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Job demands and resources and their association with employee well-being in the European Healthcare sector: a systematic review and meta-analysis of prospective research

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Despite the extant research on work and well-being in the healthcare sector, a comprehensive overview of the key work characteristics, and a meta-analytic investigation of their over-time relationships with well-being, are still lacking. This study provides 1) a summary of the most investigated job demands and resources at the group, leadership, and organisation levels (GLO) explored in the European healthcare sector; 2) a quantitative analysis of their prospective association with well-being; 3) a test of the moderator effect of work characteristics' source (GLO) and time lag. A systematic literature search was completed resulting in 47 independent samples (N = 39,467 healthcare employees). We identified a wide range of challenge (i.e., workload), hindrance (i.e., role stress), threat demands (i.e., violence from patients) and resources (i.e., control, support). Meta-analytic results showed that hindrance and threat demands were more detrimental than challenge demands, but unexpectedly challenge demands were not related to motivational outcomes. Baseline resources had an important role in protecting and promoting follow-up employee well-being, with group-level resources being more strongly negatively associated with strain. We found no significant differences in well-being between GLO levels of job demands. Time lag did not significantly moderate the prospective associations among work characteristics and employee well-being.

Keywords: meta-analysis, healthcare sector, well-being, challenge-hindrance-threat stressors model, IGLO framework

Introduction

Work characteristics are known to influence workers' well-being in a variety of employment settings (Crawford et al., 2010). A vast amount of research has shown convincing evidence of the impact of work on poor well-being, such as burnout (Nahrgang et al., 2011), distress (Schmidt et al., 2014) and physical symptoms (Nixon et al., 2011). In 1989, the implementation of the European Framework Directive 89/391/EEC on occupational safety and health (OSH) introduced employers' general obligations to ensure employees' well-being by addressing all types of risk, including work characteristics, in a preventive manner. This Directive led to the development of follow-up policies, such as the European Framework Agreement on Work-related Stress in 2004, which emphasizes the assessment and management of work characteristics (Leka et al., 2015). Identified as a high-risk sector, much research has focused on understanding the links between work characteristics and well-being in the European healthcare sector (Eurofound, 2017). Healthcare employees are exposed to a wide range of stressors, such as quantitative and emotional demands, insufficient time to perform their job, adverse social behaviours, and lack of adequate organisational resources (e.g., Adriaenssens et al., 2015). Moreover, the COVID-19 pandemic has intensified the pre-existing challenges of the sector by increasing workloads and reducing rest periods (Franklin & Gkiouleka, 2021). Despite the highly demanding characteristics of jobs in healthcare, a comprehensive overview of the major work characteristics experienced by the European healthcare employees, and an investigation of their long-term relationships with well-being, is lacking.

In the present systematic literature review and meta-analysis, we synthesise the quantitative studies on the job demands (JDs) and resources (JRs) most often explored in the healthcare, and meta-analytically summarise their prospective associations with employee well-being, using the Job Demands-Resources (JD-R) model (Bakker & Demerouti, 2017), the Challenge-Hindrance-Threat stressors model (Cavanaugh et al., 2000; Tuckey et al., 2015) and the IGLO model as our underlying frameworks. We focus on European studies due to the common framework on the management of potentially adverse work characteristics (namely, psychosocial risks) among

European Countries. Starting from the European Framework Directive 89/391/EEC, several binding and nonbinding/voluntary policies and guidance have been developed at European level (Leka et al. 2015), including those related to the healthcare sector. Indeed, the Council Directive 2010/32/EU to prevent injuries and blood borne infections to hospital and healthcare workers from sharp objects, highlights the pivotal role of work characteristics for health and safety prevention in this high-risk sector. This common framework is reflected in turn at the national level and through the actions put in place by organisations for the management of potentially adverse work characteristics. Thus, the current work focuses on European studies to grasp these specificities and common aspects.

Our literature review and meta-analysis makes three significant contributions to the existing field of work and well-being in the healthcare sector. First, previous reviews and meta-analyses have been narrower in their scope, focusing either on specific variables (e.g., Cavanagh et al., 2020) or professional groups (e.g., Broetje et al., 2020). For example, in their integrative review of reviews, Broetje et al. (2020) identified the key JDs and JRs of nursing staff: workload, lack of rewards and work-life conflict as JDs; management support, fair and authentic management, transformational leadership, interpersonal relationships, control and professional resources as JRs. Keyko et al. (2016) focused on the same occupational group and identified the key aspects leading to work engagement, including organisational climate, JRs (e.g., social support), and adequate levels of JDs (e.g., work pressure). Lee and colleagues (2011) investigated the most important JDs (i.e., overcommitment) and JRs (i.e., control, social support) predicting burnout among psychotherapists. Finally, Singh et al. (2020) explored which are the key JDs (workplace trauma, workload and setting) and JRs for the onset or prevention of compassion fatigue among mental health professionals.

Complex interventions that take a preventive approach to addressing the adverse work characteristics in the healthcare sector reflecting the interdisciplinary and interdependent nature of this sector have been recommended (Di Tecco et al., 2020). This calls for a comprehensive understanding of the relationships between work characteristics and well-being across occupational

groups in the healthcare sector. Thus, following the World Health Organisation (WHO) classification of healthcare employees (2006), we include studies on both health service providers (e.g., general practitioners, nurses) and health management and support workers who are not engaged in the direct provision of services (e.g., healthcare administrative professionals).

Second, previous reviews have mainly investigated the associations between work characteristics and employee well-being using cross-sectional data (or longitudinal studies in which only data collected at the first time point were analysed). Although informative, this strategy only allows researchers to establish whether relationships exist among variables, and they are therefore not well-suited to provide rigorous evidence on the causal order of variables (Taris & Kompier, 2003). To increase the robustness of our results, we aggregate only data of prospective research, allowing us to consider the temporal order of variables. To the best of our knowledge, our meta-analysis is the first to explore the prospective association between work characteristics and well-being among healthcare workers.

Third, although as previous reviews and meta-analyses we use the JD-R model as our underlying framework (i.e., Broetje et al., 2020), we extend the model by including recent developments of the levels of JDs and JRs and different types of JDs. We explore the importance of different sources or levels of JDs and JRs based on the IGLO model (Nielsen et al., 2017), which suggests understanding the source of a JD or JR, be it at the individual, group, leader, or organisational level, enable organisations to identify at which level they should target interventions (Nielsen et al., 2017). Furthermore, recent theory has been developed which distinguished three types of JDs (challenges, hindrances, threats) suggesting that their impact on well-being is not uniform (Crawford et al., 2010; Tuckey et al., 2015). In the present review and meta-analysis, we explore whether these three types of JDs have differential effects on well-being in the healthcare sector. Thus, we answer recent calls for research on the role that specific, high-risk work contexts may have in affecting the appraisal and consequences of work characteristics (LePine, 2022). In

doing so, we provide a more nuanced investigation of the impact that qualitatively different JDs may have on employee well-being.

Background: the healthcare sector, job demands, job resources, and well-being

At the European level, healthcare employees report the highest levels of work-related stress compared to other professionals (Eurofound, 2017), and experience poor well-being (Johnson et al., 2018; Rodrigues et al., 2018) and physical symptoms (Pekkarinen et al., 2013). The nature of healthcare work itself makes jobs in this sector inherently demanding, requiring, among others, contact with distressed and ill patients, work overload, up-to-date learning, and high-quality standards of performance (Eurofound, 2017).

According to the JD-R model, any work characteristic can be classified into two overarching categories: JDs and JRs (Bakker & Demerouti, 2017). JDs are those aspects of the job that require sustained efforts or skills and that, if excessive, lead to reduced well-being through a health-impairment process. Conversely, JRs are those aspects of the job which enable employees to achieve their goals, stimulate personal growth, and generate well-being through a motivational process. The prospective impact of JDs and JRs on employee well-being has been generally supported in previous research (e.g., Lesener et al., 2019). Early versions of the JD-R model argued that JDs are solely harmful (Demerouti et al., 2001), however, a meta-analysis found that JDs can also have positive effects, especially when they allow workers to utilise and develop their skills (Crawford et al., 2010). This perspective advocates a qualitative distinction of JDs in challenges, hindrances, and, recently, threats (Crawford et al., 2010; Tuckey et al., 2015). Challenge demands are those work characteristics or circumstances that may have associated gains for individuals (O'Brien & Beehr, 2019). Indeed, consistent with the Conservation of Resources' theory (COR; Hobfoll, 1989), challenge demands may offer a net resource gain because they are intrinsically motivating and/or determine learning and personal development (Cavanaugh et al., 2000). Thus, although energy depleting, challenge demands tend to be associated with employee well-being and

positive job attitudes. Examples of challenge demands are workload, time pressure and job complexity (Podsakoff et al., 2023). Hindrance demands reflect those circumstances that, involving excessive or undesirable constraints, interfere with or impede an employee's ability to achieve valued goals (Cavanaugh et al., 2000). Consequently, these tend to be associated with ill-being and negative job attitudes. Examples of hindrance demands are role ambiguity, job insecurity, and lack of adequate equipment (Podsakoff et al., 2023). Finally, threat demands are those work characteristics or circumstances directly associated with personal harm or loss (Tuckey et al., 2015). Differently from hindrances, which block gain and goal achievement, threat demands pose a direct threat to the self (Tuckey et al., 2015). Thus, they have substantial effects on ill-being and strain. Examples of threat demands are workplace aggressions, difficult interactions with customers, and emotional demands.

In the current study, we focus on a wide range of JDs and JRs that may stem from three different sources: the group, the leader, and the organisation. In doing so, we build on Nielsen and colleagues (2017), extending our meta-analysis also to include JDs as suggested by Lam et al. (2022). As we are interested only in work characteristics, we do not include the individual-level, i.e., resources inherent in the individual, described in the original framework (Individual-Group-Leader-Organisation model - IGLO; Nielsen et al., 2017), but focus on the GLO levels of the model. The added value of the proposed classification is that it enables us to identify which levels healthcare organisations may target when aiming to promote a healthy workplace, by concurrently reducing (or eliminating) JDs and increasing JRs.

In line with the JD-R model, we include a wide range of pathogenic outcomes resulting from prolonged exposure to stressful work characteristics or experiences of distress (i.e., burnout, depression, and anxiety), and salutogenic outcomes capturing motivation at work (i.e., work engagement, job satisfaction and mental well-being). In doing so, we rely on the definition of well-being provided by Danna and Griffin (1999). Accordingly, well-being is described as a broad and encompassing concept that takes into consideration the whole person. The construct includes

physiological (e.g., physical exhaustion) and psychological indicators (e.g., emotional exhaustion), as well as context-free measures of life experiences (e.g., general health) and, within the organisational research realm, generalised job-related experiences (e.g., work engagement) and more specific job-related dimensions (e.g., satisfaction with working hours). In line with previous meta-analyses (i.e., Kubicek et al., 2022; LePine et al., 2005), we differentiate employee well-being in two broad categories: strain and motivational outcomes.

Job demands and resources in the healthcare sector, and their association with later well-being

The identification of the work characteristics on which to focus intervention activities (i.e., excessive JDs, lack of JRs) is an important first step of any organisational intervention (Nielsen et al., 2010). This is consistent with the risk management paradigm that calls for the identification of the specific risk factors into the workplace to implement fitting corrective actions (Leka et al., 2008). Thus, to effectively improve or protect well-being in the healthcare sector, organisational interventions targeting the true issues faced by employees are needed (Di Tecco et al., 2020; Nielsen et al., 2014). A criticism of existing research is that is often excessively concerned with the assessment of a limited number of work characteristics that are common to all organisational sectors (Brough & Briggs, 2015). On the one hand, the value of such an approach lies in its applicability to a heterogeneous range of occupations and in the comparability of results among different contexts. For example, Great Britain's Health and Safety Executive (HSE) "Management Standards" (MS) taxonomy of job stressors (2009) describes six organisational areas characterising most occupations and contexts: workload, control, support, interpersonal relationships, role and change. On the other hand, there is a risk that this approach does not fully grasp occupation-specific psychosocial work environment in some contexts particularly at risk (Vignoli et al., 2017), such as the healthcare sector. Few studies have demonstrated that a wide range of work characteristics have an impact on employee well-being above and beyond context-free variables as workload, control, and social support (i.e., Balducci et al., 2014; Menghini & Balducci, 2022; Verhoef et al., 2021).

In the current study we aim to provide an overall synthesis of all the most investigated JDs and JRs affecting employee well-being over time to understand which of these work characteristics at GLO sources are more prevalent in the healthcare sector.

Therefore, our first Research Question (RQ) is the following:

RQ1: Which JDs (challenges, RQ1.1; hindrances, RQ1.2; threats, RQ1.3) and JRs (RQ1.4) at GLO levels are prospectively investigated in relation to well-being in the European healthcare sector?

A second criticism of existing research is that there is a lack of prospective studies investigating the relationship between JDs and JRs and well-being over time (Tang, 2014). Although several meta-analyses provided evidence that qualitatively distinct JDs are differently associated with employee well-being (i.e., Crawford et al., 2010; LePine et al., 2005), these relied on cross-sectional data. We argue that, to support the development of interventions aimed to reduce or eliminate the most hazardous JDs, and to maximize the most important JRs in the healthcare sector, it is paramount to quantify their over-time association with employee well-being. Therefore, to increase the validity of our analyses, we decided to aggregate only data of prospective studies, expecting to prospectively validate the essential assumptions of the JD-R model and the Challenge-Hindrance-Threat stressors model in the healthcare sector.

Therefore, we developed our related study hypotheses:

Hypothesis 1: Challenge, hindrance and threat demands at T1 are positively associated with strain at T2.

Hypothesis 2: Hindrance and threat demands at T1 are negatively associated with motivational outcomes at T2.

Hypothesis 3: Challenge demands at T1 are positively associated with motivational outcomes at T2.

Hypothesis 4: JRs at T1 are negatively associated with strain at T2, and positively associated with motivational outcomes at T2.

The role of context

Despite the growing interest in the Challenge-Hindrance-Threat stressors model, this framework is not exempt from criticisms. For example, although research generally supports the notion that, on average, specific stressors are more likely to be appraised as detrimental or challenging (e.g., LePine et al. 2005; Podsakoff et al., 2007), other scholars contend that JDs can be either experienced as more or less hindrances, threats, or challenges under particular circumstances. Thus, the classification of JDs in challenges, hindrances or threats may be not always straightforward (Bakker & Sanz-Vergel, 2013).

In a recent conceptual review, LePine (2022) underlines the importance of context in the Challenge-Hindrance stress and appraisal process, suggesting that the effect of specific JDs may depend on the occupational sector. For example, individuals who choose a healthcare profession are often motivated by helping others and working closely with people in need (e.g., McCabe et al., 2005). Thus, work characteristics such as emotional demands and difficult interactions with customers, which are generally described as threatening aspects by other occupational groups, may be considered as challenging or rewarding by healthcare employees (Bakker & Sanz-Vergel, 2013; De Jonge et al., 2008). For example, Bakker and Sanz-Vergel (2013) found that home healthcare nurses conceived the interaction with demanding patients more as a challenge rather than a threat. In a similar way, in a sample of eldercare employees, De Jonge and colleagues (2008) demonstrated that emotional demands were positively associated with employee well-being, especially when job resources were high.

Consequently, in the current study we explore which of the identified JDs have motivational (challenges) or solely detrimental (hindrances, threats) effects for healthcare employees. For the sake of completeness, we also investigate the prospective associations among all the emerged JRs and employee well-being. The positive effects of JRs on well-being have been clearly demonstrated in a plethora of studies and meta-analyses (e.g., Nielsen et al., 2017). However, the relationship among different JRs (i.e., control, social support) and well-being has not been investigated in the European healthcare sector using meta-analytic techniques and prospective data. We believe such an approach

would be paramount to provide insights on what are the most important factors that can protect or promote employee well-being in this high-risk sector. Thus, we develop our second and third RQs:

RQ2: Which of the emerged JDs are challenges (RQ2.1), hindrances (RQ2.2) or threats (RQ2.3) for healthcare professionals?

RQ3: Which of the emerged JRs are the most important in promoting and protecting healthcare employees' well-being?

Moderators of the prospective association between job demands-resources and well-being

Sources of job demands and resources

To design a psychologically healthy workplace, practices, policies, and initiatives that focus on preventing and minimizing excessive JDs as well as interventions promoting and enhancing well-being need to be integrated (Day & Randell, 2014). Recent advancements in OHP suggest developing these interventions not only at individual and organisational levels (e.g., modifying the way work is organised, designed, and managed; Nielsen et al., 2010), but also at group and leader levels (Nielsen et al., 2017). Group-level interventions are related to teams' and work-units' functioning (e.g., reducing workplace conflicts, improving team integration) and leader-level interventions target leaders' characteristics and their ability in effectively managing employees (e.g., improving leadership style and managerial support). Research in the healthcare sector has shown convincing evidence on the association between group-level JDs and JRs on well-being (e.g., Schön Persson et al., 2018). Moreover, although only few studies in the healthcare sector have explored the association between leader-level JDs and JRs and well-being (e.g., Hesselgreaves & Scholarios, 2014), they are known to be significantly associated with employee psychological health (Skakon et al., 2010).

We propose it is important to determine if JDs and JRs at any of the three levels considered in this study (GLO) are more strongly associated with employee well-being over-time than JDs and

JRs at the other two levels. In doing so, we provide useful information on which sources healthcare organisations may target when aiming to promote a psychologically healthy workplace.

RQ4: Are JDs (RQ4.1) and JRs (RQ4.2) at any of the three sources (GLO) more strongly associated over time with well-being than JDs and JRs at the other two levels?

Time lag

In the field of OHP, the results provided by prospective and longitudinal studies are still somewhat unclear and sometimes different from what we could expect. Sometimes, longitudinal studies are unable to replicate associations that had been firmly established cross-sectionally. Unexpected results could depend on an unsuitable choice of length of the time lags between study waves. Indeed, using too short or too long time lags can have two consequences a) the effects do not have enough time to emerge, or b) the effects might diminish as a result of individual adaptation (Taris & Kompier, 2014). Similarly, Dormann and Griffin (2015) argued that over time, a continuous causal process may produce both increasing and declining effect sizes.

We include time lag between the first two measurement moments as additional study-level moderator of the association between JDs and JRs and well-being. Thus, our fifth RQ is the following:

RQ5: Is time lag a significant moderator of the prospective association between JDs (RQ5.1) and JRs (RQ5.2) and well-being?

Method

Literature search and selection of studies

We developed a threefold approach to retrieve eligible prospective research and to answer RQ1. First, following PRISMA guidelines (Moher et al., 2009), we performed a systematic literature search using PubMed, Scopus, PsycINFO, Google Scholar and OpenGrey. Our research strategy was similar in all databases, implying a combination of three different thematic blocks of keywords:

one for JDs and JRs (e.g., "demand*", "social support", "role ambiguity"), one for JDs and JRs synonyms (e.g., "hazard*", "psychosocial risk*", "job stressor*") and the last for healthcare-related terms and phrases (e.g., "physician*", "nurse*", "hospital*", "healthcare"). The full list of research terms can be obtained upon request from the first author. Second, to identify eligible publications not found during the electronic search, we manually inspected the following relevant scientific journals that publish work on occupational health and safety: *Journal of Applied Psychology, Journal of Occupational Health Psychology*, *Occupational Health Science, Stress and Health*, and *Work & Stress*. Third, we scanned reference lists of the eligible studies to identify further research.

To select the final body of evidence, we checked all titles and abstracts and, if eligible, we acquired the full texts and reviewed them for the final decision. To be included, the studies had to meet the following inclusion criteria: (a) focus on the association between JDs and/or JRs and well-being; (b) prospective study with two or more waves; (c) involving healthcare employees; (d) published in Europe during the last ten years to reflect the most recent developments on occupational health (namely, between January 2008 and the date of the search, March 2019); (e) limited to English, Italian, Spanish and French. We decided to exclude studies that did not provide primary quantitative data, such as qualitative studies or reviews. We excluded papers on organisational interventions, since we wanted to avoid any external manipulation. We removed diary studies as they are focused on daily processes and do not satisfy the conventional definition of a prospective study. Moreover, we did not consider studies that investigated only composite measures of "job stress" (e.g., effort-reward imbalance). With reference to the quantitative analysis, we only included articles providing at least the prospective association between baseline JDs and/or JRs and follow-up well-being. Finally, in cases in which multiple studies were based on the same dataset, to ensure sample independency we only included one study based on the following criteria: 1) the study reporting correlation coefficients as effect size; 2) the study using the most comprehensive coding information; 3) the study using the largest sample.

Following the application of the eligibility criteria mentioned, we selected 287 studies for full-text analysis. Four co-authors, split in two subgroups, independently reviewed the full texts for inclusion. Cohen's Kappa showed an initial substantial agreement between the evaluators in both subgroups (κ=0.76; κ=0.68). Any disagreement was solved by discussion.

Study coding

The following information were extracted for the identification of each study: (a) bibliographic data; (b) study aims; (c) setting; (d) descriptive statistics at baseline; (e) number of waves and study length; (f) JDs assessed, their typology (i.e., challenge-hindrance-threat demands) and sources (GLO); (g) JRs assessed and their sources (GLO); (h) well-being indicators assessed and their typology (strain or motivational outcomes); (i) tools administered; (j) analytic strategy; (k) effect sizes of the association between JDs and/or JRs and well-being, and number of subjects involved. We decided to code correlation coefficients as measure of effect size. If a study reported total sample along with subgroups correlation analyses, we chose to extract the effect sizes for the overall sample to ensure consistency between results. Alternatively, if a study reported only subgroups correlations (e.g., women and men), we considered them as if they belonged to separate samples. When articles did not provide the zero-order correlation matrix, as a first attempt we contacted study authors to obtain correlations between our variables of interest; this resulted in the inclusion of four additional studies. Otherwise, where possible, we extracted alternative effect sizes (i.e., Crude Odds Ratios) that were further converted to correlations using Comprehensive Meta-Analysis 3.3 (Borenstein et al., 2014). For studies that included three or more waves of data collection, we selected the time points that corresponded to the shortest time lag.

Meta-analytic strategy

Multivariate and univariate analyses

To investigate hypotheses 1-4, we fitted a two-stage meta-analytic structural equation model to the data (TSSEM; Cheung & Chan, 2005) using the *metaSEM* package in R (Cheung, 2015). We decided to use this approach to account for the potentially significant correlations between the predictors (challenge, hindrance, threat demands, and JRs). At stage one, we computed a 6x6 meta-analytic matrix of pooled correlations using weighted least squares estimation (WLS). The pooled correlation matrix included the following variables: T1 challenge demands, T1 hindrance demands, T1 threat demands, T1 JRs, T2 strain and T2 motivational outcomes. At stage two, we input the pooled correlation matrix obtained to estimate a path model in which work characteristics at T1 were associated with strain and motivational outcomes at T2. Independent and dependent variables were allowed to correlate (Dormann et al., 2010).

To answer RQ2 and RQ3, we calculated pooled correlation coefficients between baseline JDs and JRs and follow-up well-being using the *metafor* package in R (Viechtbauer, 2010). In doing so, we aimed to better understand the strength and direction of associations between the specific work characteristics identified and employee well-being. We assumed a random-effects model since we expected to find variation between true population parameters due to random primary study-level and sample-level characteristics. We estimated meta-analytic correlations when at least two samples examined the given association. If multiple correlations were derived from the same sample and were, therefore, dependent (e.g., more than one measure was used to assess different JDs), we averaged the effects so that only one measure of association was included in the analysis using Fisher's *Z* transformation (Card, 2012). Additionally, to increase the validity of our conclusions, we calculated cross-lagged effects, namely effect size measures that were controlled for prior levels of the predicted variable. Cross-lagged effects indicate the prospective relation of one variable (i.e., challenge demands at T1) on the other (i.e., strain at T2) taking into account the stability across time of the predicted variable (i.e., the effect of strain at T1 on strain at T2). In doing so, we ruled out the possibility that the prospective associations were mainly due to concurrent relations between the variables and the stability of the predicted variable (Finkel, 1995).

The cross-lagged coefficients were calculated using the following formula (Cohen et al., 2003), which is applicable when an outcome (y) is influenced by two predictors (x_1, x_2):

$$\beta_{y1.2} = \frac{r_{y1} - r_{y2}r_{12}}{1 - r_{12}^2}$$

In specific, $\beta_{y1.2}$ is the standardized regression coefficient of x_1 predicting y controlling for the effect of x_2; r_{y1} and r_{y2} are the prospective correlations between each predictor and the outcome; and r_{12} is the cross-sectional correlation between the two predictors.

Heterogeneity and moderator analysis

We inspected different criteria of analysis to test for homogeneity between primary studies. First, we computed the Hedges' Q_{within} statistic, where a significant value rejects the null hypothesis of homogeneity. Second, we calculated the inconsistency index (I^2), an indicator of heterogeneity in percentage indicating the proportion of true variance to total variance across the observed effect estimates (Huedo-Medina et al., 2006), and the tau-squared (τ^2), namely the estimate of the variance in effect size. Values of 0% indicates no heterogeneity, 50% indicates moderate heterogeneity, and 75% indicates high heterogeneity (Higgins et al., 2003). Finally, we calculated the 95% credibility interval (95% CrI) for the weighted average correlations. Large CrIs (over 0.11) or including zero may indicate the presence of moderators (Whitener, 1990).

We performed moderator analysis if one of the focal prospective correlations between overall challenge, hindrance and threat JDs and JRs and well-being was heterogeneous (RQ4 and RQ5). As work characteristics' source (GLO) was a categorical variable, we used subgroup analysis and inspected the Q_{between} statistic, which, if significant, suggests a difference between the mean effect sizes across groups. Subgroup analysis was performed when at least four independent samples examined the given association (Fu et al., 2011). Conversely, the potential moderating effect of time lag (continuous variable) was tested using random effects meta-regression analyses.

Results

A total of 46 studies and 47 independent samples (N = 39,467 healthcare employees) were selected for inclusion in qualitative and quantitative synthesis. Overall, starting from strain, the majority of studies investigated the association between work characteristics and burnout or its components (24), followed by psychological distress (12; i.e., depression), sickness indicators (five; i.e., absenteeism), and sleeping difficulties (five). Turning to motivational outcomes, the most investigated variable was work engagement (12 samples), followed by satisfaction for the job or the organisation (seven) and general well-being (seven). The PRISMA Flow Diagram, the basic information for each study (including study quality) and the full reference list can be found in FigShare: https://figshare.com/s/53a7430c8e8dcac9bf53.

Demands and resources of the European healthcare sector

The literature search resulted in 27 independent samples exploring the prospective association among challenge demands and employee well-being (RQ1.1; see Table 1). All these work characteristics were at the organisation level. The most investigated challenge demand was workload (21 samples), a category which included variables such as quantitative demands, time pressure, working hours, and work intensification. Cognitive demands, which reflected aspects such as learning requirements, psychological demands, job complexity, and challenging tasks, were investigated in seven samples. Finally, the number of contacts with patients was investigated in three samples.

Hindrance demands were inspected in 27 independent samples (RQ1.2). Also in this case, all the variables were at organisation-level. The most investigated hindrance demand was role stress, which reflected aspects such as role conflict and ambiguity (11 samples), while irregular work schedule, a category including aspects such as night work and alternate days/night shifts, was investigated in seven samples. Work-life conflict, i.e., work-family interference, was investigated in six independent samples. Physical demands, which included aspects as handling heavy objects and physical endurance, was inspected in four primary samples. Finally, inadequate work environment

and equipment (i.e., lack of material resources) and workflow aspects (i.e., interruptions), were investigated in two samples and one sample, respectively. A composite measure of hindrance demands was included in only one sample.

The prospective association among threat demands and employee well-being was explored in 24 samples (RQ1.3). Most of the studies investigated organisation-level demands (15), while group-level and leader-level demands were explored in 13 and two samples, respectively. Overall, the most investigated threat demand was negative interactions at work, a category which included aspects as conflicts with colleagues/superiors, lack of cohesion, and bullying (15 samples). Next, emotional demands, a category reflecting aspects as the emotional burden due to typical healthcare work scenarios and self-control demands, was investigated in eight samples. Finally, stressful interaction with patients and their relatives, a category which included variables as violence from patients and lack of rewards from them, was investigated in seven primary samples.

[Insert Table 1 about here]

Switching to JRs (RQ1.4), the literature search resulted in 31 independent samples exploring the prospective association among JRs and employee well-being (Table 1). JRs at organisation-level were investigated in most samples (26), while leader-level and group-level resources were explored in 12 and eight samples, respectively. Overall, control was the most studied resource afforded by the organisation (18 samples). Social support provided by colleagues, leaders or the overall organisation was investigated in 16 samples. Rewards in terms of opportunities for personal and professional development were studied in nine samples. The other investigated resources were organisational fairness (6 samples; i.e., procedural justice), staff adequacy (3 samples; i.e., personnel resources) and general job resources (2 samples).

Path model

To investigate hypotheses 1-4, forty-seven primary correlation matrices were first combined to calculate a pooled correlation matrix to test the path model previously described. The correlations among variables were all significant and in the expected directions (Table 2).

In line with our expectations (Figure 1), we found that challenge demands (β = .05, $p < .05$), hindrance demands (β = .11, $p < .01$) and threat demands (β = .12, $p < .001$) were positively associated with strain at T2; thus, Hypothesis 1 was supported. In a similar way, hindrance demands (β = -.07, $p < .05$) and threat demands (β = -.10, $p < .01$) were prospectively associated with motivational outcomes, supporting Hypothesis 2. Interestingly, challenge demands were not prospectively associated with motivational outcomes (β = .03, $p = .35$); hence, Hypothesis 3 was not supported. Finally, JRs were prospectively associated both with strain (β = -.06, $p < .001$) and motivational outcomes (β = .18, $p < .001$), supporting Hypothesis 4.

[Insert Table 2 about here]

[Insert Figure 1 about here]

Prospective associations between JDs, JRs, and well-being

All the associations between work characteristics at baseline and well-being at follow-up are reported in Table 3 (strain) and Table 4 (motivational outcomes). As expected, we found a significant prospective correlation between overall challenge demands and strain ($\overline{r}$ = .13; $p < .001$). This association remained significant after controlling for strain at T1 (β = .05, $p < .001$). Nevertheless, the Q test (Q_{within}=226.77, $p < .001$, I^2=87.5%) and the credibility intervals (95% CrI = [-.04, .29]) revealed high levels of heterogeneity between the studies. Among the emerged challenge demands, workload (β = .05, $p < .001$) and cognitive demands (β = .04, $p < .05$) were significantly associated with follow-up strain after controlling for that outcome at T1. Patient contacts was not significantly associated with strain. Conversely, challenge demands at T1 were not significantly associated with motivational outcomes at T2 ($\overline{r}$ = -.04; $p = .21$). This association remained non-significant after controlling for motivational outcomes at T1 (β = -.02, $p = .07$). The

Q test (Q_{within}= 38.57, $p < .001$, I^2=80.5%) and the credibility intervals (95% CrI = [-.21, .14]) revealed high levels of heterogeneity between the studies. As regards to the specific challenge demands identified, only workload was weakly (and negatively) associated with motivational outcomes at T2 (β = -.02, $p < .05$). Thus, answering RQ2.1, none of the JDs which are generally described in literature as challenging resulted to be motivating for healthcare employees in the long run. Conversely, workload emerged as a solely detrimental factor.

Next, we found that hindrance demands were prospectively associated with strain ($\overline{r}$ = .19; $p < .001$). This association remained significant after controlling for strain at T1 (β = .06, $p < .001$). However, the *Q* test (Q_{within}=319.98, $p < .001$, I^2=94.5%) and the credibility intervals (95% CrI = [-.04, .45]) revealed high levels of heterogeneity between the studies. Based on available data, role stress (β = .06, $p < .05$) and work-life conflict (β = .11, $p < .001$) were significantly associated with follow-up strain after controlling for that outcome at T1. However, all the emerged hindrance demands, except work schedule, significantly correlated with strain. Simultaneously, hindrance demands at T1 were negatively associated with motivational outcomes at T2 ($\overline{r}$ = -.13; $p < .001$). This association remained significant after controlling for motivational outcomes at T1 (β = -.05, $p < .001$). The *Q* test (Q_{within}=39.19, $p < .001$, I^2=81.87%) and the credibility intervals (95% CrI = [-.32, .06]) revealed heterogeneity between the studies. Among the emerged hindrance demands, and based on available data, we found that role stress (β = -.06, $p < .01$) and work-life conflict (β = -.06, $p < .05$) were significantly associated with motivational outcomes at T2 after controlling for that variable at T1. Inadequate work environment and equipment at T1 significantly correlated with motivational outcomes at T2; however, we could not compute the cross-lagged effect due to a lack of primary samples (k = 1). Thus, answering RQ2.2, we found that especially role stress and work-life conflict are important hindrance demands for the European healthcare professionals.

Threat demands were prospectively associated with strain ($\overline{r}$ = .18; $p < .001$). This association remained significant after controlling for strain at T1 (β = .06, $p < .001$). The *Q* test (Q_{within}=173.55, $p < .001$, I^2=85.3%) and the credibility intervals (95% CrI = [.03, .32]) revealed

high levels of heterogeneity between the studies. Negative interpersonal relationships at work (β = .03, $p < .05$) and emotional demands at T1 (β = .10, $p < .001$) were associated with strain at T2 after controlling for that outcome at T1. However, all the emerged threat demands correlated significantly with follow-up strain. Concurrently, threat demands at T1 were negatively associated with motivational outcomes at T2 ($\overline{r}$ = -.16; $p < .001$). This association remained significant after controlling for that variable at T1 (β = -.05, $p < .01$). We found high heterogeneity between the studies as indicated by the Q test (Q_{within}=39.51, $p < .001$, I^2=83.9%) and the credibility intervals (95% CrI = [-.31, -.01]). Among the emerged threat demands, and based on available data, negative interpersonal relationships at work (β = -.06, $p < .05$) and emotional demands at T1 (β = -.06, $p < .01$) were associated with motivational outcomes at T2 after controlling for that outcome at T1. Thus, answering RQ2.3, we found that especially negative interactions at work and emotional demands are important threat demands for the European healthcare professionals.

[Insert Table 3 about here]

[Insert Table 4 about here]

Switching to JRs, we found a significant prospective correlation between JRs and strain ($\overline{r}$ = -.13; $p < .001$). This association remained significant after controlling for strain at T1 (β = -.03, $p < .01$). The Q test (Q_{within}=117.34, $p < .001$, I^2=78.9%) and the credibility intervals (95% CrI = [-.24, -.02]) revealed high levels of heterogeneity between the studies. Rewards was the only JR significantly associated with strain at T2 after controlling for that variable at T1 (β = -.04, $p < .05$). However, all the emerged job resources (except staff adequacy) prospectively correlated with strain. Additionally, we found a significant prospective correlation between JRs and motivational outcomes ($\overline{r}$ = .23; $p < .001$) (Table 3). This association remained significant after controlling for that variable at T1 (β = .08, $p < .001$). We found high heterogeneity between the studies as indicated by the Q test (Q_{within}=66.45, $p < .001$, I^2=79%) and the credibility intervals (95% CrI = [.07, .37]). Based on available data, control (β = .10, $p < .001$) and rewards (β = .08, $p < .001$) were significantly associated with motivation at T2 after controlling for that variable at T1. However, all

the emerged JRs prospectively correlated with motivation. Unfortunately, we could not calculate the correlation between staff adequacy at T1 and motivational outcomes at T2 due to a lack of primary samples (k = 1). Thus, answering RQ3, the identified JRs emerged as important factors in promoting and protecting healthcare employees' well-being. The inspection of cross-lagged effects revealed that especially control and rewards had an impact on employee well-being.

Work characteristics' source and time lag as moderators

Starting from RQ4 (Table 5), and based on available data, we found that group-level and organisation-level threat demands were similarly associated with strain ($Q_{between} = 3.42$, $df = 1$, $p = .06$) and motivational outcomes ($Q_{between} = 0.28$, $df = 1$, $p = .60$). Interestingly, group-level resources were more strongly associated with strain than leader- and organisation-level resources ($Q_{between} = 7.53$, $df = 2$, $p < .05$). Finally, resources at group-, leader- and organisation-levels were similarly associated with motivational outcomes ($Q_{between} = 0.53$, $df = 2$, $p = .77$).

[Insert Table 5 about here]

As regards to RQ5 (Table 6), time lag was not a significant moderator of the prospective associations among demands or resources and strain or motivation, as evidenced by the results of the meta-regression models.

[Insert Table 6 about here]

Publication bias and outlier detections

To test the impact of publication bias, we calculated both Rosenthal's Fail-safe *N* (Rosenthal, 1979) as well as Begg and Mazumdar's (1994) Kendall rank correlation test (1994). The large classic fail-safe *Ns* (ranging from 84 to 9,996) and the not significant Kendall rank correlations suggested that all the focal correlations between overall challenge, hindrance, and threat demands, JRs and strain or motivational outcomes were unlikely to be influenced by publication bias. Further information can be found in FigShare: https://figshare.com/s/53a7430c8e8dcac9bf53.

We analysed studentized residuals and Cook's distances to examine whether studies may be outliers and/or influential in the context of the models (Viechtbauer & Cheung, 2010). Our results confirmed the absence of outliers in the context of the models, with two exceptions. In specific, we identified a potential study outlier (Schneider et al., 2017) when studying the prospective correlation among challenge demands and motivational outcomes. However, after ascertained that the authors unequivocally investigated the association among a challenge demand (conceptualised as a composite measure of cognitive demands and learning requirements) and employee well-being (measured as work engagement), we decided not to exclude this study. Similarly, we found a potential outlier when studying the prospective correlation among threat demands and strain (van der Heijden et al., 2008). Also in this case, after ascertained that the authors had properly investigated the association among a threat demand (measured as how often healthcare employees were confronted with human suffering, aggressive patients, and troublesome patients) and employee well-being (measured as general health), we decided not to exclude this study. It should be noted that outlier analyses in meta-analyses have been described as problematic, as it is often difficult to distinguish large sample errors from true outliers (Schmidt & Hunter, 2015).

Discussion

Our study offers (a) a qualitative summary of the most investigated JDs and JRs at group, leadership and organisational levels explored in the healthcare sector in the European countries, and (b) a quantitative analysis of their prospective association with employee well-being. Moreover, (c) it provides a test of the potential moderator effect of source (GLO) and time lag. Overall, our literature review and meta-analysis results confirm that work characteristics are crucial for the healthcare sector and for the well-being of their employees.

Our RQ1 was intended to investigate which challenge, hindrance, threat JDs, and JRs at GLO levels have been prospectively investigated in relation to well-being. We identified the following challenge demands (RQ1.1): workload, cognitive demands, and patient contacts.

Workload was the most investigated variable, a result confirming this JD as one of the key work characteristics in many job design models and theories (Karasek & Theorell, 1990). Cognitive demands are the degree to which employees are required to engage in complex problem-solving and cognitive monitoring (Jackson et al., 1993). Due to the inner nature of their jobs, healthcare professionals are continually exposed to demands of cognitive nature (i.e., de Jonge & Dormann, 2006). Finally, contact with patients are key to the professional identity of healthcare employees. All the challenge demands investigated were at organisational level. We identified the following hindrance demands (RQ1.2): role stress, irregular work schedule, work-life conflict, physical demands, and inadequate work environment and equipment. Among these, role stress, reflecting workers' unawareness of their position and responsibilities within the organisation and conflicting demands, was the most investigated variable. Also in this case, all the investigated hindrance demands were at organisational level. Answering RQ1.3, we identified as threat demands negative interpersonal relationships, emotional demands, and stressful interactions with patients. Among these, patient and emotional demands represent pivotal factors when examining healthcare workers' well-being (e.g., Riley et al., 2016). These two JDs are to some extent interrelated: in their everyday working lives, healthcare employees are regularly confronted with patients who do not follow their advice and behave in hostile manners or make unrealistic requests (Bakker et al., 2000). Therefore, emotional demands can arise from exposure to patient suffering, patients' violence or patients making unrealistic requests (Zapf, 2002). Overall, the organisation-level threat demands were the most investigated, followed by threat demands at the group and the leadership-levels. Finally, we identified the following JRs (RQ1.4): control, social support, rewards, organisational fairness, and staff adequacy. The most investigated variables were control and social support. Overall, the JRs investigated were mainly at organisation-level, followed by the group and the leadership-levels.

We found partial support for our hypotheses. First, the results indicated that all JDs were strain-inducing in the long-run. Consistently with previous research, hindrance and threat demands appeared to be more detrimental than challenge demands (i.e., Cavanaugh et al., 2000; Tuckey et

al., 2015). Contrary to expectations, challenge demands were not positively associated with motivational outcomes. An inspection of individual effects (RQ3) revealed that cognitive demands and patient contacts were not associated with motivational outcomes, while workload was negatively associated with that outcome. Although surprisingly, this result confirms previous studies suggesting that workload is a hindrance rather than a challenge for these professionals (Bakker et al., 2003; Bakker & Sanz-Vergel, 2013). High workload has been primarily associated with worse health among healthcare professionals (i.e., Bakker et al., 2003). There may be multiple explanation for this finding. First, work overload may impede healthcare employees to properly pursue their primary goal of providing good care to the patients (Bakker et al., 2003). Second, the association among challenge demands and employee well-being has been mainly investigated in cross-sectional studies, while few evidence exist on their longitudinal relation. Unlike hindrance and threat demands, challenge demands create an opportunity to overcome obstacles, and thus may increase short-term motivation and performance. However, challenge demands require energy, resources, and coping mechanisms and may thus over time have an energy-depletion effect which may offset any gains and result in negative physical and mental consequences (Mazzola & Disselhorst, 2019). This would be in line with the Primacy of loss principle of the COR theory (Hobfoll, 1989), stating that resource loss (due to the prolonged exposition to a risk factor) is disproportionately more salient than resource gain (the "challenging" effect). Among hindrance and threat demands, only work schedule was not significantly correlated neither with strain nor with motivational outcomes. Night work and irregular shifts are well-recognised occupational hazards in healthcare (e.g., Poissonnet & Véron, 2000). Previous studies have underlined that the relationship between irregular work schedule and health is complex (Tucker & Rutherford, 2005). There is evidence that this variable may be a risk factor for well-being especially when combined with other work characteristics (Nabe-Nielsen et al., 2010). These include lack of schedule autonomy, lack of support, insufficient opportunities for recovery, work overload, work-life conflict and coping measures adopted (Kogi, 1996).

Regarding JRs (RQ4), each factor except staff adequacy was significantly correlated with strain and/or motivational outcomes. Among these, rewards was associated with both strain and motivational outcomes at T2 after controlling for those variables at T1. This variable included opportunities for personal development such as learning, feedback, and acquisition of new skills. Continuing professional development, also known as lifelong learning or staff development (Gallagher, 2007), is a widely accepted goal of healthcare professions (Guillemin et al., 2009). This JR is essential for healthcare professionals not only to promote well-being, but also to maintain and acquire the necessary knowledge and skills, and to provide effective patient care (King et al., 2021).

Our RQ5 was concerned with the extent to which source (GLO) moderated the prospective associations between JDs and JRs and well-being. We found that type of source only moderated the prospective association between JRs and strain, suggesting that group-level resources may be particularly important in protecting employees from strain. This result is consistent with previous studies, demonstrating that group-level resources (i.e., support) not only increase the quality of the professional lives of healthcare employees, but that also have an important protective role in strain (i.e., Labrague, 2021). We did not find significant differences between group-, leader-, and organisation-levels demands and employee well-being. Moreover, like Nielsen et al. (2017), neither JRs at any of the GLO levels were more strongly related with motivational outcomes than other of the GLO levels. Overall, our findings advocate for organisational interventions at multiple levels designed to both reduce (or eliminate) JDs and increase JRs (Nielsen & Christensen, 2021).

Finally, the prospective associations between work characteristics and well-being were not moderated by time lag (RQ6). Thus, it could be argued that JDs and JRs can manifest both shorter- and longer-term negative effects on well-being (Ford et al., 2014).

Implications for practice

Through the integration of the JD-R model, the Challenge-Hindrance-Threat stressors model, and the IGLO framework, our meta-analysis offers valuable information on how EU healthcare

organisations may promote employee well-being through strategies that target the way work is organised, designed, and managed. Our results call for interventions targeting groups, leaders and HR and occupational health practices and policies. It is important that organisations implement interventions that target the issues faced by employees (Nielsen et al., 2014) and our results suggest that interventions aimed to increase group-level resources should be particularly effective in reducing healthcare employees' levels of strain. Such interventions could include teambuilding activities or communication exercises. Moreover, our results advocate for organisational-level interventions designed to reduce excessive levels of workload, clearly define roles and responsibilities, ensure a balance between work and family activities, and provide emotional support or opportunities for emotional venting. As regards to motivational outcomes, our meta-analysis does not show that any levels of intervention, be it group, leader or organisational level are more strongly related to these outcomes than others. Our results suggest that interventions aimed to increase job autonomy and opportunities for development could be effective. We argue that those interventions may be useful not only to promote well-being, but also to improve performance and quality of care provided to patients (i.e., King et al., 2021). It should be noted that changing JDs and JRs is not straightforward and careful attention needs to be paid to the intervention process (Di Tecco et al., 2020). Thus, participatory interventions where key stakeholders such as HR, occupational health, managers at all levels, and employees go through a structured process to identify appropriate interventions is recommended (Nielsen et al., 2010).

Our study provides useful recommendations for organisations and occupational health professionals to improve systems for managing the healthcare work characteristics, and to develop more sensitive tools according to a risk assessment approach (Leka et al., 2008). Such approach calls for the identification of all the potential negative work characteristics in the workplaces to implement tailor-made interventions designed to eliminate the risks for health, or to control them when cannot be eliminated (Leka et al., 2008). First step of a risk assessment approach is the identification of the potentially adverse work characteristics, where selecting the appropriate work

characteristics and relative measures is essential to avoid ineffective and useless assessment. Systematic reviews can provide researchers and practitioners with a road map of work characteristics for certain occupational contexts and professions, and relative indicators to be considered for making a valid risk assessment (Menghini & Balducci, 2021). Contextualised interventions based on these specific working conditions should be preferred as more effective for reducing the risk of impaired health in a critical context as the healthcare.

Finally, the focus on European studies may have an impact at policy and practical levels. This contributes to improve knowledge among EU countries on the aspects to be prioritise at European policy and strategic levels. Currently, the issue of psychosocial risks (i.e., excessive JDs, low JRs) is broadly addressed in the EU Strategic Framework on Health and Safety at Work 2021–2027. A renewed debate has been opened by European social partners which are calling for a legislation dedicated to addressing work characteristics at EU level, including guidelines for action and emerging issues linked to mental health at work. This is also in line with the request of European Commission to consider healthcare workers' mental health as a public health priority to find solutions to address the consequences of the Covid-19 emergency (European Commission, 2021).

Study limitations and future research

The present review is not exempt from some limitations that should be acknowledged when drawing conclusions from our findings. First, as we debated, the current study is limited to healthcare employees in Europe. Thus, we cannot generalise our results to other professionals or countries and continents. Future research would benefit from broadening the searching criteria by including also studies performed in other cultural contexts.

Second, due to the narrow inclusion criteria depicted above, we identified a limited number of independent samples; indeed, the sample size for some meta-analytic associations (especially for cross-lagged effects) is small. These estimates should be interpreted with caution, bringing with

them the risk of second-order sampling error (Schmidt & Hunter, 2015). For the same reason, we decided to classify employee well-being in two broad clusters (strain and motivational outcomes) as we could not inspect the effects of work characteristics on single outcomes (i.e., burnout, depression). More longitudinal and prospective investigations are needed to corroborate our findings and to allow for more robust conclusions.

Third, even though the current study is entirely based on prospective data, we cannot draw conclusions regarding causality about the link between work characteristics and well-being. All studies used correlational designs and are based on non-experimental data, thus other variables not controlled for may account for these effects (Little et al., 2007). However, the computation of cross-lagged effects for each work characteristic, enabling us to control for previous levels of the outcome, have substantially improved the validity of the conclusions. Although low, the cross-lagged coefficients generally confirmed the results of the prospective correlations, with some exceptions. It should be noted that small effects are common in prospective research (Semmer et al., 1996), since a large part of the variables' variance measured at follow-up is explained by the same variable measured ate baseline.

A related limitation is that, as we were mainly interested in the predictive effects of work characteristics at T1 on well-being at T2 rather than the reverse effects (i.e., the effect of well-being at T1 on JD-Rs at T2), we did not include work characteristics measured at T2 in our meta-analysis. Since the over-time relationship between work characteristics and well-being is recognised to be reciprocal (Lesener et al., 2019), future studies could benefit from the inclusion of these information to understand how baseline well-being may affect the later perception of work characteristics in the healthcare sector.

Finally, an intrinsic limitation of literature reviews and meta-analyses is that not all existing eligible studies might have been included, as we could have missed some samples. Moreover, as we did not identify eligible grey publications, our analysis is based only on published studies. Therefore, despite the non-significant tests for publication bias, there is the risk that our results

suffer from the ‘‘file drawer’’ problem. In future research, it would be worthwhile improving the collection of unpublished data by including sources other than research databases (e.g., contacting scholars in the field for their unpublished data).

Conclusion

Overall, the main contributions of the present study are threefold. First, it offers a qualitative summary of the most investigated JDs and JRs at GLO levels explored in the European healthcare sector regarding over-time well-being. Second, it provides a more rigorous investigation of the association between work characteristics and well-being in this sector by aggregating only data from prospective research. Third, it shows that either considering their typology or GLO levels, JDs and JRs are paramount in affecting employee well-being. These results provide important indications for healthcare organisations on how to design effective organisational interventions to improve well-being. These call for organisational interventions targeting a wide range of JDs and JRs, and equally focused on GLO levels to successfully improve or protect employee well-being in this high-risk sector.

Disclosure statement

The authors report there are no competing interests to declare.

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References

Adriaenssens, J., De Gucht, V., & Maes, S. (2015). Determinants and prevalence of burnout in emergency nurses: A systematic review of 25 years of research. *International Journal of Nursing Studies*, *52*(2), 649–661. https://doi.org/10.1016/j.ijnurstu.2014.11.004

Bakker, A. B., & Demerouti, E. (2017). Job demands-resources theory: Taking stock and looking forward. *Journal of Occupational Health Psychology, 22*(3), 273–285. https://doi.org/10.1037/ocp0000056

Bakker, A. B., & Sanz-Vergel, A. I. (2013). Weekly work engagement and flourishing: The role of hindrance and challenge job demands. *Journal of Vocational Behavior, 83*(3), 397–409. https://doi.org/10.1016/j.jvb.2013.06.008

Bakker, A. B., Demerouti, E., Taris, T. W., Schaufeli, W. B., & Schreurs, P. J. G. (2003). A multigroup analysis of the job demands-resources model in four home care organizations. *International Journal of Stress Management, 10*(1), 16–38. https://doi.org/10.1037/1072-5245.10.1.16

Bakker, A. B., Schaufeli, W. B., Sixma, H. J., Bosveld, W., & Dierendonck, D.V. (2000). Patient demands, lack of reciprocity, and burnout: a five-year longitudinal study about general practitioners. *The Journal of Allergy and Clinical Immunology, 21*(4), 425–441. https://doi.org/10.1002/(SICI)1099-1379(200006)21:4%3C425::AID-JOB21%3E3.0.CO;2-%23

Balducci, C., Avanzi, L., & Fraccaroli, F. (2014). Emotional demands as a risk factor for mental distress among nurses. *La Medicina del Lavoro*, *105*(2), 100–108.

Begg, C. B., & Mazumdar, M. (1994). Operating characteristics of a rank correlation test for publication bias. *Biometrics*, *50*(4), 1088–1101.

Borenstein, M., Hedges, L., Higgins, J. P. T., Rothstein, H. R. (2014). Comprehensive Meta-Analysis (Version 3.3) [Computer software]. https://www.meta-analysis.com/

Broetje, S., Jenny, G. J., & Bauer, G. F. (2020). The key job demands and resources of nursing staff: An integrative review of reviews. *Frontiers in Psychology*, *11*, 84. https://doi.org/10.3389/fpsyg.2020.00084

Brough, P., & Biggs, A. (2015). Job demands × job control interaction effects: Do occupation-specific job demands increase their occurrence? *Stress and Health: Journal of the International Society for the Investigation of Stress*, *31*(2), 138–149. https://doi.org/10.1002/smi.2537

Card, N. A. (2012). *Applied meta-analysis for social science research.* Guilford Press.

Cavanagh, N., Cockett, G., Heinrich, C., Doig, L., Fiest, K., Guichon, J. R., Page, S., Mitchell, I., & Doig, C. J. (2020). Compassion fatigue in healthcare providers: A systematic review and meta-analysis. *Nursing Ethics*, *27*(3), 639–665. https://doi.org/10.1177/0969733019889400

Cavanaugh, M. A., Boswell, W. R., Roehling, M. V., & Boudreau, J. W. (2000). An empirical examination of self-reported work stress among U.S. managers. *Journal of Applied Psychology, 85*(1), 65–74. https://dx.doi.org/10.1037/0021-9010.85.1.65

Cheung, M. W. (2015). metaSEM: an R package for meta-analysis using structural equation modeling. *Frontiers in Psychology*, *5*, 1521. https://doi.org/10.3389/fpsyg.2014.01521

Cheung, M. W.-L., & Chan, W. (2005). Meta-analytic structural equation modeling: A two-stage approach. *Psychological Methods, 10*(1), 40–64. https://doi.org/10.1037/1082-989X.10.1.40

Cohen, J., Cohen, P., West, S. G., & Aiken, L. S. (2003). *Applied multiple regression/correlation analysis for the behavioral sciences* (3rd ed.). Lawrence Erlbaum Associates Publishers.

Crawford, E. R., LePine, J. A., & Rich, B. L. (2010). Linking job demands and resources to employee engagement and burnout: A theoretical extension and meta-analytic test. *Journal of Applied Psychology, 95*(5), 834–848. https://doi.org/10.1037/a0019364

Danna, K., & Griffin, R. W. (1999). Health and well-being in the workplace: A review and synthesis of the literature. *Journal of Management, 25*(3), 357–384. https://doi.org/10.1177/014920639902500305

Day, A., & Randell, K. D. (2014). Building a foundation for psychologically healthy workplaces and well-being. In A. Day, E. K. Kelloway, & J. J. Hurrell, Jr. (Eds.), *Workplace well-being: How to build psychologically healthy workplaces* (pp. 3–26). Wiley Blackwell.

de Jonge, J., & Dormann, C. (2006). Stressors, resources, and strains at work: A longitudinal test of the triple-match hypothesis. *Journal of Applied Psychology*, *91*, 1359–1374. https://doi/10.1037/0021-9010.91.5.1359

de Jonge, J., Le Blanc, P. M., Peeters, M. C. W., & Noordam, H. (2008). Emotional job demands and the role of matching job resources: A cross-sectional survey study among health care workers. *International Journal of Nursing Studies*, *45*(2008), 1460–1469. https://doi.org/10.1016/j.ijnurstu.2007.11.002

Demerouti, E., Bakker, A. B., Nachreiner, F., & Schaufeli, W. B. (2001). The job demands-resources model of burnout. *The Journal of Applied Psychology*, *86*(3), 499–512.

Di Tecco, C., Nielsen, K., Ghelli, M., Ronchetti, M., Marzocchi, I., Persechino, B., & Iavicoli, S. (2020). Improving working conditions and job satisfaction in healthcare: A study concept design on a participatory organizational level intervention in psychosocial risks management. *International Journal of Environmental Research and Public Health*, *17*(10), 3677. https://doi.org/10.3390/ijerph17103677

Dormann, C., & Griffin, M. A. (2015). Optimal time lags in panel studies. *Psychological Methods*, *20*(4), 489–505. https://doi.org/10.1037/met0000041

Dormann, C., Zapf, D., & Perels, F. (2010). Cross-sectional and longitudinal studies in industrial psychology. In U. Kleinbeck & K.-H. Schmidt (Eds.), *Enzyklopädie der Psychologie, Themenbereich D, Praxisgebiete, Serie III, Wirtschafts-, Organisations- und Arbeitspsychologie, Band 1. Arbeitspsychologie* (pp. 923–1001). Hogrefe.

Eurofound (2017). *Sixth European Working Conditions Survey – overview report (2017 update)*. Publications Office of the European Union.

European Commission (2021). *Supporting mental health of health workforce and other essential workers. Opinion of the expert panel on effective ways of investing in health (EXPH).* Publications Office of the European Union.

Finkel, S. E. (1995). *Causal analysis with panel data.* Sage Publications.

Ford, M. T., Matthews, R. A., Wooldridge, J. D., Mishra, V., Kakar, U. M., & Strahan, S. R. (2014). How do occupational stressor-strain effects vary with time? A review and meta-analysis of the relevance of time lags in longitudinal studies. *Work & Stress, 28*(1), 9–30. https://doi.org/10.1080/02678373.2013.877096

Franklin, P., & Gkiouleka, A. (2021). A scoping review of psychosocial risks to health workers during the Covid-19 pandemic. *International Journal of Environmental Research and Public Health*, *18*(5), 2453. http://doi.org/10.3390/ijerph18052453

Fu, R., Gartlehner, G., Grant, M., Shamliyan, T., Sedrakyan, A., Wilt, T. J., Griffith, L., Oremus, M., Raina, P., Ismaila, A., Santaguida, P., Lau, J., & Trikalinos, T. A. (2010). Conducting quantitative synthesis when comparing medical interventions: AHRQ and the effective health care program. In *Methods Guide for Effectiveness and Comparative Effectiveness Reviews*. Agency for Healthcare Research and Quality.

Gallagher L. (2007). Continuing education in nursing: A concept analysis. *Nurse Education Today*, *27*(5), 466–473. https://doi.org/10.1016/j.nedt.2006.08.007

Guillemin, M., McDougall, R., & Gillam, L. (2009). Developing "ethical mindfulness" in continuing professional development in healthcare: Use of a personal narrative approach. *Cambridge Quarterly of Healthcare Ethics, 18*(2), 197–208. https://doi.org/10.1017/S096318010909032X

Health and Safety Executive (2009). *Tackling work-related stress using the Management Standards approach.* Health and Safety Executive.

Hesselgreaves, H., & Scholarios, D. (2014). Leader-member exchange and strain: A study of job demands and role status. *Human Resource Management Journal*, *24*(4), 459–478. https://doi.org/10.1111/1748-8583.12042

Higgins, J. P., Thompson, S. G., Deeks, J. J., & Altman, D. G. (2003). Measuring inconsistency in meta-analyses. *BMJ (Clinical research ed.)*, *327*(7414), 557–560. https://doi.org/10.1136/bmj.327.7414.557

Hobfoll, S. E. (1989). Conservation of resources: A new attempt at conceptualizing stress. *American Psychologist, 44*(3), 513–524. https://doi.org/10.1037/0003-066X.44.3.513

Huedo-Medina, T. B., Sánchez-Meca, J., Marín-Martínez, F., & Botella, J. (2006). Assessing heterogeneity in meta-analysis: Q statistic or I^2 index? *Psychological Methods*, *11*(2), 193–206. https://doi.org/10.1037/1082-989X.11.2.193

Jackson, P. R., Wall, T. D., Martin, R., & Davids, K. (1993). New measures of job control, cognitive demand, and production responsibility. *Journal of Applied Psychology*, *78*, 753–762. https://doi/10.1037/0021-9010.78.5.753

Johnson, J., Hall, L. H., Berzins, K., Baker, J., Melling, K., & Thompson, C. (2018). Mental healthcare staff well-being and burnout: A narrative review of trends, causes, implications, and recommendations for future interventions. *International Journal of Mental Health Nursing*, *27*(1), 20–32. https://doi.org/10.1111/inm.12416

Karasek, R. A., & Theorell, T. (1990). *Healthy work: Stress, productivity, and the reconstruction of working life*. Basic Books.

Keyko, K., Cummings, G. G., Yonge, O., & Wong, C. A. (2016). Work engagement in professional nursing practice: A systematic review. *International Journal of Nursing Studies*, *61*, 142–164. https://doi.org/10.1016/j.ijnurstu.2016.06.003

King, R., Taylor, B., Talpur, A., Jackson, C., Manley, K., Ashby, N., Tod, A., Ryan, T., Wood, E., Senek, M., & Robertson, S. (2021). Factors that optimise the impact of continuing

professional development in nursing: A rapid evidence review. *Nurse Education Today*, *98*, 104652. https://doi.org/10.1016/j.nedt.2020.104652

Kogi, K. (1996). Improving shift workers' health and tolerance to shiftwork: recent advances. *Applied Ergonomics*, *27*(1), 5–8. https://doi.org/10.1016/0003-6870(95)00049-6

Kubicek, B., Uhlig, L., Hülsheger, U., Korunka, C., & Prem, R. (2022). Are all challenge stressors beneficial for learning? A meta-analytical assessment of differential effects of workload and cognitive demands. *Work & Stress*, 1–30. https://doi.org/10.1080/02678373.2022.2142986

Labrague L. J. (2021). Psychological resilience, coping behaviours and social support among health care workers during the COVID-19 pandemic: A systematic review of quantitative studies. *Journal of nursing management*, *29*(7), 1893–1905. https://doi.org/10.1111/jonm.13336

Lam, W. W. Y., Nielsen, K., Sprigg, C. A., & Kelly, C. M. (2022). The demands and resources of working informal caregivers of older people: A systematic review. *Work & Stress*, *36*(1), 105-127. https://doi.org/10.1080/02678373.2022.2028317

Lee, J., Lim, N., Yang, E., & Lee, S. M. (2011). Antecedents and consequences of three dimensions of burnout in psychotherapists: A meta-analysis. *Professional Psychology: Research and Practice, 42*(3), 252–258. https://doi.org/10.1037/a0023319

Leka, S., Cox, T., & Zwetsloot, G. (2008). The European framework for psychosocial risk management (PRIMA-EF). In S. Leka & T. Cox (Eds.) *The European framework for psychosocial risk management: PRIMA-EF* (pp. 1-16). Institute of Work, Health & Organizations.

Leka, S., Jain, A., Iavicoli, S., & Di Tecco, C. (2015). An evaluation of the policy context on psychosocial risks and mental health in the workplace in the European Union: Achievements, challenges, and the future. *BioMed Research International*, 2015. https://doi.org/10.1155/2015/213089

LePine, M. A. (2022). The Challenge-Hindrance Stressor framework: An integrative conceptual review and path forward. *Group & Organization Management*, *47*(2), 223–254. https://doi.org/10.1177/10596011221079970

LePine, J. A., Podsakoff, N. P., & LePine, M. A. (2005). A meta-analytic test of the Challenge Stressor-Hindrance Stressor framework: An explanation for inconsistent relationships among stressors and performance. *Academy of Management Journal, 48*(5), 764–775. https://doi.org/10.5465/AMJ.2005.18803921

Lesener, T., Gusy, B., & Wolter, C. (2019). The job demands-resources model: A meta-analytic review of longitudinal studies. *Work & Stress*, *33*(1), 76–103. https://doi.org/10.1080/02678373.2018.1529065

Little, T. D., Preacher, K. J., Selig, J. P., & Card, N. A. (2007). New developments in latent variable panel analyses of longitudinal data. *International Journal of Behavioral Development*, *31*(4), 357–365. https://doi.org/10.1177/0165025407077757

Mazzola, J. J., & Disselhorst, R. (2019). Should we be "challenging" employees? A critical review and meta-analysis of the challenge-hindrance model of stress. *Journal of Organizational Behavior*, *40*(8), 949–961. https://doi.org/10.1002/job.2412

McCabe, R., Nowak, M., & Mullen, S. (2005). Nursing careers: What motivated nurses to choose their profession? *Australian Bulletin of Labour*, *31*(4), 384–406. https://search.informit.org/doi/10.3316/ielapa.011061705950402

Menghini, L., & Balducci, C. (2021). The importance of contextualized psychosocial risk indicators in workplace stress assessment: evidence from the healthcare sector. *International Journal of Environmental Research and Public Health*, *18*(6), 3263. https://doi.org/10.3390/ijerph18063263

Moher, D., Liberati, A., Tetzlaff, J., Altman, D. G., & PRISMA Group (2009). Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *PLoS medicine*, *6*(7), e1000097. https://doi.org/10.1371/journal.pmed.1000097

Nabe-Nielsen, K., Garde, A. H., Albertsen, K., & Diderichsen, F. (2011). The moderating effect of work-time influence on the effect of shift work: A prospective cohort study. *International Archives of Occupational and Environmental Health*, *84*(5), 551–559. https://doi.org/10.1007/s00420-010-0592-5

Nahrgang, J. D., Morgeson, F. P., & Hofmann, D. A. (2011). Safety at work: a meta-analytic investigation of the link between job demands, job resources, burnout, engagement, and safety outcomes. *Journal of Applied Psychology*, *96*(1), 71–94. https://doi.org/10.1037/a0021484

Nielsen, K., & Christensen, M. (2021). Positive participatory organizational interventions: A multilevel approach for creating healthy workplaces. *Frontiers in Psychology*, *12*, 696245. https://doi.org/10.3389/fpsyg.2021.696245

Nielsen, K., Abildgaard, J. S., & Daniels, K. (2014). Putting context into organizational intervention design: Using tailored questionnaires to measure initiatives for worker well-being. *Human Relations, 67*(2)*, 1537-1560.* https://doi.org/10.1177/0018726714525974

Nielsen, K., Randall, R., Holten, A., & González, E. (2010). Conducting organizational-level occupational health interventions: What works? *Work & Stress*, *24*(3), 234–259. https://doi.org/10.1080/02678373.2010.515393

Nielsen, K., Nielsen, M. B., Ogbonnaya, C., Känsälä, M., Saari, E., & Isaksson, I. (2017) Workplace resources to improve both employee well-being and performance: A systematic review and meta-analysis. *Work & Stress*, *31*(2), 101–120. https://doi.org/10.1080/02678373.2017.1304463

Nixon, A. E., Mazzola, J. J., Bauer, J., Krueger, J. R., & Spector, P. E. (2011). Can work make you sick? A meta-analysis of the relationships between job stressors and physical symptoms. *Work & Stress*, *25*(1), 1–22. https://doi.org/10.1080/02678373.2011.569175

O'Brien, K. E., & Beehr, T. A. (2019). So far, so good: Up to now, the challenge–hindrance framework describes a practical and accurate distinction. *Journal of Organizational Behavior, 40*(8), 962–972. https://doi.org/10.1002/job.2405

Pekkarinen, L., Elovainio, M., Sinervo, T., Heponiemi, T., Aalto, A. M., Noro, A., & Finne-Soveri, H. (2013). Job demands and musculoskeletal symptoms among female geriatric nurses: the moderating role of psychosocial resources. *Journal of Occupational Health Psychology*, *18*(2), 211–219. https://doi.org/10.1037/a0031801

Podsakoff, N. P., LePine, J. A., & LePine, M. A. (2007). Differential challenge stressor-hindrance stressor relationships with job attitudes, turnover intentions, turnover, and withdrawal behavior: a meta-analysis. *The Journal of Applied Psychology*, *92*(2), 438–454. https://doi.org/10.1037/0021-9010.92.2.438

Podsakoff, N. P., Freiburger, K. J., Podsakoff, P. M., & Rosen, C. C. (2023). Laying the foundation for the Challenge-Hindrance stressor framework 2.0. *Annual Review of Organizational Psychology and Organizational Behavior*, *10*, 165–199. https://doi.org/10.1146/annurev-orgpsych-080422-052147

Poissonnet, C. M., & Véron, M. (2000). Health effects of work schedules in healthcare professions. *Journal of Clinical Nursing*, *9*(1), 13–23. https://doi.org/10.1046/j.1365-2702.2000.00321.x

Riley, R., & Weiss, M. C. (2016). A qualitative thematic review: Emotional labor in healthcare settings. *Journal of Advanced Nursing*, *72*(1), 6–17. https://doi.org/10.1111/jan.12738

Rodrigues, H., Cobucci, R., Oliveira, A., Cabral, J. V., Medeiros, L., Gurgel, K., Souza, T., & Gonçalves, A. K. (2018). Burnout syndrome among medical residents: A systematic review and meta-analysis. *PloS One*, *13*(11), e0206840. https://doi.org/10.1371/journal.pone.0206840

Rosenthal, R. (1979). The file drawer problem and tolerance for null results. *Psychological Bulletin, 86*(3), 638–641. https://doi.org/10.1037/0033-2909.86.3.638

Schmidt, F., & Hunter, J. (2015). *Methods of meta-analysis: Correcting error and bias in research findings (3nd ed.)*. Sage Publications.

Schmidt, S., Roesler, U., Kusserow, T., & Rau, R. (2014). Uncertainty in the workplace: Examining role ambiguity and role conflict, and their link to depression - a meta-analysis. *European Journal of Work and Organizational Psychology*, *23*(1), 91–106. https://doi.org/10.1080/1359432X.2012.711523

Schneider, A., Hornung, S., Weigl, M., Glaser, J., & Angerer, P. (2017). Does it matter in the long run? Longitudinal effects and interactions in the differentiated job demands–resources model. *European Journal of Work and Organizational Psychology*, *26*(5), 741–754. https://doi.org/10.1080/1359432x.2017.1347561

Schön Persson, S., Nilsson Lindström, P., Pettersson, P., Nilsson, M., & Blomqvist, K. (2018). Resources for work-related well-being: A qualitative study about healthcare employees' experiences of relationships at work. *Journal of Clinical Nursing*, *27*(23-24), 4302–4310. https://doi.org/10.1111/jocn.14543

Semmer, N., Zapf, D., & Greif, S. (1996). 'Shared job strain': A new approach for assessing the validity of job stress measurements. *Journal of Occupational and Organizational Psychology, 69*(3), 293–310. https://doi.org/10.1111/j.2044-8325.1996.tb00616.x

Singh, J., Karanika-Murray, M., Baguley, T., & Hudson, J. (2020). A systematic review of job demands and resources associated with compassion fatigue in mental health professionals. *International Journal of Environmental Research and Public Health*, *17*, 6987. https://doi.org/10.3390/ijerph17196987

Skakon, J., Nielsen, K., Borg, V., & Guzman, J. (2010). Are leaders' well-being, behaviors and style associated with the affective well-being of their employees? A systematic review of three decades of research. *Work & Stress, 24*(2), 107–139. https://doi.org/10.1080/02678373.2010.495262

Sparks, K., & Cooper, C. L. (1999). Occupational differences in the work–strain relationship: Towards the use of situation-specific models. *Journal of Occupational and Organizational Psychology, 72*(2), 219–229. https://doi.org/10.1348/096317999166617

Tang, K. (2014). A reciprocal interplay between psychosocial job stressors and worker well-being? A systematic review of the "reversed" effect. *Scandinavian Journal of Work, Environment & Health, 40*(5), 441–456. https://doi.org/10.5271/sjweh.3431

Taris, T. W., & Kompier, M. A. J. (2003). Challenges in longitudinal designs in occupational health psychology [Editorial]. *Scandinavian Journal of Work, Environment & Health, 29*(1), 1–4. https://doi.org/10.5271/sjweh.697

Taris, T. W., & Kompier, M. A. J. (2014). Cause and effect: Optimizing the designs of longitudinal studies in occupational health psychology [Editorial]. *Work & Stress, 28*(1), 1–8. https://doi.org/10.1080/02678373.2014.878494

Tucker, P., & Rutherford, C. (2005). Moderators of the relationship between long work hours and health. *Journal of Occupational Health Psychology, 10*(4), 465–476. https://doi.org/10.1037/1076-8998.10.4.465

Tuckey, M. R., Searle, B. J., Boyd, C. M., Winefield, A. H., & Winefield, H. R. (2015). Hindrances are not threats: Advancing the multidimensionality of work stress. *Journal of Occupational Health Psychology, 20*(2), 131–147. https://doi.org/10.1037/a0038280

van der Heijden, B. I., Demerouti, E., Bakker, A. B., & NEXT Study Group coordinated by Hans-Martin Hasselhorn (2008). Work-home interference among nurses: reciprocal relationships with job demands and health. *Journal of Advanced Nursing*, *62*(5), 572–584. https://doi.org/10.1111/j.1365-2648.2008.04630.x

Verhoef, N., De Ruiter, M., Blomme, R., & Curfs, E. (2021). Relationship between generic and occupation-specific job demands and resources, negative work−home interference and burnout among GPs. *Journal of Management & Organization,* 1–29. https://doi.org/10.1017/jmo.2021.16

Viechtbauer, W. (2010). Conducting meta-analyses in R with the metafor package. *Journal of Statistical Software*, *36*(3). https://doi.org/10.18637/jss.v036.i03

Viechtbauer, W., & Cheung, M. W. (2010). Outlier and influence diagnostics for meta-analysis. *Research Synthesis Methods*, *1*(2), 112–125. https://doi.org/10.1002/jrsm.11

Vignoli, M., Nielsen, K., Guglielmi, D., Tabanelli, M. C., & Violante, F. S. (2017). The importance of context in screening in occupational health interventions in organizations: A mixed methods study. *Frontiers in Psychology*, *8*, 1347. https://doi.org/10.3389/fpsyg.2017.01347

Whitener, E. M. (1990). Confusion of confidence intervals and credibility intervals in meta-analysis. *Journal of Applied Psychology, 75*(3), 315–321. https://doi.org/10.1037/0021-9010.75.3.315

World Health Organization (2006). *World Health Report 2006: Working together for health.* World Health Organization.

Zapf, D. (2002). Emotion work and psychological well-being: A review of the literature and some conceptual considerations. *Human Resource Management Review, 12*(2), 237–268. https://doi.org/10.1016/S1053-4822(02)00048-7

Demands and resources of the European healthcare sector

Table 1. Work characteristics investigated in the European healthcare sector.

Variables	Description
	Challenge demands (27)
Workload (21)	Quantitative demands (e.g., workload), work overload, unfavourable organisation of work (e.g., time pressure), number of working hours, work intensification
Cognitive demands (7)	Psychological demands, mental demands, learning demands, job complexity, mentally challenging tasks requiring workers to use a number of complex skills
Contacts with patients (3)	Exposure to patients, number of patients visited per week
	Hindrance demands (27)
Role stress (11)	Workers' unawareness of their position and responsibilities within the organisation (e.g., role ambiguity), conflicting demands (e.g., role conflict)
Irregular work schedule (7)	Demanding shifts, night work, alternate days/night shifts
Work-life conflict (6)	Interference among work and home duties
Physical demands (4)	Moving patients, handling heavy objects (i.e., furniture, equipment), physical endurance
Inadequate work environment and equipment (2)	Perceived problems in the physical work environment, inadequate equipment
	Threat demands (24)
Negative interpersonal relationships (15)	Social stressors, conflicts at work, harassment, verbal and physical violence, poor relationships, lack of cohesion
Emotional demands (8)	Emotional burden due to typical healthcare work scenarios, self-control demands, emotional dissonance, dealing with pain and death
Stressful interactions with patients (7)	Difficult patient contacts, high patient expectations, lack of rewards from patients, patient aggressions
	Job resources (31)
Control (18)	Workers' decision-making power over the way they perform their own tasks (e.g., decision authority)
Support (16)	Encouragement, support and resources provided by colleagues, supervisors and/or by the overall organisation
Rewards (9)	Prospects for personal and professional growth in terms of task variety, provision of feedback, opportunities for learning, job meaningfulness

Demands and resources of the European healthcare sector

Organisational fairness (6)	Procedural, interactional and distributive justice, fair communication, provision of relevant information to employees, quality and feasibility of procedures
Staff adequacy (3)	Adequate number and quality of personnel on every shift

Note. Numbers in parentheses represent the number of samples investigating the association among work characteristics and well-being

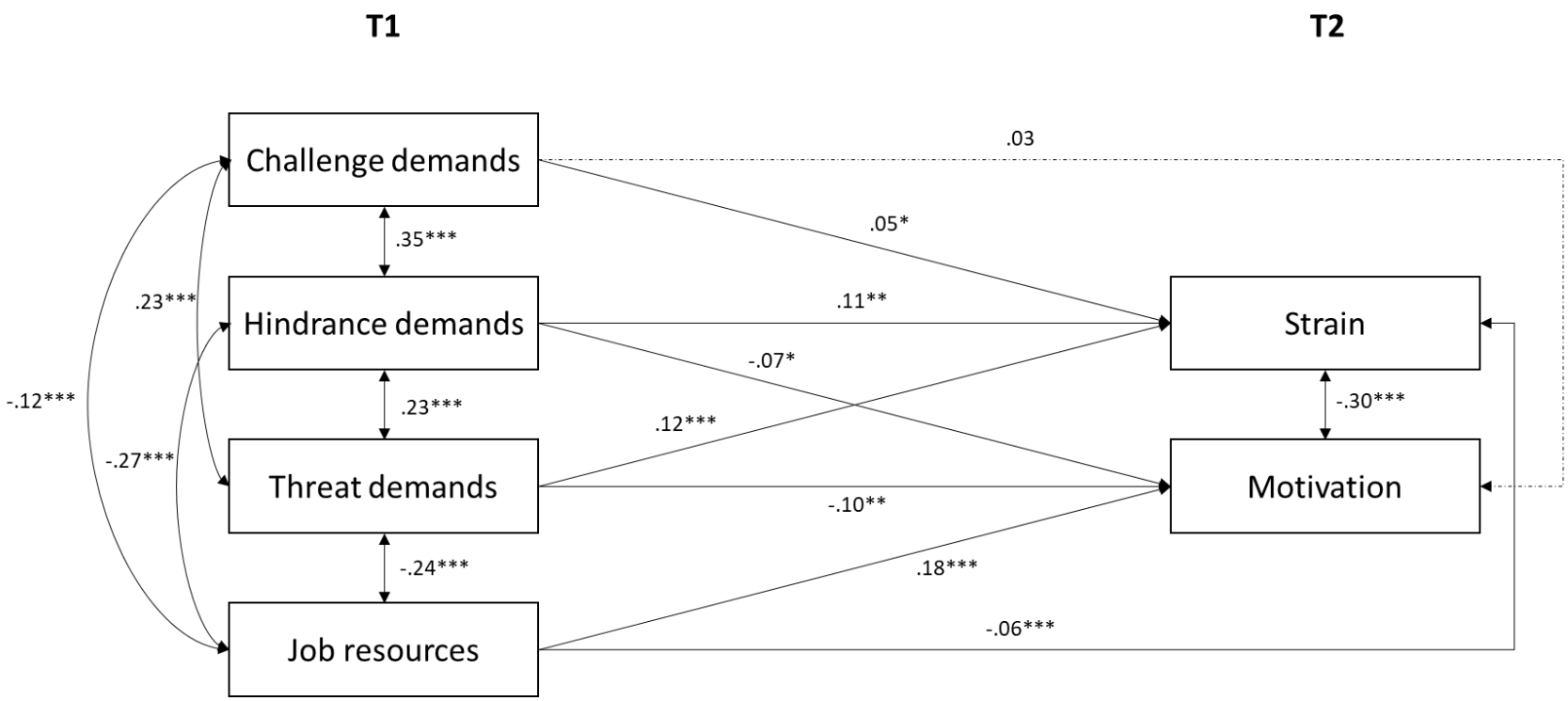
Table 2. Pooled correlation matrix for TSSEM.

	1.	2.	3.	4.	5.	6.
1. Challenge demands T1	1					
2. Hindrance demands T1	.35*** (13)	1				
3. Threat demands T1	.23*** (11)	.23*** (10)	1			
4. Job resources T1	-.12*** (14)	-.27*** (14)	-.24*** (8)	1		
5. Strain T2	.12*** (24)	.18*** (22)	.17*** (21)	-.13*** (23)	1	
6. Motivational outcomes T2	-.04 (12)	-.14*** (12)	-.16*** (8)	.22*** (16)	-.35*** (8)	1

Note. Numbers in parentheses represent the number of samples contributing to meta-analysis.

***$p < .001$.

Figure 1. Path model results



Note. Motivation = motivational outcomes; dotted lines denote non-significant paths.

***p < .001; **p < .01; *p < .05.

Table 3. Associations between baseline work characteristics and follow-up strain.

	Prospective correlations								Cross-lagged effects			
Variables	***k***	***N***	$\bar{r}$	**95% CI**	**95% CrI**	Q_{within}	I^2	τ^2	***k***	***N***	$\bar{\beta}$	**95% CI**
Overall challenge demands	24	27753	.13***	.09 ; .17	-.04 ; .29	226.773***	87.52%	.007	19	11205	.05***	.03 ; .06
Workload	18	25211	.15***	.11 ; .19	-.01 ; .30	203.721***	88.41%	.006	14	8857	.05***	.03 ; .07
Cognitive demands	7	8258	.07	-.01 ; .15	-.13 ; .26	69.247***	88.11%	.009	5	2706	.04*	.00 ; .07
Patient contacts	3	392	.01	-.09 ; .11	-.09 ; .11	1.603	0%	0	2	198	-.06	-.20 ; .08
Overall hindrance demands	22	23943	.19***	.13 ; .25	-.09 ; .45	319.976***	94.97%	.020	15	8631	.06***	.03 ; .10
Role conflict / ambiguity	8	15136	.21***	.13 ; .28	-.00 ; .40	91.344***	92.91%	.010	5	2326	.06*	.01 ; .11
Work-life conflict	4	1125	.37***	.32 ; .44	.31 ; .44	4.226	1.00%	.000	4	1125	.11***	.04 ; .16
Physical demands	3	5296	.10***	.04 ; .16	.01 ; .19	3.068	37.17%	.035	2	525	.03	*-.12 ; .18*
Work schedule	7	10484	.02	-.02 ; .07	-.08 ; .13	23.082***	76.43%	.003	2	1799	-.00	-.08 ; .08
Inadequate work environment and equipment	2	2725	.26***	.14 ; .36	.08 ; .41	2.470	59.52%	.005	*1*			
Overall threat demands	21	25321	.18***	.14 ; .22	.03 ; .32	173.552***	85.29%	.005	13	7361	.06***	.03 ; .08
Negative interpersonal relationships	13	22920	.14***	.11 ; .18	.03 ; .25	84.465***	81.01%	.003	7	5787	.03*	.00 ; .05

Stressful interactions with patients / relatives	6	1444	.23***	.15 ; .31	.07 ; .39	12.165*	55.95%	.006	5	859	.06	-.01 ; .13
Emotional demands	8	12457	.20***	.11 ; .28	-.05 ; .42	203.914***	93.09%	.014	5	3709	.10***	.06 ; .13
Overall resources	23	29439	-.13***	-.16 ; -.10	-.24 ; -.02	117.341***	78.85%	0.003	14	8450	-.03**	-.05 ; -.01
Control	15	21286	-.11***	-.15 ; -.08	-.23 ; .01	66.202***	80.22%	0.003	10	5153	-.03	-.07 ; .01
Support	13	20413	-.14***	-.18 ; -.10	-.28 ; .00	101.133***	86.25%	0.005	5	2501	-.02	-.07 ; .03
Rewards	5	7936	-.18***	-.25 ; -.11	-.32 ; -.04	14.733**	81.21%	.004	3	2995	-.04*	-.07 ; -.00
Organisational fairness	6	4387	-.19***	-.25 ; -.11	-.34 ; -.02	18.784**	79.65%	.006	3	2100	-.03	-.07 ; .01
Staff adequacy	3	2287	-.09	-.22 ; .04	-.33 ; .16	10.602**	88.12%	.012	*0*			

Note. *K* = number of samples contributing to meta-analysis; *N* = total sample size; $\overline{r}$ = average weighted correlation coefficient; $\bar{\beta}$ = average weighted beta coefficient; 95% CI = 95% confidence interval around the effect size; 95% CrI = 95% credibility interval around $\overline{r}$; $Q_{within} = Q$ statistics, a significant value indicates significant heterogeneity in the true effect size that is attributable to true population differences; I^2 = inconsistency index; τ^2 = estimate of the variance in effect size.

***p<.001; **p<.01; *p<.05.

Table 4. Associations between baseline work characteristics and follow-up motivational outcomes.

	Prospective correlations								Cross-lagged effects			
Variables	***k***	***N***	$\bar{r}$	**95% CI**	**95% CrI**	Q_{within}	I^2	τ^2	***k***	***N***	$\bar{\beta}$	**95% CI**
Overall challenge demands	12	7629	-.04	-.09 ; .02	-.21 ; .14	38.570***	80.49%	.007	11	7435	-.02	-.04 ; .00
Workload	8	6764	-.07***	-.11 ; -.03	-.15 ; .01	14.283*	49.57%	.001	8	6764	-.02*	-.05 ; -.00
Cognitive demands	4	1349	.04	-.09 ; .17	-.23 ; .31	17.017***	82.47%	.015	3	1155	-.01	-.08 ; .07
Patient contacts	2	297	-.01	-.12 ; .10	-.12 ; .10	0.875	0	0	*1*			
Overall hindrance demands	12	7352	-.13***	-.19 ; -.07	-.32 ; .06	39.189***	81.87%	.009	10	6967	-.05***	-.07 ; -.03
Role conflict / ambiguity	3	3023	-.15	-.30; .01	-.41 ; .14	8.656*	82.32%	.015	3	2314	-.06**	-.10 ; -.02
Work-life conflict	3	1283	-.18	-.37 ; .04	-.53 ; .23	11.755***	89.03%	.031	3	1283	-.06*	-.12 ; -.01
Physical demands	2	1213	-.04	-.11 ; .03	-.13 ; .05	1.342	25.50%	.001	2	1213	.00	-.07 ; .08
Work schedule	2	462	-.02	-.11 ; .08	-.11 ; .08	0.210	0	0	*1*			
Inadequate work environment and equipment	2	2555	-.23**	-.38 ; -.06	-.46 ; .04	4.722*	78.82%	.012	*1*			
Overall threat demands	8	8718	-.16***	-.22 ; -.10	-.31 ; -.01	39.505***	83.87%	.005	7	6394	-.05**	-.08 ; -.01
Negative interpersonal relationships	6	7505	-.18***	-.23 ; -.14	-.27 ; -.09	14.681*	64.83%	.002	4	5181	-.06*	-.11 ; -.00

Stressful interactions with patients / relatives	2	1192	-.13	-.37 ; .12	-.51 ; .29	12.885***	92.24%	.031	2	1192	-.03	-.09 ; .04
Emotional demands	2	2822	-.19***	-.27 ; -.12	-.30 ; -.08	1.908	47.58%	.002	2	2822	-.06**	-.09 ; -.02
Overall resources	16	10952	.23***	.18 ; .27	.07 ; .37	66.446***	78.99%	.006	12	8434	.08***	.06 ; .10
Control	8	3313	.20***	.11 ; .28	-.03 ; .41	27.039***	80.58%	.012	5	2949	.10***	.06 ; .14
Support	6	4761	.17***	.10 ; .24	.03 ; .31	17.115**	71.97%	.004	3	2243	.03	-.01 ; .07
Rewards	6	5028	.26***	.20 ; .31	.14 ; .37	16.818**	62.13%	.003	5	4858	.08***	.05 ; .11
Organisational fairness	2	1694	.19**	.05 ; .32	-.03 ; .39	3.322	69.89%	.008	*1*			
Staff adequacy	*1*								*0*			

Note. k = number of samples contributing to meta-analysis; N = total sample size; $\overline{r}$ = average weighted correlation coefficient; $\bar{\beta}$ = average weighted beta coefficient; 95% CI = 95% confidence interval around the effect size; 95% CrI = 95% credibility interval around $\overline{r}$; $Q_{within} = Q$ statistics, a significant value indicates significant heterogeneity in the true effect size that is attributable to true population differences; I^2 = inconsistency index; τ^2 = estimate of the variance in effect size.

***p<.001; **p<.01; *p<.05.

Table 5. Results of subgroup analysis – source as moderator.

Variables	K	N	$\bar{r}$	95% CI	95% CrI	Q_{within}	I^2	$Q_{between}$
Threat demands -> Strain								
Group	11	20803	.14	.09 - .18	.02 - .25	70.333***	82.84%	3.424 $p = .06$
Organisation	14	18087	.21	.14 - .27	-.01 - .41	233.677***	92.03%	
Threat demands -> Motivational outcomes								
Group	6	7505	-.18	-.23 ; -.14	-.27 ; -.09	14.681*	64.83%	0.280 $p = .60$
Organisation	4	4014	-.15	-.26 ; -.04	-.37 ; .09	33.446***	89.04%	
Job resources -> Strain								
Group	7	5163	-.19	-.23 ; -.15	-.27 ; -.11	10.166	46.40%	7.531 $p < .05$
Leadership	9	19571	-.12	-.17 ; -.07	-.26 ; .03	72.272***	90.50%	
Organisation	20	26399	-.12	-.15 ; -.09	-.23 ; -.01	84.138***	78.36%	
Job resources -> Motivational outcomes								
Group	4	4482	.18	.09 ; .26	.01 ; .34	9.215*	82.85%	0.525 $p = .77$
Leadership	4	4397	.19	.12 ; .25	.07 ; .30	9.693*	66.37%	
Organisation	12	6207	.21	.15 ; .27	.03 ; .38	52.679***	77.67%	

Note. k = number of samples contributing to meta-analysis; N = total sample size; $\bar{r}$ = average weighted correlation coefficient; 95% CI = 95% confidence interval around $\bar{r}$; 95% CrI = 95% credibility interval around $\bar{r}$; $Q_{within} = Q$ statistics, a significant value indicates significant heterogeneity in the true effect size that is attributable to true population differences; I^2 = inconsistency index; $Q_{between}$ = moderator test, a significant value indicates a significant difference between the mean effect sizes across groups.

***p<.001; **p<.01; *p < .05

Table 6. Results of meta-regression analyses – time lag as moderator.

Variables	***R²***	***Qbetween***	***β***	**SE**	***p value***
		Outcome: Strain			
Challenge demands	2.11%	1.100	.001	.001	.29
Hindrance demands	0%	0.002	.000	.003	.96
Threat demands	8.42%	2.019	.002	.002	.15
Job resources	2.76%	1.799	.001	.001	.18
		Outcome: Motivational outcomes			
Challenge demands	0%	0.040	.000	.002	.84
Hindrance demands	0%	0.036	-.001	.003	.85
Threat demands	0%	0.294	-.002	.003	.59
Job resources	6%	3.424	-.003	.002	.06

Note. R^2 = percentage of variance explained; $Q_{between}$ = moderator test, a significant value indicates a significant difference between the mean effect sizes across groups; β = beta coefficient; SE = standard error.