.58%) reported being employed in healthcare, $N = 27$ (20.93%) in technology/telecommunication, $N = 15$ (11.62%) in financial or consulting services, $N = 14$ (10.85%) in education/culture, $N = 4$ (3.1%) in the industrial or consumer products industry, and $N = 36$ (27.91%) participants did not further specify their field of work and ticked the box "other." Mean tenure (in years) was $M = 8.20$ ($SD = 7.83$), and participants worked for $M = 33.64$ ($SD = 8.98$) hours per week.

Most participants reported having a relapsing–remitting MS course ($N = 119$, 85.27%). Seven participants reported having primary progressive MS, $N = 6$ secondary progressive MS, and one participant stated having progressive relapsing MS. Three participants stated that it was still unknown or unclear which type of MS they had. Two participants did not specify the MS type. Most participants ($N = 105$, 81.40%) were taking disease-modifying medication (e.g. Teriflunomide, Interferon beta-1a, Dimethyl fumarate, Ocrelizumab, and Natalizumab) at the time of the study. The participants reported a mean onset age of $M = 29.74$ ($SD = 8.89$) and a mean age of diagnosis of $M = 33.55$ ($SD = 9.43$).

Measures

We assessed perceived *symptom severity* at baseline (T0) using the SymptoMScreen (Green et al., 2017). The SymptoMScreen is a 12-item questionnaire that asks the participants to rate different physical and cognitive MS-related symptoms (e.g. hand tremors, muscle cramps, numbness, concentration problems, and vertigo) in the past 4 weeks on a 7-point Likert-type scale from 1 = not affected at all to 7 = total limitation. The scale showed good internal consistency, with $\alpha = .85$ and $\omega_{RT} = .88$.

We again assessed *burnout* using the Oldenburg Burnout Questionnaire (Demerouti et al., 2003) at baseline and follow-up. We calculated the exhaustion and disengagement subscales and a total burnout scale, including all 16 items. The internal consistency of the exhaustion burnout scale was acceptable to good, with $\alpha = .79$ and $\omega_{RT} = .84$ (T0) and $\alpha = .78$ and $\omega_{RT} = .85$ (T1), as was the reliability of the disengagement scale, with $\alpha = .80$ and $\omega_{RT} = .86$ (T0) and $\alpha = .75$ and $\omega_{RT} = .85$ (T1). The full burnout scale also showed good reliability indicators, with $\alpha = .86$ and $\omega_{RT} = .89$ (T0) and $\alpha = .85$ and $\omega_{RT} = .89$ (T1). We assessed *work engagement* with the full version of the UWES (Schaufeli & Bakker, 2004).¹ In the full version of the UWES, the vigor and absorption subscales are assessed with six items, and the dedication subscale with five items. Furthermore, we calculated a total work engagement score of the means of all items. The internal consistency of the work engagement scales was good, with $\alpha = .83$ and $\omega_{RT} = .90$ (T0 vigor), $\alpha = .86$ and $\omega_{RT} = .91$ (T1 vigor), $\alpha = .85$ and $\omega_{RT} = .90$ (T0 dedication), $\alpha = .90$ and $\omega_{RT} = .93$ (T1 dedication), $\alpha = .85$ and $\omega_{RT} = .90$ (T0 absorption), and $\alpha = .90$ and $\omega_{RT} = .93$ (T1 absorption).

At baseline, we assessed the covariates *quantitative job demands*, *cognitive job demands*, and *social support* as a job resource using scales from the COPSOQ (Nübling et al., 2005). In contrast to Study 1, we used the short forms of the scales with four items for each job demand. Whereas the quantitative job demands scale showed acceptable to good reliability, with $\alpha = .75$ and $\omega_{RT} = .80$,

the cognitive job demands scale's reliability was questionable, with $\alpha = .69$ and $\omega_{RT} = .74$. We assessed social support with the same four items that we used in Study 1. The scale showed good internal consistency with $\alpha = .84$ and $\omega_{RT} = .91$.

Because MS is more common among women, with previous evidence showing differences in symptoms between men and women (Miller & Dishon, 2006), we included gender as a control variable. Age was also included as a covariate because of evidence showing a correlation between age and work-related difficulties in people with MS (Raggi et al., 2019). We included the type of MS (relapsing–remitting MS vs. other types of MS) as a covariate, as previous research indicates an association between MS types and employment status (Sterz et al., 2016).

Additions related to the Covid-19 pandemic

The planning of this study started in early 2020 with the plan to assess the data in Spring 2020. In light of the progression of the Covid-19 pandemic and the implementation of measures and restrictions to work in several countries, we decided to include several measures related to the pandemic and work situation for exploratory analyses at both measurement points. We included a single item asking the participants whether their working conditions had significantly changed compared with before the Covid-10 outbreak (e.g. switch to remote work/home office, changes in shift work, and changes regarding working hours). Furthermore, we asked them how many days of the week, on average, they had been working remotely before the pandemic (baseline only) and in the past 4 weeks (both baseline and follow-up).

Results

Preliminary analyses

First, we analyzed whether there were significant differences in the baseline variables between the final sample and the 74 participants who were not included in the final sample (Appendix C). Participants in the final sample reported significantly lower symptom severity, $t(211) = 3.037$, $p = .003$, and significantly lower cognitive job demands, $t(211) = -2.090$, $p = .04$.

Descriptive analyses

We used the psych (Revelle, 2021), multilevel (Bliese et al., 2022), and MuMIn packages (Bartoń, 2022) for data analysis. Table 4 shows the means and standard deviations of the study variables and the results of paired t -tests comparing the burnout and work engagement variables between baseline and follow-up. There were significant differences in all repeated measures across time, except for the composite burnout score. Whereas exhaustion burnout, vigor, dedication, absorption, and the composite work engagement score were significantly lower at follow-up compared with baseline, disengagement burnout increased between baseline and follow-up.

The bivariate correlations of the study variables are reported in Table 5. Participants with other course types than relapsing–remitting MS (i.e. progressive MS course types) were significantly older and reported higher MS symptom severity. Baseline perceived symptom severity was positively and significantly correlated to baseline quantitative job demands, exhaustion burnout, and the vigor dimension of work engagement.

TABLE 4 Study 2 means, standard deviations, and pairwise *t*-test for repeated measures.

	Baseline (T0)		Follow-up (T1)		<i>t</i> (128)
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
Quantitative work demands	2.53	.73			
Cognitive work demands	3.78	.63			
Social support	3.84	.87			
Symptom severity	2.26	.75			
Exhaustion	2.55	.39	2.43	.39	3.91**
Disengagement	2.16	.51	2.28	.46	-4.38**
Burnout	2.35	.39	2.36	.37	-.20
Vigor	4.67	1.01	4.40	1.05	4.16**
Dedication	5.10	1.06	4.83	1.17	3.94**
Absorption	4.65	.96	4.35	1.03	4.28**
Work engagement	4.79	.92	4.51	.99	4.78**

Note: *N* = 129.

**p* < .05.

***p* < .01.

Hypothesis testing

We fit mixed models to account for the clustering of the repeated data assessment at baseline and follow-up (Level 1) within individuals (Level 2). Mixed models allow the differentiation between the fixed effects of the study variables and the random effects. Through the stepwise determination of the best-fitting model type, we determined that, for all outcome variables, models with random intercepts and slopes did not fit the data significantly better compared with the random intercepts-only models. Hence, we fitted random intercept models, allowing the outcome variables' intercepts to vary freely between individuals. All models accounted for time, coded 0 = baseline and 1 = follow-up, as a predictor variable and for the autocorrelation of the time-varying data within persons.

We regressed the outcomes on the standardised covariates, job demands, and social support (models 1a to 7a). We then added standardised perceived symptom severity (models 1b to 7b). The results of the regression analyses are stated in Tables 6 and 7. Models 1b, 2b, and 3b show that perceived MS symptom severity at baseline is associated with exhaustion, $b = .35$, $p > .001$; disengagement, $b = .21$, $p = .01$; and the total burnout variable, $b = .32$, $p = .0001$, thus supporting Hypothesis 1. According to the differences in the marginal pseudo R^2 , which indicates the variance explained by the model's fixed effects, adding perceived symptom severity explained 10% of the variance in exhaustion, 3% of the variance in disengagement, and 8% of the variance of the total burnout score above and beyond the effects of job demands and social support.

Symptom severity was significantly and negatively associated with the vigor dimension of work engagement, $b = -.17$, $p = .04$, above and beyond the effects of the covariates, job demands, and social support. Adding symptom severity to the model resulted in an additional 2% of the variance explained by the fixed effects. Symptom severity was not significantly associated with the dedication subdimension ($b = -.05$, $p = .54$) or the absorption subdimension ($b = -.05$, $p = .50$) of work engagement. Regarding the total work engagement score, there was no negative

TABLE 5 Study 2 bivariate correlations between the study variables.

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1. Gender										
2. Age	-.14									
3. MS course type	-.13	.35**								
4. Quant. demands (T0)	.08	.02	.06							
5. Cogn. demands (T0)	.13	-.08	-.14	.32**						
6. Social support (T0)	.21*	-.09	-.11	-.15	-.03					
7. Symptom severity (T0)	-.01	.17	.33**	.25**	.06	-.18*				
8. Exhaustion (T0)	.12	-.04	-.01	.28**	.00	-.26**	.40**			
9. Disengagement (T0)	-.11	-.10	.01	.02	-.19*	-.40**	.21*	.47**		
10. Burnout (T0)	-.01	-.09	.00	.16	-.13	-.39**	.34**	.81**	.90**	
11. Vigor (T0)	.08	.03	-.14	.03	.36**	.35**	-.18*	-.36**	-.59**	-.57**
12. Dedication (T0)	.12	.06	-.08	.10	.35**	.37**	-.05	-.22*	-.63**	-.53**
13. Absorption (T0)	.12	-.06	-.09	.16	.41**	.27**	-.05	-.15	-.52**	-.42**
14. Work engagement (T0)	.11	.01	-.12	.11	.41**	.36**	-.10	-.27**	-.63**	-.55**
15. Exhaustion (T1)	.13	-.04	-.15	.26**	.11	-.18*	.31**	.63**	.29**	.51**
16. Disengagement (T1)	-.06	-.04	-.04	.09	-.24*	-.33**	.19*	.54**	.78**	.79**
17. Burnout (T1)	.03	-.04	-.11	.19*	-.09	-.30**	.29**	.68**	.65**	.77**
18. Vigor (T1)	.01	-.01	-.10	-.08	.28**	.20*	-.21*	-.46**	-.49**	-.56**
19. Dedication (T1)	.08	.12	.06	-.05	.26**	.35**	-.06	-.35**	-.62**	-.58**
20. Absorption (T1)	.00	-.06	-.04	.07	.33**	.19*	-.06	-.27**	-.48**	-.45**
21. Work engagement (T1)	.03	.02	-.03	-.02	.32**	.27**	-.12	-.40**	-.58**	-.58**

Note: N = 129. T0 = Baseline measurement, T1 = follow-up measurement; gender coded 1 = male, 2 = female; MS course type coded 1 = relapsing-remitting, 2 = other types.

*p < .05.

**p < .01.

TABLE 5 (Continued)

	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.
1. Gender										
2. Age										
3. MS course type										
4. Quant. demands (T0)										
5. Cogn. demands (T0)										
6. Social support (T0)										
7. Symptom severity (T0)										
8. Exhaustion (T0)										
9. Disengagement (T0)										
10. Burnout (T0)										
11. Vigor (T0)										
12. Dedication (T0)	.76**									
13. Absorption (T0)	.76**	.73**								
14. Work engagement (T0)	.92**	.90**	.91**							
15. Exhaustion (T1)	-.23*	-.12	-.10	-.17						
16. Disengagement (T1)	-.53**	-.56**	-.44**	-.56**	.47**					
17. Burnout (T1)	-.46**	-.41**	-.33**	-.44**	.83**	.88**				
18. Vigor (T1)	.74**	.57**	.55**	.68**	-.28**	-.53**	-.49**			
19. Dedication (T1)	.59**	.76**	.55**	.69**	-.20*	-.64**	-.51**	.72**		
20. Absorption (T1)	.62**	.60**	.69**	.70**	-.08	-.51**	-.37**	.77**	.77**	
21. Work engagement (T1)	.71**	.70**	.65**	.76**	-.21*	-.61**	-.49**	.91**	.90**	.93**

Note: N = 129. T0 = Baseline measurement, T1 = follow-up measurement; gender coded 1 = male, 2 = female; MS course type coded 1 = relapsing–remitting, 2 = other types.

* $p < .05$.

** $p < .01$.

TABLE 6 Study 2 random intercept models regressing burnout on the standardised covariates and symptom severity.

	Outcome: Exhaustion		Outcome: Disengagement		Outcome: Burnout	
	Model 1a	Model 1b	Model 2a	Model 2b	Model 3a	Model 3b
Fixed effects						
Intercept	.22	.29	-.36	-.32	-.12	-.05
Time	-.29**	-.29**	.25**	.25**	.01	.01
Gender	.33	.30	.01	-.01	.18	.15
Age	-.02	-.04	-.10	-.12	-.07	-.09
MS type	-.11	-.57*	-.18	-.35	-.26	-.52*
Quantitative demands	.25**	.18*	.09	.04	.19*	.12
Cognitive demands	-.06	-.08	-.27**	-.27**	-.21*	-.22**
Social support	-.22**	-.18*	-.37**	-.35**	-.36**	.32**
Symptom severity		.35**		.21*		.32**
Random effects						
Intercept (individuals)	.72	.64	.77	.75	.78	.72
Residual	.60	.60	.47	.47	.48	.48
AIC	680.12	665.65	617.95	616.72	630.75	620.64
BIC	718.86	707.86	656.69	658.93	669.49	662.85
Marginal pseudo R^2	.15	.25	.21	.24	.18	.26
Conditional pseudo R^2	.65	.65	.79	.79	.77	.77

Note: $N = 129$ (Level 2), $N = 258$ (Level 1). Time coded 0 = T0, 1 = T1, Gender coded 1 = male, 2 = female, MS course type coded 1 = relapsing–remitting, 2 = other types, all fixed effects variables assessed at T0, outcome variables assessed at T0 and T1, all models accounted for autocorrelation.

* $p < .05$.

** $p < .01$.

association with symptom severity, with $b = -.10$, $p = .21$. Thus, Hypothesis 2 was only supported for the vigor dimension of work engagement.

Furthermore, people with relapsing–remitting MS experienced higher levels of exhaustion burnout, $b = -.57$, $p = .01$, and the total burnout score, $b = -.52$, $p = .02$. Social support at baseline was positively and significantly associated with all burnout and work engagement variables. Cognitive demands at baseline were negatively related to disengagement, $b = -.27$, $p < .01$, and the total burnout score, $b = -.22$, $p = .005$, and positively associated with all work engagement outcomes. Whereas time had a negative effect on all work engagement outcomes, indicating a general increase across the measurement points, exhaustion burnout seemed to decrease over time. In contrast, time had a positive effect on disengagement.

Additional analyses regarding the Covid-19 pandemic

As the data assessment was carried out in April and May 2020, we conducted exploratory analyses, including the Covid-related variables. At baseline, most participants ($N = 123$, 88.49%) stated that there had been a significant change in their work life since the pandemic outbreak. At follow-up (T1), 40.3% ($N = 56$) stated that there had been a significant change in their working conditions

TABLE 7 Study 2 random intercept models regressing work engagement on the standardised covariates and symptom severity.

	Outcome: Vigor		Outcome: Dedication		Outcome: Absorption		Outcome: Work engagement (total)	
	Model 4a	Model 4b	Model 5a	Model 5b	Model 6a	Model 6b	Model 7a	Model 7b
Fixed effects								
Intercept	.26	.23	.11	.10	.23	.22	.22	.20
Time	-.27**	-.27**	-.24**	-.24**	-.30**	-.30**	-.29**	-.29**
Gender	-.13	-.11	<-.01	<.01	-.12	-.11	-.09	-.08
Age	.08	.09	.14	.14	-.02	-.02	.07	.08
MS type	-.19	-.05	.10	.13	.05	.09	-.02	.06
Quantitative demands	-.09	-.06	-.03	-.02	.04	.05	-.03	-.01
Cognitive demands	.36**	.36**	.34**	.34**	.37**	.37**	.39**	.40**
Social support	.28**	.26**	.38**	.37**	.25**	.25**	.33**	.32**
Symptom severity		-.17*		-.05		-.05		-.10
Random effects								
Intercept SD (individuals)	.75	.74	.73	.72	.71	.72	.73	.73
Residual	.51	.53	.50	.55	.56	.56	.49	.49
AIC	638.03	657.27	620.87	625.76	654.80	659.57	621.42	625.08
BIC	676.77	699.487	659.61	667.97	693.54	701.78	660.15	667.29
Marginal pseudo R ²	.21	.23	.25	.25	.21	.21	.25	.26

Note: $N = 129$ (Level 2), $N = 258$ (Level 1). Time coded 0 = T0, 1 = T1, Gender coded 1 = male, 2 = female, MS course type coded 1 = relapsing–remitting, 2 = other types, all fixed effects variables assessed at T0, outcome variables assessed at T0 and T1, all models accounted for autocorrelation.

* $p < .05$.

** $p < .01$.

compared with the baseline survey. Before the pandemic outbreak, participants had worked for a mean of $M = 1.29$ days per week ($SD = 1.84$). However, only $N = 116$ participants responded to the question. At baseline (T0, April 2020), they reported working remotely for $M = 3.49$ days per week ($SD = 2.13$). $N = 132$ participants responded to the question. At follow-up (T1, May 2020), participants reported working remotely for $M = 3.3$ days per week ($SD = 2.3$) (137 responses). We calculated the difference between the days per week worked remotely before the pandemic and the days per week worked remotely reported at baseline and follow-up. There was a mean difference in days per week working remotely of $M = 2.14$ ($SD = 2.42$) at baseline and $M = 2.25$ ($SD = 2.44$) at follow-up.

We conducted t -tests comparing all study variables between participants who had reported differences in working conditions compared with before the pandemic outbreak at baseline. We also checked for differences in follow-up variables between participants reporting a change in working conditions at follow-up (compared with the working conditions at baseline). We did not

find significant differences between the groups (Appendix D). *T*-tests comparing people reporting changes between baseline and follow-up showed no significant differences (Appendix E). We subsequently analyzed the bivariate correlations between the study variables, the days worked remotely during the pandemic, and the differences in remote work compared with the time before the pandemic (Appendix F). We found a significant correlation between the days per week worked remotely at follow-up and exhaustion burnout at follow-up, $r = -.18$, $p = .04$. Also, people who reported more remote work at follow-up than before the pandemic reported lower exhaustion burnout at follow-up, $r = -.25$, $p = .01$. We repeated the analysis of the mixed models using the hours of remote work reported at T0 and T1 as a Level 1 covariate, which did not change the study's main findings. The hours worked remotely per week did not significantly affect burnout and work engagement outcomes.

Discussion Study 2

To a large degree, the results of Study 2 replicated and supported the findings of Study 1. The results imply that people experiencing more severe symptoms experience more exhaustion and overall burnout. However, Study 2 also shows that people with MS perceiving more severe symptoms also feel more disengaged. Thus, symptom severity plays a particular role in the JD-R health impairment process among employed people with MS. Regarding work engagement, we found that people perceiving their MS symptoms as more severe experienced lower levels of vigor work engagement.

GENERAL DISCUSSION

Employees with chronic illnesses are part of almost every workforce in any organisation. This paper aimed to investigate the role of individual health status, defined as the perceived symptom severity of a chronic illness, in the experience of burnout and work engagement. We focused our investigations on employees with autoimmune illnesses, a group of non-communicable diseases with increasing worldwide incidence rates (Lerner et al., 2016). Our findings show that for employees with MS and IBD, the perceived illness or symptom severity impacts higher levels of exhaustion and general burnout, as well as the vigor dimension of work engagement, incrementally explaining variance in the outcomes above and beyond the effects of job demands and job resources. Moreover, we found symptom severity associated with disengagement burnout among people with MS.

Theoretical implications

Although our findings suggest that some basic assumptions described in the JD-R model apply to employees with chronic autoimmune illnesses, such as the effects of certain demands and resources, the individual health status of employees seems to play an essential role. The most important contribution of our studies is that viewing and conceptualising health as an outcome only bears the risk of overlooking important effects and processes and may bias the interpretation of results by working under the assumption that everyone enters the workforce with the same baseline health status. In other words, “the normative assumption is that people are physically

and mentally able to perform their work roles and functioning bodies and are taken for granted” (Beatty, 2018, p. 36). Our findings suggest that this consideration should be updated, considering the high prevalence of chronic health conditions (European Commission Eurostat, 2019).

Our results contribute to the further development of the JD-R model by conceptualising health status, respectively, the absence of health impairments and illness symptoms as an individual resource that affects both the health impairment and motivational processes. We thus challenge assumptions on the directionality of effects between health, well-being, and motivation. Our research is based on the idea that the severity of autoimmune illness symptoms reflects an impaired energy resource. According to the COR theory, energy resources facilitate the acquisition of other types of resources, such as objects. Similar to personal resources, another category of resources outlined in the COR theory, energy resources are located in the individual or employee and can be integrated into the JD-R framework in multiple ways. Our findings support the idea that the resource lack due to more severe symptoms may lead to burnout because of the primacy of loss and a higher sensitivity to daily stressors of people with diminished resources (Hobfoll & Freedy, 1997).

A consistent finding in both studies was that symptom severity explained exhaustion and general burnout variance in participants with autoimmune illness, independent of the actual demands of the job. Only Study 2 showed a significant relationship between disengagement and symptom severity. Exhaustion is often seen as the more immediate response to prolonged stress in burnout research (Block et al., 2020) and the central strain dimension linked to energy (Bakker et al., 2014). Given that disengagement may be a less central and more distal burnout outcome, the limitations in the sample size of Study 1 may have led to insufficient power to detect a small effect. Moreover, the symptoms of MS include cognitive difficulties (Green et al., 2017), which may be more likely to lead to disengagement than IBD symptoms.

Our findings also support the notion that as a resource loss, symptom severity may decrease the capacity of employees with autoimmune illnesses to “navigate and succeed at their engagement” (Hobfoll, 2010, p. 17). However, we only found significant associations regarding the vigor dimension of work engagement. Vigor is characterised by “high levels of energy and mental resilience while working, the willingness to invest effort in one’s work, and persistence in the face of difficulties” (van den Heuvel et al., 2010, p. 136) and is the dimension of work engagement most closely connected to the investment of energy into work. The fact that we could not find significant associations with the absorption dimension can be explained by evidence suggesting that absorption is a less central indicator for work engagement, not necessarily unique to the construct of work engagement (Mazzetti et al., 2021) and, in contrast to vigor and dedication, has been unrelated to somatic symptoms in previous research (González-Gancedo et al., 2019). High levels of dedication imply “being strongly involved in one’s work and experiencing a sense of significance, enthusiasm, and challenge” (Bakker et al., 2014, p. 391). The fact that we did not find an association of symptom severity with dedication could imply that the work engagement process linked to identification and enthusiasm about work is less or not affected by impaired health or that we should consider lower vigor as a more proximal outcome and potential mediator for effect on dedication. However, the associations between illness severity and dedication deserve more attention in future research.

Previous literature on work engagement suggests that engaged workers perform better because work engagement is associated with better health (Bakker & Demerouti, 2008). Our results indicate that there is still a strong necessity for longitudinal studies on the association between work engagement on health to investigate reciprocal effects. In light of our results and the examination of past evidence, we feel that the statement “engaged workers experience good

health” (Langseth-Eide & Vittersø, 2021, p. 10) could also be rephrased to state that employees who are in good health also experience higher work engagement. Although we do not deny the potential health-improving effects of work engagement, it is important to investigate the causal relationships further and carefully consider the causality directions when planning and evaluating interventions to increase work engagement.

Our results show consistent associations between the exhaustion dimension of burnout and the vigor dimension of work engagement. Exhaustion and vigor are related and are considered to be the two opposites of a spectrum named “energy” (Bakker et al., 2014; González-Romá et al., 2006). Our findings indicate that the consequences of impaired health as a diminished energy resource may be more pronounced on the energy spectrum compared with the identification spectrum (cynicism/disengagement and dedication). As exhaustion is a more general and immediate stress reaction, it may be more affected by health impairments. However, “even slightly elevated but prolonged exhaustion can lead to the erosion of vigor” (Mäkikangas et al., 2017, p. 52). Evidence indicates that there is some degree of independence in the construct, indicating that vigor and exhaustion are not necessarily mutually exclusive (Mäkikangas et al., 2017). Hence, future research should investigate a potential mediating effect of exhaustion on vigor work engagement in longitudinal studies.

Previous research on the JD-R model in the context of MS also implies that the effect of health status on burnout and work engagement may be mediated through illness-specific work problems (e.g. Lehmann et al., 2021). As many chronic illnesses require constant illness management, another possible mediator could be work-health management interference, that is “experiencing competing, incompatible pressures from the need to manage one’s health condition and the need to manage one’s work responsibilities” (McGonagle et al., 2020, p. 445), which predicts burnout. Both illness-specific work problems and work-health management interference should be integrated and investigated into the JD-R framework, taking into consideration that they may also be affected by job characteristics and thus possibly mediate both the effects of health status and the effects of job demands and resources on well-being and motivational outcomes (Lehmann et al., 2021).

Analyzing the bivariate correlations in Study 2 showed that there were significant relations between symptom severity and quantitative job demands and social support. Parallel to work conducted on the effects of personal resources (Schaufeli & Taris, 2014), this can imply that individual health status as an energy resource may impact how employees perceive their working conditions in the first place. Health status affects perceived work ability (McGonagle et al., 2015), which may indicate that it also influences how the respective employee perceives to be able to deal with job demands and whether they perceive job resources as adequate for their needs. This is highly relevant as studies usually assess job demands through employee self-reports. Future research should consider research designs in which the objective job characteristics are kept relatively constant and the health status varies to investigate this proposed effect. A possible research design could investigate pairs of employees working in highly similar, if not the same, jobs in which one employee has a health impairment and the other employee is “healthy” to provide detailed insights into how health and illness shape our perceptions of the work environment.

Future research should investigate to which degree impaired health and working conditions interact, that is if employees with impaired health experience stronger negative effects toward jobs with high demands. For personal resources, there is evidence that individual resources and job demands interact as they moderate the effects of job demands on exhaustion (Schaufeli & Taris, 2014). However, in supplemental exploratory analyses of interactions between job demands, resources, and symptom severity, we could not find any indications of interaction effects, which may be due to the limitations of the samples (Data S1). It is, however, possible that health consti-

tutes a preceding or primary personal resource that interacts with working conditions through its effect on other resources, for example, personal resources such as self-efficacy and resilience.

Our findings also have implications for the theoretical conceptualisation and investigation of job demands and their role in predicting burnout and work engagement. We found quantitative job demands to be a consistent predictor of exhaustion. This finding is in line with previous meta-analyses showing that workload is a crucial factor in the development of emotional exhaustion (Alarcon, 2011). Furthermore, both studies found cognitive demands to have positive effects on work engagement and negative effects on disengagement and general burnout. This result mirrors previous findings on positive associations between cognitive demands and motivation (Bakker et al., 2005). It implies that not all job demands can be assumed to have the same effects on employee well-being. Van den Broeck et al. (2010) distinguish job demands as hindrances and challenges. They theorise that cognitive demands pose a job challenge, that is which require energy but are stimulating to the employee and, therefore, positively affect health and well-being by providing opportunities for need satisfaction. Even though autoimmune illnesses are often accompanied by fatigue and cognitive difficulties (Zielinski et al., 2019), we found that cognitive demands had these protective effects. This raises the question of whether cognitively demanding work can give employees with autoimmune illnesses a feeling of purpose, even when faced with possible cognitive impairments. Therefore, future research should differentiate different types of job demands and investigate how cognitive demands positively affect employee well-being.

Finally, our findings support the assumption that social support is crucial for people with chronic illnesses (de Boer et al., 2018) and is positively associated with employee well-being. Participants that felt that their social environment at work was more supportive reported less burnout (both studies) and higher levels of work engagement (Study 2). A possible reason for the effect of social support on employee motivation in Study 2 is the context of the Covid-19 pandemic and the increase in working from home as the feeling of social isolation is associated with lower work engagement among people working remotely during the pandemic (Galanti et al., 2021). Future research should explore how and when colleagues and leaders support employees with chronic illnesses in more detail. Insights into how social support prevents burnout and facilitates motivation among employees with chronic illnesses can provide starting points for interventions on the leader and team level and help researchers and practitioners understand how social working conditions affect work life with a health impairment.

Limitations

This paper has several strengths but also limitations. We tested hypotheses among two specific samples of people with medically diagnosed chronic illnesses. Both studies included two measurement points with two different time lags. However, this still prevents us from gaining insights into causal and reciprocal effects. Further studies with longitudinal and crossed-lagged designs should investigate various chronic illnesses over longer periods to better understand the interaction between job characteristics, health status, and employee well-being.

Second, although our theoretical considerations apply to a wide range of chronic health conditions, the current studies only covered a specific type of chronic illness—autoimmune illnesses—limiting our findings' generalizability. Nevertheless, both studies show that the perceived severity of chronic illnesses is a fundamental impact factor on burnout and work engagement among two different autoimmune illnesses. This common effect is an important starting point for further research in occupational health and should be replicated in other areas of chronic illnesses. Apart from basic

communalities, future research should also examine the specifics of various chronic illnesses and their impact on work life. Additionally, our sample only allows us to test the assumptions of a direct effect of health status on employee well-being to a certain degree, as the variance in health was restricted. Although several participants reported no symptoms in both studies, comparing people with different health statuses (i.e. healthy, illness with low symptom severity, and illness with high symptom severity) could provide valuable insights into whether health status as a personal resource can moderate the effects of job characteristics on well-being (Schaufeli & Taris, 2014).

Third, our studies investigated the role of health status exclusively among people with health impairments. Although people with autoimmune illnesses vary greatly in their perception of symptom severity, further studies should compare employees with a greater variance in health impairments, from “good health” to strongly impaired health.

Fourth, although we assessed illness-related information in both samples, we did not collect data on comorbidities. Chronic illnesses are sometimes accompanied by psychiatric comorbidities, which may also be important determinants of occupational health. Depression and anxiety are prevalent among people with IBD and MS (Boeschoten et al., 2017) and predict paid employment among people with autoimmune illnesses (De Boer et al., 2016). Moreover, recent investigations on burnout suggest that the distinction between depression and burnout is not clear enough because of the conceptual and theoretical overlaps. Treating burnout as a form of depression (Bianchi et al., 2015) would imply that future research on chronic illnesses should include comorbidity and multimorbidity, including both somatic illnesses and mental disorders, and conduct high-resolution analyses of the differences and similarities between specific comorbidities, psychological symptoms of physical illnesses, and well-being outcomes.

Fifth, the sample sizes in this paper are small to moderate, which restricts the power of the sample size to detect smaller effects. Researching chronic illnesses in work settings can be challenging, as employees with chronic illnesses may not trust the analyses' anonymity, so they do not report their chronic illnesses. If research is carried out through employee surveys, employee representatives may consent to the assessment illness related questions to protect employees from possible disadvantages. Research on volatile topics, therefore, requires other strategies in acquiring participants, such as contact with illness-related societies (without which this research would not have been possible). Further studies should increase the effort to get more employees with chronic illnesses to participate in this research area.

Sixth, all measures in our studies rely on self-report and not clinical objective measures of health status or illness severity. Although the instruments used to assess symptom severity are frequently used in clinical practice to measure changes and progressions in illness severity and show good validity (Fitzgerald et al., 2019; Jowett et al., 2001) and capture the perceived reality of people living and working with IBD and MS, future studies should strive to also include objective measures of health and illness.

Practical and societal implications

Previous studies on the associations described in the JD-R model concluded that organizations have to ensure that their employees have adequate job resources to perform well and perceive high levels of well-being (Demerouti & Nachreiner, 2019). Our results challenge these conclusions to a certain degree, as they indicate that more fine-tuned interventions regarding specific aspects of health status diversity among the staff may be necessary. As a minimum requirement, practitioners must carefully examine the accessibility of existing interventions to consider that

some employees may not have the same level of individual resources in terms of energy and time because of existing health impairments.

Work adjustments are related to decreased sick leave among employed people with chronic diseases (Boot et al., 2013). They can buffer or inhibit possible negative effects of an illness on work ability (Torp et al., 2012). Examples of work adjustments include the availability of specific devices or furniture, change of job tasks, adjusted working hours, adjustments in the quantity of work, adjustments in office accessibility, and education and retraining opportunities (Boot et al., 2013). As our findings emphasise the role of illness severity on employee well-being outcomes, organizations should consider implementing more individually tailored work adjustments in their occupational health programs focusing on employee mental health and motivation. In Europe, work adjustments are included in the European Strategy for the Rights of Persons with Disabilities 2021–2030 (European Union, 2021), which states that people with disabilities have the right to experience good conditions in the workplace and equal opportunities for participation in life. Both illnesses included in the studies are strongly associated with (legal) disability status (Feagan et al., 2005; Pugliatti et al., 2006), with MS being “the most common cause of neurological disability in young adults worldwide and approximately half of those affected in Europe” (Kingwell et al., 2013, p. 128). Providing work adjustments for people with autoimmune illnesses in line with the European Union’s aim to “unlock the potential and talents of persons with disabilities (...) for the benefit of the individuals, the economy and for the cohesion of the society as a whole” (European Union, 2021, p. 13 f.)

Insights and knowledge on the effects of autoimmune severity on work life and work-related outcomes are valuable for both employees and employers to create awareness and caution regarding potential issues that can occur. Several illness-related associations offer short guides and comprehensive information sheets on employment issues targeted specifically at employees with a specific chronic disease or their employers (e.g. Crohn’s & Colitis UK, 2021; Vereniging MS Nederland, 2021) and research on psychosocial aspects of illness at work can make an important contribution to these offers. Having accurate information on and knowledge about the illness can signal a supportive environment and reduce the probability of false assumptions on the employer’s side that could make the employee not taken seriously or even feel stigmatised. Starting a conversation with employees with chronic illnesses can also help evaluate existing occupational health measures to reduce stress and prevent burnout. This way, organizations can ensure that the occupational health measures they invest in do not exclude employees with chronic illnesses or disabilities.

Connecting research to lay theories: The Spoon Theory

The core idea of conceptualising life with a chronic illness in terms of resources (or a loss or limitation thereof) also exists beyond psychological research, as it can be found in a popular metaphor used by people with chronic diseases. The essay “The Spoon Theory” by Christine Miserandino (2003) explains how a chronic illness leads to energy depletion throughout the day. The author represents the limited energy available for the day through a fixed number of spoons. She explains: “when you are healthy you expect to have a never-ending supply of ‘spoons’. But when you have to now plan your day, you need to know exactly how many ‘spoons’ you are starting with. It doesn’t guarantee that you might not lose some along the way, but at least it helps to know where you are starting” (Miserandino, 2003, para. 9). The author explains that almost every activity, even seemingly small actions such as standing on the train, cost a spoon, sometimes leaving her with a severely depleted number of spoons before she even arrives at work. The

limitation forces one to make choices: “Its hard, the hardest thing I ever had to learn is to slow down, and not do everything. I fight this to this day. I hate feeling left out, having to choose to stay home, or to not get things done that I want to” (para. 15).

The metaphor described in Miserandino's blog post has become extremely popular in social media discourses among people with chronic illnesses and invisible disabilities, represented among others through the use of the word “Spoonie” to self-describe as a person with a chronic illness or mark posts about the topic on Twitter and Instagram (Hale, 2018; Isika et al., 2020; Kattari & Beltrán, 2022). Essentially, Miserandino describes a basic resource concept that aligns with the assumptions of COR theory that form the basis of this paper and is in line with our findings. Thus, as a final contribution, this research confirms and validates a lay theory from the chronic illness online community, which people with health impairments can use to explain the challenges of their daily lives.

CONCLUSION

Chronic illnesses can be viewed as a unique category of diversity in organizations often overlooked in theory, research, and practice (Beatty & Joffe, 2006). By excluding interindividual differences in baseline health status in theory and research, organizational psychology and occupational health research run the risk of overlooking essential individual-level factors that may influence the effects of work on well-being and motivation and promoting a perspective on employee life in which the specific issues of people with chronic illness remain invisible. Assuming that people enter the workforce as healthy individuals, tailoring occupational health measures according to this view may lead to employers' negligence in attending to those employees for which health may have a different personal meaning, and health-related measures might be particularly important. It is the task of occupational health researchers to identify factors that improve or complicate work life for employees with chronic illnesses and to provide evidence-based suggestions for inclusion and the successful management of a health-diverse workforce.

CONFLICT OF INTEREST STATEMENT

The authors report that there are no competing interests to declare.

ETHICS STATEMENT

The study documents and designs were reviewed and approved by Ethics Review Boards at Chemnitz University of Technology (Faculty of Behavioural and Social Sciences) and VU Amsterdam (Faculty of Behavioral and Movement Sciences).

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

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ENDNOTE

¹ The reason for choosing to use the full scale in this study was based on a student's thesis carried out in the scope of the project.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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APPENDIX A

T-tests investigating differences in baseline variables between participants included in the sample and baseline participants not included in the final sample (lost-to-follow-up and employment changes) (Study 1).

	Lost-to follow-up M	Final sample M	df	t
Age	37.16	39.60	135	−1.332
T0 Symptom severity	3.87	3.85	135	−.102
T0 Quantitative demands	3.16	3.14	135	.164
T0 Cognitive demands	3.87	3.90	135	−.274
T0 Control over working time	3.56	3.44	135	.675
T0 Social support	2.90	3.05	132	−.825

Note: $N = 137$.

APPENDIX B

T-tests investigating differences between participants with Crohn's disease and participants with ulcerative colitis (Study 1).

	Crohn's disease (<i>N</i> = 60) <i>M</i>	Ulcerative colitis (<i>N</i> = 27) <i>M</i>	<i>df</i>	<i>t</i>
Age	39.67	39.44	85	-.094
T0 Symptom severity	3.98	3.58	85	1.596
T0 Quantitative demands	3.19	3.02	85	.879
T0 Cognitive demands	3.94	3.82	85	.697
T0 Control over working time	3.34	3.67	85	-1.391
T0 Social support	2.98	3.19	85	-.870
T1 Exhaustion	2.88	2.81	85	.569
T1 Disengagement	2.24	2.22	85	.142
T1 Burnout	2.56	2.51	85	.405
T1 Vigor	3.23	3.10	85	.502
T1 Dedication	3.76	3.60	85	.582
T1 Absorption	3.34	3.16	85	.693
T1 Work engagement	3.30	3.14	85	.652

Note: *N* = 87.

APPENDIX C

T-tests investigating differences in baseline variables between participants included in the sample and baseline participants not included in the final sample (lost-to-follow-up and employment changes) (Study 2).

	Not included in the final sample <i>M</i>	Included in the final sample <i>M</i>	<i>df</i>	<i>t</i>
Age	37.61	40.05	211	-1.702
T0 Symptom severity	2.58	2.57	211	3.037*
T0 Quantitative demands	2.54	2.53	211	.079
T0 Cognitive demands	3.57	3.78	211	-2.090*
T0 Social support	3.49	3.67	211	-1.587

**p* < .05.

APPENDIX D

T-tests comparing participants reporting significant changes in their working conditions due to Covid to participants reporting no changes (Study 2).

	Changes due to the pandemic (<i>N</i> = 123)<i>M</i>	No changes reported (<i>N</i> = 16)<i>M</i>	<i>df</i>	<i>t</i>
T0 Symptom severity	2.25	2.32	127	-.339
T0 Quantitative demands	2.52	2.62	127	-.497
T0 Cognitive demands	3.78	3.79	127	-.017
T0 Social support	3.82	4.00	127	-.710
T0 Exhaustion	2.56	2.47	127	.767
T1 Exhaustion	2.43	2.42	127	.046
T0 Disengagement	2.16	2.16	127	-.006
T1 Disengagement	2.29	2.22	127	.528
T0 Burnout	2.36	2.31	127	.382
T1 Burnout	2.36	2.32	127	.357
T0 Vigor	4.68	4.60	127	.311
T1 Vigor	4.41	4.29	127	.426
T0 Dedication	5.13	4.91	127	.699
T1 Dedication	4.82	4.80	127	.105
T0 Absorption	4.69	4.37	127	1.163
T1 Absorption	4.38	4.11	127	.941
T0 Work engagement	4.81	4.61	127	.785
T1 Work engagement	4.53	4.37	127	.544

Note: *N* = 129.

APPENDIX E

T-tests comparing participants reporting significant changes in their working conditions due to Covid between baseline and follow-up to participants reporting no changes (Study 2).

	Changes between baseline and follow-up (<i>N</i> = 53) <i>M</i>	No changes reported (<i>N</i> = 76) <i>M</i>	<i>df</i>	<i>t</i>
T1 Exhaustion	2.40	2.46	127	−.889
T1 Disengagement	2.32	2.26	127	.785
T1 Burnout	2.36	2.36	127	.016
T1 Vigor	4.43	4.38	127	.283
T1 Dedication	4.84	4.82	127	.085
T1 Absorption	4.39	4.33	127	.312
T1 Work engagement	4.84	4.76	127	.455

Note: *N* = 129.

APPENDIX F

Bivariate correlations between Covid-related variables and study variables (Study 2).

	(T0) Days/week remote work (<i>N</i> = 122)	(T0) Difference in days/week remote work (<i>N</i> = 118)	(T1) Days/week remote work (<i>N</i> = 127)	(T1) Difference in days/week remote work (<i>N</i> = 106)
T0 Symptom severity	.03	−.07		
T0 Quantitative demands	.17	.08		
T0 Cognitive demands	.08	.11		
T0 Social support	−.07	.02		
T0 Exhaustion	−.03	−.14		
T1 Exhaustion	−.08	−.16	−.18*	−.25*
T0 Disengagement	.01	−.03		
T1 Disengagement	−.01	−.10	−.01	−.13
T0 Burnout	−.01	.10		
T1 Burnout	−.05	−.15	−.10	−.22*
T0 Vigor	−.12	−.10		
T1 Vigor	−.11	−.03	−.10	.03
T0 Dedication	−.08	−.08		
T1 Dedication	−.04	.00	−.10	.02
T0 Absorption	−.03	.02		
T1 Absorption	.02	.02	.04	.04
T0 Work engagement	−.08	−.06		
T1 Work engagement	−.05	.00	−.03	.03

**p* < .05.

APPENDIX G
Regressing standardised burnout and work engagement on the standardised covariates, symptom severity, and remote work (Study 2).

	Exhaustion	Disengagement	Burnout	Vigor	Dedication	Absorption	Work engagement
Fixed effects (Level 2)							
Intercept	.31	-.30	-.02	.57**	.35	.54**	.54**
Time	-.29**	.24**	<.01	-.30**	-.25**	-.30**	-.31**
Gender	.27	-.03	.13	-.13	.02	-.11	-.08
Age	-.06	-.13	-.12	.08	.14	-.02	.07
MS type	-.51*	-.32*	-.48*	-.02	.11	.07	.06
Quantitative demands	.19*	.06	.14	-.06	-.03	.04	-.02
Cognitive demands	-.06	-.28**	-.22**	.37**	.34**	.38**	.40**
Social support	-.18*	-.32**	-.31**	.24**	.35**	.22**	.30**
Symptom severity	.34**	.21*	.31**	-.18*	-.04	-.05	-.10
Fixed effects (Level 1)							
Hours/week remote work	-.09	-.02	-.06	-.08	.01	<-.01	-.02
Random effects							
Intercept SD (Individuals)	.63	.77	.73	.73	.75	.72	.73
Residual			.50	.51	.49	.57	.51
AIC	652.16	613.51	618.06	625.47	619.67	654.41	620.92
BIC	697.35	658.71	663.25	670.66	664.86	699.60	666.12
Marginal pseudo R ²	.26	.23	.26	.23	.24	.20	.25
Conditional pseudo R ²	.64	.79	.76	.75	.77	.69	.76

Note: N = 129 (Level 2), N = 249 (Level 1). Time coded 0 = T0, 1 = T1, Gender coded 1 = male, 2 = female, MS course type coded 1 = relapsing-remitting, 2 = other types, outcome variables assessed at T0 and T1, all models accounted for autocorrelation.

*p < .05.

**p < .01.