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Linking objective and subjective job demands and resources in the JD-R model: A multilevel design

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ABSTRACT

The Job Demands-Resources (JD-R) model is a well-recognized theoretical framework assessing the impact of job demands and resources on well-being. Though the model conceptualises job demands and resources in terms of how jobs are both objectively designed and subjectively experienced, most studies have relied only on subjective self-reported data. In a comprehensive test of the model, our study investigates how objective job characteristics at the occupation level are associated with employees' perceptions of job demands and resources in their role, and examines the indirect effect of objective characteristics on employee outcomes via perceived characteristics. Multilevel analyses of multisource and lagged data from 2,049 employees in 97 jobs indicated that perceived job characteristics mediate the effects of objective job characteristics on employee outcomes. Specifically, the objective requirement for positive emotional displays is positively related to exhaustion through perceived emotional demands. Second, objective job hazard exposure is positively related to physical health problems through perceived physical demands. Finally, objective job complexity has a significant positive indirect relationship with work engagement through perceived skill discretion. The results suggest that risk identification and enrichment processes should consider the nature of the job itself instead of merely focusing on employees' cognitive appraisals.

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Introduction

The Job Demands-Resources (JD-R) model, first introduced in the seminal work of Demerouti et al. (2001), has become one of the dominant models in work psychology and has been widely applied in research on job stress, work motivation, and occupational health and well-being. Drawing upon JD-R theory, the impacts of perceived job demands, job resources, and their interactions on employee motivation, health, well-being, and performance are well established (see a review by Bakker & Demerouti, 2017a).

In the first study on the JD-R model, Demerouti and colleagues (2001) explicitly distinguished perceptions of job demands and resources from objective job demands and resources and asserted the importance of examining both. They described objective job characteristics as job “prototypes” or “traits” (p. 510) that are independent from, but which are enacted by and produce effects on, job incumbents. Objective job demands and resources were operationalised via observer-ratings in their study, and perceived demands and resources through self-reports; both were significantly related to self-reported outcomes (burnout and disengagement), with the analysis conducted at the individual level.

Despite the clear conceptual distinction between objective and perceived job characteristics in the JD-R model, a major gap in knowledge lies in understanding the link between the ways that jobs are designed (as manifested in objective job characteristics) and appraised (reflected as subjective job characteristics) (Ganster & Rosen, 2013). Most studies framed by the JD-R model have relied only on subjective self-reported data to reflect perceived job demands and resources, leaving objective job characteristics, their association with perceived job characteristics, and their impacts on employee outcomes largely unexamined (Crawford et al., 2010; Mauno et al., 2007). According to Ganster and Rosen (2013, p. 1096), “the degree of association between objective and subjective measures of stressors remains to be determined” though this association speaks to a core theoretical assumption of job characteristics models of occupational stress.

To understand the link between objective and subjective assessments of job characteristics in association with employee outcomes, we undertake a comprehensive test of the JD-R model by measuring both objective and subjective job characteristics in the health erosion and motivation pathways, linking independent data at the occupation level with data at the individual level over two time-points. More specifically, we investigate a selection of objective job characteristics that respectively make jobs more emotionally demanding, physically demanding, ripe for skill utilisation and more empowering than others in the eyes of employees. We then examine whether these perceptions of jobs are, in turn, associated with employee exhaustion, physical health and work engagement. Reflecting the call by Bakker and Demerouti (2017a) for “objective indicators of the prevailing job demands and resources” (p. 279) and “integrating multiple levels in research using JD-R theory” (p. 281), our study utilises a multilevel, multisource and lagged design.

The inclusion of objective job characteristics is beneficial for theoretical, practical and methodological reasons. From a theoretical job design perspective, our study explores the link between objective work design and the subjective experience of work in association with employee outcomes. Though the link between objective and perceptual job characteristics has been proposed in seminal work on job design (Hackman & Lawler, 1971; Hackman & Oldham, 1975, 1980; Spector, 1992), this link has not yet been established in empirical research. In exploring the link between objective and subjective job characteristics, our study tests the underlying theoretical premise of job design research – that how a job is designed shapes how a job is appraised which, in turn, meaningfully impacts on employee outcomes (cf. Hackman & Oldham, 1975, 1980). In this way, our findings show that the JD-R model can be extended to account for job design as well as the links between job design and the prevailing psychosocial working conditions. Moreover, in most JD-R studies, including the seminal work (Demerouti et al., 2001), job demands and resources are usually assessed at the individual level (Bakker & Demerouti,

2017a). By conceptualising and assessing objective job characteristics at the occupational level, our study expands the propositions of JD-R theory beyond the focus on individual-level relationships. Finally, it further remains unclear which types of objective job characteristics are antecedent to which types of perceived job characteristics. Our study offers insight regarding which underlying elements of a job make it inherently more demanding or resourceful, independent of (but antecedent to) how the job is appraised by a particular job incumbent (Spector & Jex, 1991).

From a practical perspective, knowledge gathered from the converging findings linking objective and perceived job characteristics to employee outcomes can guide the development of more effective interventions to redesign job characteristics in a way that will have maximum benefit for employee well-being, motivation, and performance. A singular focus on employee perceptions of work is unlikely to be a solid base for redesigning jobs (Schaubroeck, 1999). As argued by Sonnentag and Frese (2012), job redesign (e.g. Bond & Bunce, 2001; Holman & Axtell, 2016) makes sense when strains are not only attributed to employees' perceived exposure to stressors but also to actual exposure to stressors.

From a methodological standpoint, most studies grounded in the JD-R model have used *self-reported* data on job demands and resources, as well as *self-reported* employee outcomes (Bakker & Demerouti, 2017a). This methodological limitation increases the risk of common method variance, which undermines confidence that the patterns of results reflect the correct estimates of the relationships between predictor and criterion variables (Podsakoff et al., 2012). In view of this threat to validity, there has been an increased use of time-lagged designs and non-self-rated outcome variables in recent JD-R research. In our study, the use of objective measures of job characteristics within a time-lagged design overcomes, in part, the methodological flaws associated with single source self-reported data. Moreover, we use an established job analysis database to source objective assessments, in comparison to single observer ratings used in previous research (e.g. Demerouti et al., 2001), which addresses the potential for single observers' biases to undermine study validity.

Theoretical development

The JD-R model

The JD-R model identifies two broad categories of job characteristics – job demands and job resources. Job demands involve physical, psychological, social and organisational aspects of the job that require sustained physical and/or psychological effort (Demerouti et al., 2001). Examples are high workload and emotionally demanding interactions with customers. Job demands consume effort and energy, thereby impairing employee health and leading to outcomes such as burnout, which is a health impairment process (Schaufeli & Bakker, 2004). In contrast, job resources are the physical, psychological, social, and organisational aspects of the job that assist achieving work goals; reducing job demands; or stimulating personal growth, learning, and development (Bakker & Demerouti, 2007). Examples are job autonomy, social support, feedback, and recognition from others. Job resources initiate a motivational process (Schaufeli & Bakker, 2004). Intrinsically, they meet basic psychological needs such as autonomy, relatedness, and competence. Extrinsically, they aid employees to achieve work-related goals. The intrinsic and extrinsic motivation foster higher work engagement, organisational commitment, enjoyment, and performance (Bakker &

Demerouti, 2017a). Meta-analyses on the JD-R model have largely confirmed that various job demands are positively related to burnout while various job resources are positively related to engagement (Crawford et al., 2010; Halbesleben, 2010; Nahrgang et al., 2011). Evidence is also building to support the propositions that job resources have a protective role in buffering the adverse impacts of job demands on employee outcomes (Bakker & Demerouti, 2017a; Bakker et al., 2005; Xanthopoulou et al., 2007), and hold greater salience under conditions of high job demands (Bakker et al., 2007).

Job demands and job resources – Objective design and subjective experience

Research informed by the JD-R model has established ample evidence for the employee and organisational impacts of job demands and resources, as perceived by job incumbents. However, job demands and resources are conceptualised in two ways in the model (Demerouti et al., 2001) – the way in which the job is designed and the way in which the job is appraised, representing objective design versus subjective experience respectively.

Objective characteristics of a job are embedded in the job itself as a result of the institutional, organisational, and technological processes underpinning the construction of the job (Daniels, 2006; Parker et al., 2018). Objective characteristics capture a job's content, structure and process, existing prior to and independent from an incumbent's cognitive and emotional processing (Frese, 1999) and providing a basis for differentiating among occupational groups (Daniels, 2006). Once job incumbents start working in a job, they experience an ongoing process of transacting with the objective job characteristics, making appraisals of such experiences, and gradually forming subjective perceptions of their job (Cooper et al., 2001). For example, the nature of machine-paced work (reflecting how the job is designed) is likely to foster machine operators' perceptions of low job autonomy (reflecting how the job is appraised) (Daniels, 2006). Alternatively, working in jobs that have an inherently high occupational value of altruism (reflecting how the job is designed) is likely to foster the perception that such jobs are significant (reflecting how the job is appraised) (Morgeson et al., 2010).

In being exposed to objective job characteristics, incumbents may form a perception of the job in various ways. For example, employees learn the nature of the job by doing it, and/or through a social learning process by attending training and through observing, interacting, and having discussions with supervisors and colleagues (Daniels, 2006). Alternatively, perceptions of job characteristics might manifest and be adjusted through exposure to different occupational values (i.e. achievement, independence, altruism, status, comfort and safety) which reinforce and satisfy individual work-related needs and shape individuals' work experiences and perceptions (Morgeson et al., 2010).

Incorporating objective job characteristics in JD-R research

Although research literature on the JD-R model in particular, and job design and work characteristics in general, suggests the preeminent nature of objective job characteristics for work-related health and well-being, limited efforts have been made to incorporate objective job characteristics into empirical research on the JD-R model. In one study, the geographical distance between employees' workplace and hometown was utilised as a proxy for increased objective job demands and decreased objective job resources

for rural migrant workers, and was positively related to higher turnover intentions (Qin et al., 2014). In another, company specific register data were used to measure business travel frequency, which functioned as an objective job demand and predicted increased work-family conflict and emotional exhaustion (Jensen, 2014). Objective workload measures such as the number of daily admissions (Wingo et al., 2016) and the average number of weekly working hours (Peters et al., 2016) were used in JD-R research in the medical context, and found to be positively associated with increased risks to patient safety and increased emotional exhaustion.

These studies represent initial attempts to incorporate objective measures of job characteristics into tests of the JD-R model. However, this line of research requires more vigorous attention to a range of theoretical and methodological issues. Theoretically, these few existing studies examined the direct link between objective job characteristics and employee outcomes without considering the impact of perceptual job characteristics. The use of objective measures of job characteristics in these studies is merely an attempt to overcome the methodological flaws of self-reported data rather than building evidence for the theoretical linkage between objective and subjective job characteristics (Ganster & Rosen, 2013).

Conceptually, objective job characteristics are concerned with content and structure inherent in a particular job, uniform for a given job but variant across jobs (Judge & Zapata, 2015). Incumbents in the same job are confronted with the same set of objective job characteristics although they may appraise these characteristics in various ways. In other words, objective job characteristics are conceptualised at the job level, a higher level than the individual employee level, thus exerting “top-down” influences manifest as cross-level effects in the analytical framework (Dierdorff & Morgeson, 2013). Such a conceptualisation indicates that objective job characteristics are best analyzed at the job level (Judge & Zapata, 2015). However, the very limited number of JD-R studies with objective assessments of job characteristics (e.g. Demerouti et al., 2001; Ford & Tetrick, 2011; Liu et al., 2005) have mostly been conducted at the individual level of analysis, failing to demonstrate the extent of variance in employee outcomes resulting from job characteristics at the job level.

Methodologically, the objective assessments used in existing studies have relied on archival records that have restrictive application potential; objective archival data are not available for many jobs and job characteristics. Moreover, archival records cannot be used to indicate less quantifiable job characteristics such as autonomy, complexity, or competition. Observer-ratings represent an alternative option to acquire objective assessments of job characteristics. However, observer-ratings may not be feasible for a large survey population (Demerouti et al., 2001). Moreover, observer-ratings are not immune to biases, raising questions about the validity of such measures too (Cellar et al., 1985; Daniels, 2006; Hoyt & Kerns, 1999). In addition, observer-ratings require comprehensive observation of every potentially important aspect of the job, even sensitive and/or cognitive aspects, and necessitate an accurate understanding of the social context in which the job operates (Daniels, 2006), which presents a range of logistical difficulties.

The present study

Objective job characteristics are typically difficult or even impossible to obtain (Hurrell et al., 1998) and are thus typically operationalised using job analysis databases (Daniels,

2006). In this study, we used ratings from O*NET 17.0 (U.S. Department of Labour, 2013) as proxies of objective job characteristics, at the occupational level. O*NET is a comprehensive repository of occupational information on a variety of job descriptors for about 1,000 occupations assessed by occupational analysts, occupational experts, and a national random sample of occupational incumbents. O*NET is developed and periodically updated in the U.S. under the sponsorship of the U.S. Department of Labor's Employment and Training Administration. Large job analysis databases such as O*NET represent occupation-level aggregate ratings of job characteristics and rely on a range of sources and consensus between the sources, which cancel out variations in individual perceptions of jobs and remove biases inherent in self reports. The sampling approach used in O*NET's data collection also makes sure that "any potential organization-specific influence on occupation-level responses is greatly minimized" (Dierdorff & Morgeson, 2007, p. 1232). O*NET offers a standardised classification system that characterises occupational requirements, "better reflect(ing) a job as it has become institutionalised in documentary form" (Daniels, 2006, p. 273). Thus, O*NET ratings are generally viewed as "objective" (Ganster & Rosen, 2013; Judge & Zapata, 2015; Spector & Jex, 1991).

In this study, rather than examining an exhaustive list of job demands and resources, we focus on four perceived job characteristics that cover key aspects of the ways in which jobs are experienced: two perceived job demands – emotional and physical demands; and two perceived job resources – skill discretion and decision authority. This selection contains some of the most studied job characteristics; is relevant for both blue- and white-collar occupations; and also broadly covers job characteristics in domains of social, contextual, and task respectively (Morgeson & Humphrey, 2008). Building on the rationale underpinning JD-R theory, we examine how objective job characteristics (Level 2) are linked with these four perceived job demands and resources (Level 1, measured at Time 1), which in turn are associated with employee outcomes such as exhaustion, physical health and work engagement (Level 1, measured at Time 2) through health erosion and motivation processes (Figure 1).

Hypotheses

Emotional labour requirements are those inherent job characteristics that, shaped by work design, require frequent positive interactions with the public (i.e. customer contact) and effective emotional regulation during the interactions (i.e. positive display expectations) (Grandey et al., 2013). Research shows that "people work" jobs (such as in service, sales, and caring professions) have significantly higher emotional labour requirements than other occupational groupings (Brotheridge & Grandey, 2002), indicating that there are differences in emotional labour requirements across jobs. These emotional labour requirements may lead employees to fake their emotions (i.e. surface acting), thus depleting energy and eliciting feelings of estrangement from the self (Brotheridge & Grandey, 2002; Brotheridge & Lee, 2002). Thus employees who are exposed to these "objective" emotional labour requirements are likely to perceive greater exposure to emotional demands. We propose,

Hypothesis 1. Objective emotional job characteristics for (a) customer contact and (b) positive emotional displays are positively associated with perceived emotional demands.

Jobs differ in the level of exposure to job hazards such as radiation, contaminants, other hazardous conditions, and the requirement for certain body positions and motion (Smith

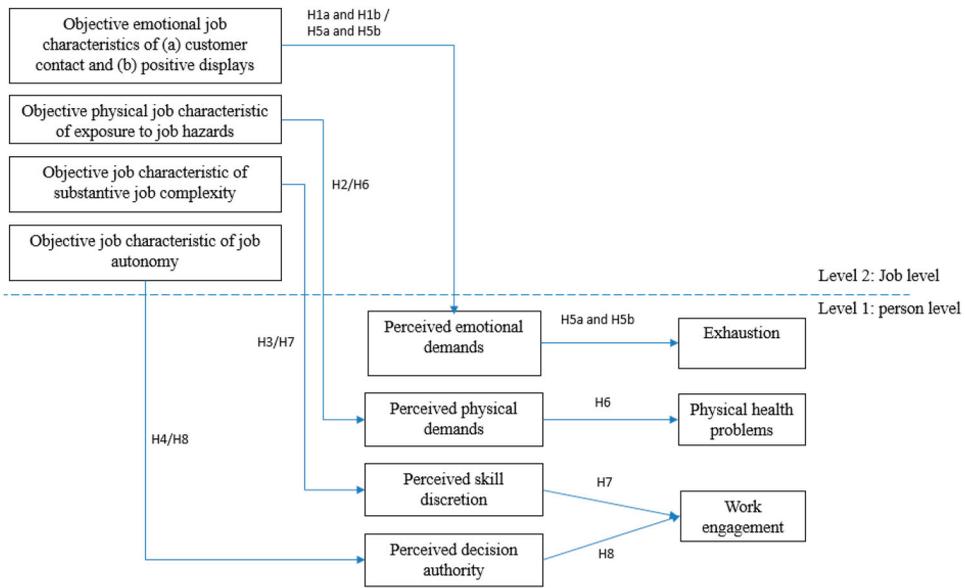


Figure 1. Theoretical model.

et al., 2003). Exposure to such these type of physical job hazards has been directly linked to workplace injuries and illnesses. For example, Ford and Wiggins (2012) showed that occupational-level physical hazards could explain injury incidents across 563 occupations. Similarly, we propose that employees in hazardous occupations will perceive greater exposure to physical demands.

Hypothesis 2. Objective physical job characteristic of exposure to job hazards is positively associated with perceived physical demands.

Substantive job complexity, defined as the amount of initiative, thought, and independent judgement required on the job (Kohn & Schooler, 1982), indicates “more intricate thought processes” (Shalley et al., 2009, p. 493) thus requiring job incumbents to utilise a greater array and a higher level of skills, as well as creative thinking so as to make such judgement. Complex jobs are often multifaceted (Shalley et al., 2009), indicating the need to learn and to use different skills to perform multiple tasks. Thus we propose (objective) substantive job complexity is an antecedent of perceived skill discretion (the perceived degree of variety and level of skills required on a job and the need for learning, creativity and personal development; Jalonen et al., 2015; Karasek, 1979).

Hypothesis 3. Objective job characteristic of substantive job complexity is positively associated with perceived skill discretion.

Occupations vary in the degree of autonomy inherent in the role (Liu et al., 2008; Poussette & Hanse, 2002). For example, blue-collar workers have lower level of job autonomy than white-collar workers, elderly-care workers and childcare workers. Similarly, faculty staff have higher job autonomy than support staff. Objective job autonomy reflects the extent to which a job is designed to allow for freedom and independence to make decisions regarding how and when the job gets done (Morgeson & Humphrey, 2006).

Experimental studies have revealed that improvements in objective job autonomy, such as increasing employees' opportunities to recommend and comment on ways that his/her tasks are structured, assigned and performed, also increase employees' perceived job control (Bond & Bunce, 2001; Holman & Axtell, 2016). Thus, we propose employees in autonomous jobs report greater perceived decision authority.

Hypothesis 4. Objective job characteristic of job autonomy is positively associated with perceived decision authority.

Objective job characteristics are theorised to exert not only direct effects on perceived job characteristics but also indirect effects on employee outcomes mediated by perceived job characteristics. In their highly influential research on job design, Hackman and colleagues (Hackman & Lawler, 1971; Hackman & Oldham, 1975, 1980) proposed that objective characteristics of the job are the major determinants of employees' perceptions of their job which, in turn, are of central importance in affecting employees' attitudes and behaviours. Specifically, objective job features (including skill variety, task identity and significance, autonomy, and feedback) are thought to influence how individuals perceive the meaningfulness of their job, the responsibility for and knowledge of the outcomes of their job, which in turn is associated with employee motivation and satisfaction. They also noted that although objective job characteristics are of importance, it is how these objective job characteristics are experienced by employees (i.e. perceptual characteristics) that affects employee attitudes and behaviours. This proposition points to an indirect effect of objective job characteristics on employee outcomes via perceived job characteristics. In other words, the manipulation of objective job characteristics will eventually affect employee outcomes through changes in job characteristics as perceived by employees.

Similarly, Spector (1992) argued that the theoretical premise underpinning many organisational models in areas of job characteristics, job stress, and leadership is that individuals react to objective characteristics of the work environment first perceptually and then affectively and behaviourally. Given this proposed causal sequence, he called for research to study the entire process from environment to perception to outcome. More recently, Dierdorff and Morgeson's (2013) study built some evidence that occupational values (the extent to which jobs are designed to reinforce various work-related needs) influence how employees perceive their jobs which in turn is related to employee-reported job satisfaction.

Therefore, following the theoretical reasoning regarding the indirect effect of objective job characteristics (Hackman & Lawler, 1971; Hackman & Oldham, 1975, 1980; Spector, 1992) as well as extensive evidence regarding perceived job characteristics on employee outcomes from existing JD-R research, we examine the top-down indirect effects of the objective job characteristics on employee outcomes through perceived job characteristics.

Hypothesis 5. Objective emotional job characteristics of (a) customer contact and (b) positive displays are significantly and indirectly associated with exhaustion through perceived emotional demands.

Hypothesis 6. Objective physical job characteristic of exposure to job hazards is significantly and indirectly associated with physical health problems through perceived physical demands.

Hypothesis 7. Objective job characteristic of substantive job complexity is significantly and indirectly associated with work engagement through perceived skill discretion.

Hypothesis 8. Objective job characteristic of job autonomy is significantly and indirectly associated with work engagement through perceived decision authority.

Method

We tested the hypotheses by matching data from two national databases. National survey data on working conditions and employee outcomes from the Australia Workplace Barometer (AWB; Dollard et al., 2009) were linked with objective job analysis ratings from O*NET database.¹ Specifically, we used Standard Occupational Classification (SOC) codes² to match job attribute ratings in O*NET with perceived job attributes rated by job incumbents in the AWB data. Hence, our design is multi-level, with two data sources – perceived job demands, resources, and outcomes rated by workers in various occupations and collected at two time points (Level 1; AWB data) nested within objective requirements of occupations (Level 2; O*NET data).

*O*NET and AWB*

Each occupation consists of a variety of work activities and tasks that are performed in various work contexts. Based on occupational analyses, O*NET was developed to capture these key distinguishing characteristics of discrete occupations, and provides detailed occupational profiles using a standardised, measurable set of variables called descriptors. In this study, data on job characteristics were obtained from O*NET 17.0, the most current version of the O*NET available during the research phase of our study. O*NET 17.0 contains 277 descriptors for 974 jobs/occupations, describing the features of the work performed (i.e. work activities, work context, and tasks) and the attributes of the worker required to successfully perform the job (i.e. abilities, skills, knowledge, and education). Ratings of O*NET descriptors are collected from three primary sources: job incumbents, occupational experts, and occupational analysts. Together these three sources provide objective measurement of job characteristics. Reliability and validity evidence of the O*NET descriptors have been provided in the literature (Peterson et al., 2001). O*NET ratings have been used in past studies (Ford & Tetrick, 2011; Valcour, 2007) as well as in the Australian context (Spitzmueller et al., 2018).

The AWB project, with the first wave data collected in 2009–2010 and the second wave data collected in 2011, was developed to provide science-driven evidence of Australian working conditions and relationships with workplace health and productivity. The AWB survey provides representative national data for Australian workers and working conditions, with unique information regarding psychosocial risk factors at work, including job demands, control, support, and resources, as well as health and work outcomes (Dollard et al., 2012; Dollard & Bailey, 2014).

*Process for linking O*NET and AWB datasets via SOC codes*

The O*NET and AWB databases were linked via SOC codes. A SOC code was allocated to each AWB survey participant according to three fields of data: (1) industry classification

for the current job; (2) main duties performed; and (3) string data regarding the name of the workplace. For the third field, a “Google” search was conducted for each case, gathering information based on business names in order to guide the allocation of an appropriate SOC code. In the event that insufficient information was available, an SOC code was not assigned and the case was excluded from the following data analyses.

Some aspects of the matching process required discretionary judgments by the coder. A coding process file was established to make the allocation strategy transparent. A “training phase” was held between one of the authors and a research assistant, followed by a “testing phase” wherein both allocated the SOC codes independently using a randomly selected sample of 80 cases. Both coders were blind to the perceived job characteristics ratings when they assigned the SOC codes. The two coders assigned the same SOC codes in 95% cases. In the remaining 5% of cases, a discussion was held to elucidate the rationale for non-agreement and resolve the coding decision. After that, the author completed the remaining allocations. More detailed information on industry classifications, main duty groupings, and other aspects of the matching process is available from the authors upon request.

Of the original AWB dataset ($N = 4,772$), an SOC code was successfully allocated to 3,829 incumbents. Among them, 2,139 incumbents completed both Time 1 and Time 2 surveys with a one-year gap in between. To meet the sample size recommendation for level 1 units in multilevel analysis, 213 responses were removed because there are less than 5 incumbents per SOC. The final dataset identified 97 unique SOC codes with 2,049 employees, with an average cluster size of 21.12. Among the 2,049 employees, a total of 906 respondents were male employees, which accounts for 44.2% of our sample. The average age was 47.42 ($SD = 11.82$) and the average organisational tenure was 3.40 years ($SD = 3.20$). A total of 1,496 respondents (83.0%) were permanent full-time or part-time employees, and the remaining were casual/temporary or fixed-term contract employees. These respondents worked in 18 industries including health and community services, education, retail trade, and construction. One-way analysis of variance (ANOVA) results showed no significant differences in perceived physical demands [$F(1, 4772) = 1.07, p = n.s.$], perceived emotional demands [$F(1, 4772) = .57, p = n.s.$], perceived decision authority [$F(1, 4772) = 1.11, p = n.s.$] between the 2,723 participants who were excluded from the final dataset and the 2,049 respondents remaining in the dataset. However, there was significant difference in perceived skill discretion [$F(1, 4772) = 17.58, p < 0.01$] where the mean was 3.08 ($SD = .48$) and 3.03 ($SD = .46$) for the 2,723 participants who were excluded from the final dataset and the 2,049 respondents remaining in the dataset, respectively.

Measures

Objective emotional job characteristics of customer contact and positive display

We utilised the measurement of *customer contact* and *positive displays* as per Grandey et al. (2013) study. Contact was measured by two O*NET items: “deal with external customers” (how important it is to work with external customers or the public in this job) and “performing for or working directly with the public” (to what extent this job requires incumbents to perform for people or deal directly with the public). Four O*NET items were used to measure *positive displays*. Of these, two related to showing positive

emotions: “concerns for others” (to what extent this job requires being sensitive to others’ needs and feelings, and being understanding and helpful on the job) and “cooperation” (to what extent this job requires being pleasant with others on the job, and displaying a good-natured, cooperative attitude). Another two items concerned hiding negative emotions: “self-control” (to what extent this job requires maintaining composure, keeping emotions in check, controlling anger, and avoiding aggressive behaviour, even in very difficult situations) and “stress tolerance” (to what extent this job requires accepting criticism and dealing calmly and effectively with high stress situations). O*NET ratings range from 0 to 100. For this study, O*NET job measures were coded such that higher values represent higher levels of customer contact and emotion display expectation. In our sample, both customer contact and emotion display expectation were normally distributed, with Kurtosis and Skewness both in the range between -1 and 1 .

Confirmatory factor analyses were conducted to examine the distinctiveness of customer contact and emotion displays. Results indicated that the hypothesised two-factor model fit the data well ($\chi^2(8) = 33.90$, $N = 209$, CFI = .96, TLI = .93, RMSEA = .03, SRMR_{within} = .00, SRMR_{between} = .03) and significantly better than the single-factor model ($\Delta\chi^2(1) = 89.58$, $N = 209$, $p < .01$, CFI = .83, TLI = .71, RMSEA = .06, SRMR_{within} = .00, SRMR_{between} = .10).

Objective physical job characteristic of exposure to job hazards

Replicating the study of Ford and Tetrick (2011), 14 O*NET 17.0 job descriptors, such as exposure to contaminants and hazardous conditions, were used to create a composite variable of physical hazards. These 14 job descriptors reflect the physical requirements of a job and an employee’s exposure to job hazards.

Objective job characteristic of substantive job complexity

We operationalised substantive job complexity as the average of seven complexity descriptors from O*NET (Shaw & Gupta, 2004). Sample items are “updating and using relevant knowledge,” “making decisions and solving problems,” and “monitoring and controlling resources.”

Objective job characteristic of job autonomy

This measure was assessed by three O*NET descriptors including “how do the decisions an employee makes impact the results of co-workers, clients or the company?”; “how frequently is the worker required to make decisions that affect other people, the financial resources, and/or the image and reputation of the organisation?” and “how much decision making freedom, without supervision, does the job offer?” Higher values of O*NET ratings represent higher levels of job autonomy.

(Perceived) emotional demands (at Time 1)

Emotional demands were measured in the AWB using items from the Job Content Questionnaire 2.0 (JCQ, www.jcqcenter.org). The scale consists of four items (e.g. “My job is emotionally demanding” and “My work places me in emotionally challenging situations”). Participants could respond to these items using a four-point scale (1 = strongly disagree, 4 = strongly agree).

(Perceived)#physical demands (at Time 1)

Physical demands were measured using five items on a four-point scale (1 = strongly disagree, 4 = strongly agree) from the Karasek's (1985) JCQ. A sample item is "My job requires lots of physical effort."

(Perceived)#skill discretion (at Time 1)

To assess skill discretion, the five-item skill discretion scale from Karasek's (1985) JCQ was used. The skill discretion scale was independent from items of the decision authority scale. Participants were asked to respond to items such as "I am able to do a great variety of things in my work," using a four-point scale (1 = strongly disagree, 4 = strongly agree).

(Perceived)#decision authority (at Time 1)

This measure was assessed by three decision authority items on the decision latitude scale from Karasek's (1985) Job Content Instrument. A sample item is "My job allows me to make a lot of decisions on my own" (1 = strongly disagree, 4 = strongly agree).

Exhaustion (at Time 2)

Exhaustion (at Time 2) was measured with the Maslach Burnout Inventory-General Survey (Maslach et al., 1986). The subscale includes five-items, such as "I feel emotionally drained from my work" (1 = never, 7 = every day). Burnout has three dimensions labelled exhaustion, cynicism, and professional efficacy. We examined exhaustion rather than the other two dimensions because, firstly, exhaustion and cynicism are the core dimensions of burnout, as opposed to professional efficacy; and secondly, cynicism and identification (which we measured as a sub-dimension of work engagement in our study) likely represent the opposite ends of the same construct, meaning that it is not necessary to include both in the same study (Demerouti et al., 2010).

Physical health problems (at Time 2)

Physical health problems were measured by four items related to musculoskeletal problems from the Work Outcomes Research Cost-Benefit (WORC) project (QIDS-SR, Rush et al., 2003; Section A – Health). The items were measured on a 4-point scale, 1 (not at all/never) to 4 (a lot). A sample item is "During the last 7 days, how much were you bothered by headaches?".

Work engagement (at Time 2)

Work engagement was assessed with three sub-scales of the Utrecht Work Engagement Scale (UWES; Schaufeli et al., 2006) that include three items each, for example, "At my job, I feel strong and vigorous" (vigour), "I am enthusiastic about my job" (dedication), and "I am immersed in my work" (absorption). Participants could respond to the items using the same seven-point scale as for exhaustion. The engagement scale was treated as a composite measure in data analysis.

Analysis strategy

In this study, employees (Level 1) were nested within jobs (Level 2). Using Krull and MacKinnon's (2001) typology, our model corresponds to a 2-1-1 design in which the

influence of a Level 2 variable (objective job characteristics) on Level 1 outcome variables (exhaustion, physical health and work engagement) is mediated by other Level 1 variables (perceived job characteristics).

To take account of the nested structure and the hypothesised multilevel mediation relationship to explain the top-down effects, data were analyzed via the two-level modelling approach recommended by Preacher et al. (2010). Preacher et al.'s approach separates the between-level and within-level components of perceived job characteristics and employee outcomes, thereby avoiding a conflation of the Level 1 and Level 2 relationships and a resulting incorrect estimation of the indirect effect. More specifically, we estimate the top-down relationships between objective and perceived job characteristics. We also estimate the relationship between perceived job characteristics and employee outcomes (partitioned into its within-level and between-level components). The indirect effects between objective emotional job characteristics and exhaustion through perceived emotional demands were calculated using the product-of-coefficients method by multiplying path coefficients among objective emotional job characteristics, group means of perceived emotional demands, and the group mean of exhaustion, with the confidence intervals provided. The other indirect effects of objective job characteristics on employee outcomes were calculated in the same way.

The model was analyzed using Mplus 7.4 software (Muthén & Muthén, 2016) with the maximum likelihood (ML) estimation. The Monte Carlo method recommended by Preacher et al. (2010) was used to estimate confidence intervals for the hypothesised multilevel mediated relationships. Moreover, in our model, we specified random intercepts for mediator and dependent variables. We did not need to specify random slopes because the model did not include a cross-level moderation effect.

Results

Descriptive statistics

Table 1 presents the means, standard deviations, Cronbach's alphas, and correlations among the variables of interest. At the individual level (Level 1), perceived emotional demands were positively correlated with exhaustion ($r = .29, p < .01$) and perceived physical demands were positively correlated with physical health problems ($r = .16, p < .01$). Perceived skill discretion ($r = .23, p < .01$) and perceived decision authority ($r = .21, p < .01$) were positively correlated with work engagement.

At the job level (Level 2), objective job characteristics are largely correlated. The two objective emotional job characteristics – positive displays and customer contact – were positively correlated ($r = .55, p < .01$). Positive displays and customer contact were also negatively related to the objective physical job characteristic exposure to hazards ($r = -.31, p < .01$ and $r = -.34, p < .01$, respectively), and positively related to objective job characteristics of substantive job complexity ($r = .26, p < .01$ and $r = .22, p < .01$, respectively) and job autonomy ($r = .30, p < .01$ and $r = .31, p < .01$, respectively). Objective physical job characteristics were negatively related to objective job complexity ($r = -.43, p < .01$) and job autonomy ($r = -.25, p < .01$). Finally, objective job complexity was positively related to objective job autonomy ($r = .62, p < .01$).

Table 1. Descriptive statistics, Cronbach's alphas, and intercorrelations at Level 1 (individual-level) and Level 2 (job-level).

| Variable | <i>M</i> | <i>SD</i> | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|--|----------|-----------|--------|--------|-------|--------|--------|--------|--------|--------|--------|--------|-------|--------|
| <i>Individual level</i> | | | | | | | | | | | | | | |
| 1. Exhaustion (T2) | 2.98 | 1.50 | (.86) | .28** | -.21* | .30** | .01 | .11 | -.03 | .08 | .08 | .13 | .05 | -.06 |
| 2. Physical health problems (T2) | 1.81 | .70 | .35** | (.68) | -.08 | .16 | .30** | -.22* | -.24* | .08 | .07 | .03 | -.18 | -.32** |
| 3. Engagement (T2) | 5.72 | 1.02 | -.30** | -.14** | (.84) | .30** | -.13 | .49** | .28** | .35** | .32** | -.30** | .39** | .31** |
| 4. Perceived emotional demands (T1) | 2.60 | .62 | .29** | .13** | -.01 | (.82) | -.03 | .36** | .05 | .53** | .33** | -.10 | .28** | .27** |
| 5. Perceived physical demands (T1) | 2.10 | .60 | .14** | .16** | -.05* | .15** | (.87) | -.44** | -.36** | -.30** | -.23* | .63** | -.44* | -.33* |
| 6. Perceived skill discretion (T1) | 5.75 | .85 | -.01 | -.05* | .23** | .14** | -.17** | (.72) | .67** | .29** | .14 | -.34** | .65** | .50** |
| 7. Perceived decision authority (T1) | 11.74 | 2.18 | -.10** | -.07** | .21** | -.06** | -.14** | .53** | (.72) | .09 | .14 | -.20 | .52** | .46** |
| <i>Job level</i> | | | | | | | | | | | | | | |
| 8. Objective emotional job characteristic of positive displays | 77.93 | 8.95 | | | | | | | | (.89) | | | | |
| 9. Objective emotional job characteristic of customer contact | 61.60 | 20.67 | | | | | | | | .55** | (.87) | | | |
| 10. Objective physical job characteristic of exposure to hazards | 30.27 | 12.07 | | | | | | | | -.31** | -.34** | (.84) | | |
| 11. Objective job characteristic of substantive job complexity | 57.66 | 12.60 | | | | | | | | .26** | .22** | -.43** | (.93) | |
| 12. Objective job characteristic of job autonomy | 78.15 | 11.61 | | | | | | | | .30** | .31** | -.25* | .62** | - |

Notes: ** $p < .01$ * $p < .05$. $n = 2,049$ at Level 1 (individual level), $n = 97$ at Level 2 (job level). Cronbach's alphas are reported in the parentheses on the diagonal. Correlations below the diagonal represent individual-level correlations ($N = 2,049$). Correlations above the diagonal represent job-level correlations ($N = 97$).

Discriminant validity of the constructs

Confirmatory factor analyses were conducted to examine the construct validity of employee-rated measures (i.e. exhaustion, physical health problems, work engagement, perceived skill discretion, perceived decision authority, perceived emotional demands and perceived physical demands). A seven-factor model was specified by loading items on their respective latent variables. Results showed that the seven-factor model fit the data well, $\chi^2(539, N = 2,139) = 3462.79$, CFI = .93, TLI = .92, SRMR = .06, and RMSEA = .04. Indicators all significantly loaded on their respective latent factors (standardised factor loadings ranged from .47 to .88). An alternative one-factor model was tested by loading all employee-rated items onto a single latent factor. This one-factor model fit the data significantly worse than the seven-factor model ($\chi^2(560) = 29911.79$, CFI = .27, TLI = .23, SRMR = .15, RMSEA = .12). An alternative five-factor model was also tested by loading job demands and job resources items on two latent factors, with the addition of the three outcome variables. The five-factor model fit the data significantly worse than the seven-factor model ($\chi^2(549) = 12017.33$, CFI = .78, TLI = .76, SRMR = .09, RMSEA = .08).

Hypotheses testing

The multilevel structural model showed a satisfactory fit to the data ($\chi^2(53) = 193.24$, $p < .001$, CFI = .92, TLI = .89, SRMR = .05, RMSEA = .04). [Table 2](#) presents standardised coefficient estimates of the direct relationships in the hypothesised model and unstandardised coefficient estimates for the indirect relationships. At the job level, the objective emotional job characteristic of positive displays was positively related to perceived emotional demands ($\beta = .67$, $p < .01$), supporting Hypothesis 1b. The objective emotional job characteristic of customer contact was not significantly related to perceived emotional demands, thus Hypothesis 1a was not supported. Consistent with Hypothesis 2, the objective physical job characteristic of exposure to job hazards was positively related to perceived physical demands ($\beta = .75$, $p < .01$). As predicted by Hypothesis 3, the objective job characteristic of substantive job complexity was positively related to perceived skill discretion ($\beta = .77$, $p < .01$). The objective job characteristic of job autonomy was positively related to perceived decision authority ($\beta = .68$, $p < .01$), in line with Hypothesis 4.

Hypotheses 5a and 5b predicted that the effects of objective emotional job characteristics of customer contact and positive displays on exhaustion would be mediated by perceived emotional demands. The indirect effect of customer contact on exhaustion through perceived emotional demands was not significant, meaning that Hypothesis 5a was not supported. There was, however, a significant indirect effect of the objective emotional job characteristics of positive displays on exhaustion through perceived emotional demands. Examining the 95% CIs (unstandardised estimate of the product of coefficients = .27, $p < .01$, 95% CI of [.02, .52]) with 20,000 Monte Carlo replications indicated support for the mediation proposed in Hypothesis 5b. Hypothesis 6 predicted the mediating effect of perceived physical demands in the relationship between objective physical job characteristic for exposure to job hazards and physical health problems. With 20,000 Monte Carlo replications, the 95% CIs (unstandardised estimate of the

Table 2. Multi-level results of mediation hypotheses.

| Path | Estimate | SE | Lower and upper 95% CI limits |
|--|----------|-----|----------------------------------|
| <i>Perceived job characteristics → Employee outcomes</i> | | | |
| Perceived emotional demands → exhaustion | | | |
| Within-level relationship | .25** | .02 | (.21, .29) |
| Between-level relationship | .55* | .23 | (.10, 1.01) |
| Perceived physical demands → physical health problems | | | |
| Within-level relationship | .10** | .02 | (.07, .15) |
| Between-level relationship | .42* | .20 | (.63, .86) |
| Perceived skill discretion → engagement | | | |
| Within-level relationship | .14** | .02 | (.10, .19) |
| Between-level relationship | .84* | .43 | (.01, 1.67) |
| Perceived decision authority → engagement | | | |
| Within-level relationship | .10** | .02 | (.05, .15) |
| Between-level relationship | .18 | .35 | (−.50, .87) |
| <i>Objective job characteristics → Perceived job characteristics</i> | | | |
| Objective emotional job characteristics of customer contact → perceived emotional demands (H1a) | | | |
| | .05 | .12 | (−.19, .29) |
| Objective emotional job characteristics of positive displays → perceived emotional demands (H1b) | | | |
| | .67** | .10 | (.47, .87) |
| Objective physical job characteristic for exposure to job hazards → perceived physical demands (H2) | | | |
| | .75** | .06 | (.63, .86) |
| Objective job characteristic of substantive job complexity → perceived skill discretion (H3) | | | |
| | .77** | .06 | (.65, .88) |
| Objective job characteristic of job autonomy → perceived decision authority (H4) | | | |
| | .68** | .10 | (.49, .86) |
| <i>Indirect relationships: Objective job characteristics → Perceived job characteristics → Employee outcomes</i> | | | |
| Objective emotional job characteristics of customer contact → perceived emotional demands → exhaustion (H5a) | | | |
| | .02 | .05 | (−.08, .12) |
| Objective emotional job characteristics of positive displays → perceived emotional demands → exhaustion (H5b) | | | |
| | .27* | .13 | (.03, .52) |
| Objective physical job characteristic for exposure to job hazards → perceived physical demands → physical health problems (H6) | | | |
| | .03* | .01 | (.001, .06) |
| Objective job characteristic of substantive job complexity → perceived skill discretion → work engagement (H7) | | | |
| | .59* | .23 | (.13, 1.05) |
| Objective job characteristic of job autonomy → perceived decision authority → work engagement (H8) | | | |
| | .11 | .18 | (−.25, .47) |

Note: ** $p < .01$ * $p < .05$. Standardised estimates are reported for the direct relationships to facilitate interpretation while unstandardised estimates are reported for the indirect relationships to conduct Monte Carlo analyses.

product of coefficients = .03, $p < .05$, 95% CI of [.001, .06]) supported the mediation proposed in Hypothesis 6. As predicted by Hypothesis 7, objective job characteristic of substantive job complexity had a positive and statistically significant indirect relationship with work engagement through perceived skill discretion (unstandardised estimate of the product of coefficients = .59, $p < .01$, 95% CI of [.13, 1.05] with 20,000 Monte Carlo replications). Objective job characteristic of job autonomy was significantly related with perceived decision authority, however perceived decision authority was only significantly associated with work engagement at the individual level not the job level, thus the indirect effect was not significant leaving Hypothesis 8 unconfirmed.

As for the R^2 values, the total explained variance in exhaustion, physical health problems and work engagement were 18.3%, 9.4% and 44.0% respectively. In comparison to a single-level model that only include perceived job characteristics as predictors, only 6.2%, 1.6% and 5.5% of the variance in exhaustion, physical health problems and work engagement were explained. Thus, the explained variance increased considerably in the model that accounted for both objective and perceived job characteristics as

compared to the model in which only perceived job characteristics were considered as antecedents.

Additional analyses

In our model, we examined the impact of one particular objective job characteristic on a particular employee outcome through a particular perceived job characteristic. The relationships could be more complex wherein a particular job characteristic could impact multiple employee outcomes. For example, objective job complexity could impact perceived skill discretion, but also affect exhaustion through perceived emotional demands because such objective job characteristic requires employees' emotional stability to cope with complex tasks. Accordingly, we conducted additional analyses to take account of such complexity.

Each of the three employee outcomes were regressed on all four perceived job characteristics each of which was then regressed on all four objective job characteristics. All of the proposed relationships in our model remained significant. As shown in [Table 3](#), the magnitude of the other significant relationships between objective and subjective job characteristics and between perceived job characteristics and employee outcomes are generally much smaller than the proposed relationships in our model. This suggests that the predicted and observed results for the focal job characteristics were robust while also controlling for several other job characteristics, and that the focal job characteristics have the most significant impact on the corresponding outcomes.

Discussion

Theoretically, this study sheds light on the link between objective job design and the subjective experience of the job, and how through this pathway job design affects employee outcomes. Using a multilevel design with multisource and lagged data, we investigated how objective job characteristics inherent to occupations are linked with perceptual job characteristics in the eyes of employees, which are in turn associated with self-reported employee well-being and work motivation. The results supported the majority of the predicted relationships. At the job level, the results extend JD-R theory by highlighting the top-down effects of objective job characteristics related to the requirement for positive displays, exposure to job hazards, and substantive job complexity on employee outcomes through perceived job characteristics, in the health erosion and motivation pathways. We also found, at the job level, that the positive relationship between objective job characteristic of job autonomy was significantly related with perceived decision authority. These results not only establish support for a central assumption of job design, they also provide indications about which aspects of work are inherently stressful independent of, but prior to, the perceptions of job incumbents.

Theoretical contributions

Our main theoretical contribution lies in testing the key tenant of job design and work characteristics models, within the JD-R framework. The findings of our study support the core theoretical premise that how jobs are designed (as indicated by objective

Table 3. Multi-level results of additional analysis.

| Path | Dependent outcomes | | | |
|---|-----------------------------|----------------------------|----------------------------|------------------------------|
| | Exhaustion | Physical health problems | Engagement | |
| <i>Perceived job characteristics</i> → <i>Employee outcomes</i> | | | | |
| Perceived emotional demands | | | | |
| Within-level relationship | .26** (.02) | .10** (.02) | -.04 (.02) | |
| Between-level relationship | .54* (.22) | | | |
| Perceived physical demands | | | | |
| Within-level relationship | .08** (.02) | .11** (.02) | .01 (.02) | |
| Between-level relationship | | .45* (.20) | | |
| Perceived skill discretion | | | | |
| Within-level relationship | .00 (.03) | .01 (.02) | .15** (.03) | |
| Between-level relationship | | | .84* (.40) | |
| Perceived decision authority | | | | |
| Within-level relationship | -.08** (.03) | -.03 (.03) | .12** (.03) | |
| Between-level relationship | | | .13 (.36) | |
| <i>Objective job characteristics</i> → <i>Perceived job characteristics</i> | Perceived emotional demands | Perceived physical demands | Perceived skill discretion | Perceived decision authority |
| Objective emotional job characteristics of customer contact | .06 (.12) | .11 (.10) | -.21* (.10) | .01 (.15) |
| Objective emotional job characteristics of positive displays | .67** (.10) | -.10 (.10) | .24* (.10) | -.12 (.14) |
| Objective job characteristic of substantive job complexity | .30* (.13) | -.12 (.11) | .65** (.10) | .62** (.14) |
| Objective job characteristic of job autonomy | -.04 (.13) | -.16 (.11) | .18 (.10) | .36* (.15) |
| Objective physical job characteristic for exposure to job hazards | .19 (.11) | .67** (.08) | -.09 (.09) | .07 (.13) |

Note: ** $p < .01$ * $p < .05$. Standardised estimates are reported for the direct relationships to facilitate interpretation and standard errors are provided in parentheses

occupational requirements) is a predictor of how jobs are perceived by incumbents (perceived job characteristics) which is, in turn, associated with employee outcomes. Specifically, we found support for both the health erosion and motivation pathways of the JD-R model from work design at the occupational level to incumbent experience and outcomes at the individual level. Though posited in the original JD-R model (Demerouti et al., 2001) and other seminal work on job design (Hackman & Lawler, 1971; Hackman & Oldham, 1975, 1980; Spector, 1992), our studies is one of the few to examine and demonstrate support for this link empirically.

The multilevel and mediational linkages we discovered in our study have important implications for JD-R research specifically and job design research more generally. First, job demands and resources are conceptualised in both objective and subjective manners in JD-R theory, but rarely operationalised in this way in empirical research. The first JD-R study used both observer-ratings and self-ratings of job demands and job resources to capture the rich portrait of the job. However, “no further systematic evaluation of job demands and particularly resources has been published after this study” (Bakker & Demerouti, 2017a, p. 279). Our study examined and found support for the JD-R model using different operationalizations of job demands and resources in both core processes in the model, filling this important gap in evidence for core JD-R theory. Although there is evidence for convergence between self-reported and more objective assessments of job characteristics (Ganster & Rosen, 2013), the relationship

between the two often tends to be modest (Bowling & Kirkendall, 2012). A very likely reason is that objective and self-reported assessments assess somewhat different constructs; whereas the former measures the job characteristics in absolute terms without “making reference to a subjective personal standard” (Bowling & Kirkendall, 2012, p. 223), the latter measures characteristics of a job in relative terms (e.g. relative to what the individual expects or can afford, or to previous jobs held by the individual).

The distinction between objective and subjective assessments of job characteristics highlights the potential importance of the agentic role employees can play in shaping the experience and perceptions of their jobs. Literature on job crafting (Tims et al., 2012) theorises that, for employees holding the same job position and exposed to the same objective job characteristics, some more proactively make changes to their job demands and resources, and especially in how they appraise their work (i.e. cognitive crafting), which consequently improves their perceptions of job characteristics. Going a step further from acknowledging the distinction between objective and subjective assessments of job characteristics, there is a need to understand how objective and subjective job characteristics are linked in association with employee outcomes, which points to our second theoretical contribution.

Our second theoretical contribution lies in advancing understanding of the link between objective and subjective job demands and resources, addressing the question of what features make jobs more or less demanding and likewise resource rich or poor. For example, existing research has provided inconsistent support for what makes a job emotionally demanding. Customer contact has been proposed as a primary cause of emotional demands (Brotheridge & Grandey, 2002; Cordes & Dougherty, 1993). However, several studies did not find support for the frequency of customer interactions as a significant predictor of emotional demands and emotional exhaustion (Brotheridge & Grandey, 2002; Kim, 2008; Morris & Feldman, 1997). Likewise, the literature reveals mixed findings regarding the requirements for emotion displays. While in some studies display rules were not significantly related to job satisfaction (Grandey et al., 2013) and emotional exhaustion (Brotheridge & Grandey, 2002), this job demand was found to predict emotional exhaustion when it was rated by supervisors (Wilk & Moynihan, 2005), and when it was aggregated to the unit-level (Diefendorff et al., 2011).

Against the backdrop of these mixed findings regarding the factors associated with emotional demands, our study offers clarification by using a broad range of occupations and a combination of objective and subjective job assessments. Our study shows that the inherent requirement for customer contact does not necessarily translate into a stressor for exhaustion. In contrast, the requirement for positive displays (i.e. the need to hide negative and show positive emotions) plays a more significant role in influencing perceived emotional demands, and this influence eventually results in exhaustion. Hence, according to our findings, it is not the necessity for customer contact in itself that creates strain; rather it is the need to regulate emotions to manage those customer encounters in a way that meets organisational display requirements that depletes energy reserves. This finding is consistent with the emotional labour literature (Grandey & Melloy, 2017). It helps to resolve the inconsistent findings and, in doing so, sharpens the picture arising on the emotional toll of work.

Third, by conceptualising and assessing objective job characteristics on the occupation level (cf. Demerouti et al., 2001; Judge & Zapata, 2015), our multi-level study highlights the role of the inherent requirements of occupations in predicting employee outcomes, lifting extant JD-R literature beyond the focus on individual-level antecedents. Empirical examination of higher-level factors (such as organisational factors and occupational factors) as antecedents of employee motivation and job satisfaction is rare in job design research (Morgeson et al., 2010) and JD-R research (Bakker & Demerouti, 2017b; Morrison et al., 2003), but hold important keys to work stress prevention.

Identification of occupation-level factors can inform intervention programmes driven by a job design perspective. In this way, our study integrates the job design perspective with the JD-R framework. By changing the structural aspects of work and improving the nature and organisation of the job itself, our findings suggest that employee health, motivation, and well-being may be optimised in a top-down approach. Not only do individual, team, and organisational levels come into play (see Bakker & Demerouti, 2017b); this study shows that the nature of the occupation itself has an important influence on the way jobs are experienced by employees and the corresponding outcomes, which needs to be taken into account in JD-R theory. Integrating a multilevel perspective in research on the JD-R model was strongly recommended by Bakker and Demerouti (2017a) to explore the complexity of organisational phenomena and help guide the development of more effective interventions.

Practical implications

There are important practical implications that flow from building an understanding of how *both* objective and perceived job characteristics leading to employee health and well-being outcomes. Objective measures of job characteristics have an explicit focus on risk characteristics and attributes associated with tasks, jobs, and organisations that are not related to incumbents' perceptions of stimuli in the work environment. By definition, such characteristics are independent of (and, as we demonstrate here, antecedent to) jobs holders' cognitive and emotional reactions to these stimuli. When the focus moves from the experiences of employees who perform the job towards the job itself, there is scope to design *primary* intervention programmes that aim to directly reduce or eliminate job stressors and increase the provision of job resources to prevent job strain at a very early stage and from the source of the problem that shapes the experiences and outcomes of job incumbents. In this way, primary prevention goes beyond adopting a reactive approach to improve incumbents' cognitive appraisal of stressors or ability to manage strain (via *secondary* interventions) or to reduce the negative impacts of strain on job holders after erosive effects have begun (via *tertiary* interventions) (Ganster & Rosen, 2013; Sonnentag & Frese, 2012). Secondary and tertiary interventions remain important components of a holistic approach to stress management, but should be supplemented by primary prevention efforts.

Understanding the causal process from objective job characteristics to subjective job characteristics and then to employee outcomes facilitates the identification of what goes wrong (and what goes right) in job design at which stages. So long as researchers predominantly rely *only* on employees to report both the presence and the impacts of job characteristics, research will fail to distinguish between cases wherein certain aspects of a job are inherently designed in a problematic way within an organisation from

those wherein aspects of the job are negatively evaluated by some employees due to individual differences (e.g. negative affectivity; see for example Tepper et al., 2006), intra-individual psychological processes (e.g. stress appraisal; see for example McGonagle et al., 2014), or specific aspects of the immediate work environment that shape how job design factors are enacted and experienced (e.g. leadership; see for example Tuckey et al., 2012). Objective indicators have implications of their own and can be used together with subjective indicators to determine appropriate stress management interventions.

As an example, consider the case of a community centre that has the function of providing legal support to victims of violence. A well-being survey conducted at the centre shows that employees generally perceive a high level of emotional demands that lead to high levels of emotional exhaustion. In response to this data, exhausted workers could be given additional time off work to recover and access to free counselling support (example tertiary interventions); or workshops could be offered regarding how to enhance individual resilience (e.g. Tonkin et al., 2018) or mindfulness (e.g. Foureur et al., 2013) (example secondary interventions). Before investing in these secondary and tertiary interventions, however, it would be important to look at objective indicators of emotional demands, such as checking if employees who occupy the same job positions tend to have consensual assessment about the level of emotional demands, and reviewing organisational data regarding job characteristics that might shape perceptions of emotional demands and contribute to exhaustion such as the number and complexity of cases coming into the centre. These kinds of indicators can guide primary interventions to improve the structural aspects themselves, such as creating a dedicated team to handle complex cases that has a different workload profile and enhanced supports, or changing workload profiles and supports in response to seasonal variations in caseloads. In addition, combining the subjective survey data with the objective indicators might reveal that certain teams experience lower exhaustion than others despite similar caseload characteristics, perhaps pointing to the need for exploring and addressing leadership or team dynamics in those teams.

Our study showed in particular that objective requirements for positive emotional displays are associated with perceived emotional demands. Building upon this finding, organisations could review and revise formal statements regarding emotional display rules to assess what display rules are required and if these rules are appropriate and relevant for a particular job, and what organisational or job resources are provided to assist employees to manage emotional displays. For example, when an organisation claims to “offer service with a smile” and explicitly writes this promise into job descriptions, employees may feel they have to fake or suppress their emotions to satisfy customer needs. In contrast, some service organisations avoid such explicit requirements in the job description and instead encourage authentic emotion display by giving employees the so called “display autonomy” (Goldberg & Grandey, 2007).

To summarise, despite the high correlations between perceived and objective job characteristics revealed in our study, these types of characteristics may actually indicate different directions for prevention and intervention. Failure in accurate risk identification and enrichment at the structural level prevents the (re)design and implementation of effective primary prevention strategies. Our results suggest that the risk identification and enrichment process should usefully start with the nature of the occupation itself, which plays an important role in shaping psychosocial aspects of the work and outcomes.

Limitations and future directions

Our study explored the relationships between objective and subjective job characteristics flowing onto employee outcomes. To enhance internal validity, we examined the impact of one particular objective job characteristic on a particular employee outcome through a particular perceived job characteristic. In reality, in terms of external validity, employees work in a context where multiple job characteristics take effect simultaneously. Our additional analysis to some extent reveals the complexity of the relationships. Future research could elaborate the way in which employee outcomes are influenced by multiple job characteristics simultaneously.

This study examined two perceived job demands and two perceived job resources. Despite its potential significance across many contexts, we did not include workload in this study. Existing studies (Johnson & Allen, 2013; Peters et al., 2016; Van Emmerik & Jawahar, 2006) have used average weekly working hours to measure workload in an objective way. We instead chose to focus on job characteristics that are harder to measure using archival or official records, for which the O*NET provides a suitable assessment. Future research should incorporate various job demands and resources and examine the complexity of job features employees are facing and the (objective) antecedents of these features. More importantly, future research could examine the process by which or in what organisational contexts objective job characteristics influence perceived job characteristics to understand how job design is experienced by individual employees through their “enactment” and daily interactions with supervisors and co-workers (Daniels, 2006).

The JD-R model investigates both the main and interaction effects of job demands and job resources. We explored the main effects in the model – the central aspects of the health and motivation pathways – to test the causal process whereby objective job characteristics influence perceived job characteristics and consequently influence employee outcomes. While we did not look at interaction effects, this would be an interesting topic to explore in future research now that our study has provided support for the links between objective job design and the subjective experience of work. The interaction between job demands and resources has been widely studied in the JD-R literature using perceived job characteristic ratings, but not yet with objective data. JD-R model does not explicitly propose if only perceived characteristics interact to influence employee outcomes or objective job characteristics may also interact to influence employees’ perceptions and outcomes. Future research could examine if and how objective job demands interact with objective job resources with a theoretical justification.

Conclusion

In conclusion, this study provides a more complete portrait of the connection between job characteristics and employee exhaustion, health and work engagement by focusing on the role of objective job characteristics at the occupational level in shaping the process of how employees perceive and respond to their jobs. In examining the role of objective job characteristics and utilising a multi-level design with lagged multisource data, this study builds on and extends JD-R theory and also enriches the connection between JD-R theory and a job design perspective. The knowledge generated from this

study can inform a more effective and proactive approach to reduce job stressors, increase job resources, and improve employee well-being and work engagement in which objective and subjective assessments inform prevention and intervention strategies, individually and collectively.

Notes

1. O*NET database: <https://www.onetonline.org/>
2. SOC is a federal statistical standard used by U.S. federal agencies to define occupational categories and classify workers into occupational categories (<https://www.bls.gov/soc/>). The O*NET-SOC taxonomy currently includes ratings of 974 occupations (<https://www.onetcenter.org/overview.html>).

Disclosure statement

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