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Matching Job Demands and Job Resources as Linear and Non-linear Predictors of Employee Vigor and Sustainable Performance

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ABSTRACT

The present study studied two prominent job stress models as predictors of employee vigor and employee sustainable performance. First, based on the matching principle of the Demand-Induced Strain Compensation (DISC) Model, we predicted that job resources moderate (i.e. strengthen) the linear relation of job demands with employee vigor and sustainable performance, particularly when the type of demands corresponds well with the type of resources. Second, based on the non-linearity principle of the Vitamin Model, we predicted that non-linear (i.e. *curvilinear*) relations between job demands or job resources with employee vigor and sustainable performance exist, particularly when the type of demands or resources matches well with the outcome. An online cross-sectional study was conducted among 1,175 Chinese employees working in different industries. Multivariate regression analyses revealed that (1) although we did not find moderating effects of job resources, "conceptual matches" were found in line with the matching principle of the DISC Model, and (2) curvilinear patterns were detected (although with a non-expected shape) in which so-called "non-linear matching" relations between either demands or resources and outcomes were present. This study highlights the importance of matching demands and resources in both linear and non-linear ways to predict employee vigor and employee sustainable performance. Finally, theoretical and practical implications of the findings were addressed.

Introduction

The past two decades have witnessed a growing interest in improving employee vigor and employee sustainable performance to ensure long-term productivity of people and organizations (e.g., De Jonge & Peeters, 2019; Docherty et al., 2009; Ji et al., 2021; Perrott, 2015; Spreitzer and Porath, 2012). Issues of how to build employee sustainable performance and simultaneously maintain employee vigor are increasingly explored in both academia and practice, under the assumption that especially job characteristics (i.e., job demands and job resources) are important predictors of these outcomes (e.g., De Jonge & Peeters, 2019; Ji et al., 2021).

Importantly, within contemporary work psychology, these issues have usually been studied under the assumption that relations between job characteristics and a wide array of well-being (i.e., vigor) and performance indicators are linear in nature. *Non-linear* associations have rarely been examined, even though past research has provided empirical evidence that such associations may exist as well. For example, Warr's well-known Vitamin Model (Warr, 1987, 1990, 2011) assumes that, beyond a particular threshold, an increase in beneficial job characteristics may not have a similar beneficial effect on work-related well-being such as employee's feeling of vigor and job satisfaction, and may

even be detrimental. In a similar vein, Wielenga-Meijer et al. (2012) found that having too much job autonomy negatively affects employee work-related well-being. Also, Kubicek et al. (2014) showed that the beneficial effect of job control only holds up to a certain threshold and that once this threshold is exceeded, job control becomes detrimental to employee's general well-being.

Thus, available research suggests that non-linear relations should not be ignored when focusing on the relations of job characteristics with employee well-being (i.e., vigor): having (too) much of a good thing may not always result in better outcomes. Therefore, the present study aims to fill this gap by investigating both linear and non-linear relations between specific job characteristics and two distinct positive work outcomes (i.e., employee *vigor* and employee *sustainable performance*).

Specific job characteristics: linear versus non-linear relations

Linear effects of job characteristics on work-related outcomes

Job demands and *job resources* are two key representatives of job characteristics within job stress, employee well-being, and job performance (e.g., Bakker & Demerouti, 2018; De Jonge et al., 2001; De Jonge & Dormann, 2017). *Job demands* are referred to as work-related tasks that require immediate or prolonged cognitive, emotional, and/or physical effort (De Jonge & Dormann, 2017). In contrast, *job resources* are considered as job-related assets that can be employed when an employee must deal with job demands (De Jonge & Dormann, 2017). Since the 1970s, theories, perspectives, and conceptual models have been developed to explain how job demands and job resources affect employee well-being and job performance (e.g., De Jonge & Dormann, 2003; Demerouti et al., 2001; Karasek, 1979; Warr, 1987). For instance, Karasek's Demand-Control Model (Karasek, 1979) assumed the well-known interaction effect between job demands and job control in the prediction of well-being and performance. Aiming to increase comprehension of job demands and job resources as well as their potential interactions, De Jonge and Dormann (2003, 2006) developed the Demand-Induced Strain Compensation (DISC) Model which distinguishes between job demands and job resources on three different dimensions: (1) cognitive, (2) emotional, and (3) physical.

Furthermore, the DISC Model proposes that interactions between job demands and job resources mainly depend on the correspondence or fit between specific types of demands and resources (De Jonge & Dormann, 2003; De Jonge et al., 2006). Specifically, its so-called *matching principle* pertains to a particular fit between both demands and resources as well as work-related outcomes. It follows functional self-regulation processes which cause the activation of functional, matching resources to regulate particular demands (Pomaki & Maes, 2002). For example, previous empirical evidence indicated that people would be more inclined to first opt for matching resources to regulate corresponding demands, and it seems essential to create an appropriate equilibrium between specific resources and corresponding demands to ensure/promote employee's well-being and health (e.g., Daniels & De Jonge, 2010; De Jonge & Dormann, 2006; De Jonge & Huter, 2021). Thus, linear associations between specific demand/resource combinations and work-related outcomes are assumed to be particularly strong(er) when these variables belong to the same domain (i.e., cognitive, physical, or emotional). In other words, the likelihood of connections between specific job demands and specific job resources in the prediction of employee vigor and sustainable performance increases as the degree of match increases (De Jonge & Dormann, 2003; De Jonge et al., 2006).

Non-linear effects of job characteristics on work-related outcomes

Warr's (1987, 1990, 2011) *Vitamin Model* challenges the "common sense" of linear relations between job characteristics and work-related outcomes. The model states that the effects of job characteristics on work-related outcomes are analogous to the effects of vitamins on the human body. Vitamin intake is important for physical health but should not be beyond a certain level, as excessive vitamin consumption can be harmful to a person's health. For example, vitamins C and E are positive regardless of the extent to which they are consumed, whereas vitamins A and D become detrimental to people's health with excessive intake. Certain features of the work context are suggested to have

comparable properties as vitamins, like vitamins C/E and A/D, such that after a certain level, an increase in beneficial job characteristics may not be beneficial anymore and may even be detrimental. Specifically, when the so-called C/E vitamins (i.e., salary, physical health, supervisor support, and job prospects) reach a certain level, they will have a C*onstant Effect* (CE). In contrast, when A/D vitamins (i.e., job autonomy, skill use, variety, and interpersonal contact) occur at an elevated level, they will yield an *Additional Decrement* (AD).

In this vein, non-linear effects of job characteristics have been argued for in this model in terms of curvilinear relations (i.e., inverted U-shaped relations). Several studies have empirically tested the assumptions of the Vitamin Model, especially focusing on job autonomy and different aspects of work-related well-being (e.g., burnout and job satisfaction). Kubicek et al. (2014) found full support for the Vitamin Model in both cross-sectional and longitudinal ways among workers in elderly care, and they concluded that higher levels of job control are not necessarily advantageous for the work-related well-being of these workers. In both studies, workers with high and low levels of job control reported a higher tendency to be irritated, a higher tendency to depersonalize care recipients, and a lower tendency to feel dedicated to, absorbed by, and vigor at work than those with intermediate levels of job control. Similarly, the findings of Wieland et al. (2004) among IT workers indicated that high job autonomy could be counterproductive. This was because high job autonomy could lead to increased task insecurity, which in turn was related to occupational burnout symptoms.

Collectively, excessive job characteristics might inhibit employees' well-being rather than cultivate it, because it might be associated with a higher workload, too many responsibilities, increased planning requirements, and problems with the predictability of one's work and, in turn, may reduce employees' psychological capabilities and decrease work-related well-being (Kubicek et al., 2017).

Job demands and job resources as vital antecedents of employee vigor and employee sustainable performance

Vigor has been used as a key representative of employee well-being and is defined as the presence of positive well-being, energy, fitness, and/or aliveness (Shirom, 2003; Shirom, 2007). Vigor is a multidimensional construct that comprises the interconnected feelings of cognitive liveliness, emotional energy, and physical strength (Shirom, 2003). Several studies posited and found a linear relation between job demands, job resources, and employee vigor (e.g., De Jonge & Huter, 2021; De Jonge et al., 2019). For example, the more job resources an individual perceives, the more s/he feels vigorous to cope with perceived job demands, improve health and well-being as well as enhance work performance. However, some scholars have argued and demonstrated that a curvilinear relation between job demands, job resources, and employee vigor could also exist (e.g., Sawang, 2012; Kubicek et al., 2014) For example, in low job demands conditions, employees would experience less motivation and engagement at work (Reijseger et al., 2013; Reijseger et al., 2017). Increasing job demands will function as an intrinsic motivator leading individuals to feel highly engaged with their work. However, when there are excessive job demands that require (too) much effort from individuals, job demands may turn into job stressors and trigger fatigue and exhaustion (Nahrgang et al., 2011). Therefore, on the one hand, job demands and job resources are considered vital antecedents of employee vigor. On the other hand, curvilinear relations between job demands, job resources, and employee vigor should also be considered.

Employee vigor is positively associated with employee work performance indicators (Shirom, 2007; Carmeli et al., 2009), such as *employee sustainable performance* (Spreitzer and Porath, 2012; Dorenbosch, 2014). Employee sustainable performance has been defined as a self-regulatory process in which an individual worker enduringly and efficiently achieves particular desired work goals while maintaining a satisfactory level of well-being (Ji et al., 2021). Specifically, this process involves a continuous (re)generation and preservation of job resources invested while achieving these goals, and these goals usually refer to desired outcomes for the individual, as well as for this individual's environment (Ji et al., 2021). Moreover, job demands

and job resources are theoretically considered two key antecedents in predicting employee sustainable performance. However, note that contrary to employee vigor (which has been empirically explained by job demands and job resources, e.g., De Jonge & Huter, 2021; Mauno et al., 2007), as yet little empirical research exists on the predictors of employee sustainable performance. Although some theoretical propositions point out that similar processes as with employee vigor may be at play in employee sustainable performance (e.g., De Jonge & Peeters, 2019; Dorenbosch, 2014; Ji et al., 2021), so far, no research has thoroughly investigated the relation between job demands and job resources with employee sustainable performance. The present study aims to fill this gap and contributes to a further understanding of the functions of job demands and job resources in terms of building employee sustainable performance, whereby, just as in the case of vigor, curvilinear relations will be considered as well.

Aims and hypotheses of the present study

The present study aims to investigate both linear and non-linear relations between (1) specific job demands and job resources on the one hand, and (2) employee vigor and employee sustainable performance on the other. First, as proposed by the matching principle of the DISC Model, the likelihood of finding moderating effects of job resources is positively related to the degree of match (i.e., triple-matches will occur most frequently). Thus, the matching principle between job demands, job resources, and the corresponding outcomes (i.e., employee vigor) will be tested in a linear way. Moreover, the challenge-hindrance demands framework (Cavanaugh et al., 1998) pointed out that different types of demands can have either positive or negative effects for employees. Specifically, challenge demands can evoke positive affect and attitudes as they are viewed as opportunities for growth, development, and goal attainment. Conversely, hindrance demands have the potential to undermine personal growth, development, and goal attainment as they are associated with resource loss in the form of decreased satisfaction (Cavanaugh et al., 1998; Schilbach et al., 2021). In a similar vein, the DISC Model proposes that high job demands stimulate positive psychological outcomes best as long as people have sufficient corresponding kinds of job resources (i.e., activation-enhancing mechanism; cf. De Jonge & Huter, 2021). The matching combination of high demands and resources could then result in positive outcomes such as employee creativity, vigor, and growth (De Jonge et al., 2019). For instance, cognitively challenging demands may stimulate cognitive vigor (i.e., cognitive liveliness) and active learning, but only in the case of high cognitive resources. Therefore, we derive the following hypotheses:

Hypothesis 1: Positive relations between job demands and employee vigor outcomes (i.e., cognitive liveliness, emotional energy, and physical strength) will be moderated by corresponding job resources, such that these relations will be stronger for people with high resources than for people with low resources.

Specifically, high cognitive job resources will moderate (i.e., strengthen) the positive relation between cognitive job demands and cognitive liveliness (*Hypothesis 1a*); high emotional job resources will moderate (i.e., strengthen) the positive relation between emotional job demands and emotional energy (*Hypothesis 1b*); and high physical job resources will moderate (i.e., strengthen) the positive relation between physical job demands and physical strength (*Hypothesis 1c*).

Hypothesis 2. Positive relations between job demands and employee sustainable performance will be moderated by corresponding job resources, such that these relations will be stronger for people with high resources than for people with low resources.

Specifically, high cognitive job resources will moderate (i.e., strengthen) the positive relation between cognitive job demands and employee sustainable performance (*Hypothesis 2a*); high emotional job resources will moderate (i.e., strengthen) the positive relation between emotional job demands and employee sustainable performance (*Hypothesis 2b*); and high physical job resources will moderate (i.e., strengthen) the positive relation between physical job demands and employee sustainable performance (*Hypothesis 2c*).

Second, as proposed by the DISC Model, job characteristics (i.e., job demands and job resources) and job-related strains (and concepts concerned with positive well-being) are not unidimensional constructs (i.e., cognitive, emotional, and physical; De Jonge & Dormann, 2003). Furthermore, Ji et al. (2023) showed that in 6 out of 8 "main-effect" linear regression models, so-called "conceptual matching demands and resources" were found, in addition to matching moderating effects of job resources. Therefore, there is reason to believe that "conceptual matching" might also apply to a non-linear relation (i.e., non-linear conceptual matching) between the constructs of interest. In this way, we try to empirically establish to what extent particular demands and resources (i.e., cognitive, emotional, physical) are non-linearly related to corresponding dimensions of employee vigor (i.e., cognitive liveliness, emotional energy, and physical strength) as well as non-linearly related to employee sustainable performance. Consequently, we expect that:

Hypothesis 3. Specific job demands will be more inclined to match an identical dimension of employee vigor outcomes in a curvilinear (i.e., inverted U-shaped) way. Specifically, cognitive job demands will be more inclined to be curvilinearly associated with cognitive liveliness (*Hypothesis 3a*); emotional job demands will be more inclined to be curvilinearly associated with emotional energy (*Hypothesis 3b*); physical job demands will be more inclined to be curvilinearly associated with physical strength (*Hypothesis 3c*).

Hypothesis 4. Specific job resources will be more inclined to match a corresponding dimension of employee vigor outcomes in a curvilinear (i.e., inverted U-shaped) way. Specifically, cognitive job resources will be more inclined to be curvilinearly associated with cognitive liveliness (*Hypothesis 4a*); emotional job resources will be more inclined to be curvilinearly associated with emotional energy (*Hypothesis 4b*); physical job resources will be more inclined to be curvilinearly associated with physical strength (*Hypothesis 4c*).

Moreover, guided by the Vitamin Model, the non-linear relation between job characteristics and work-related outcomes has been empirically investigated in previous studies. However, the non-linear relation between job characteristics (i.e., job demands and job resources) with employee sustainable performance has not been explored before. Thus, in line with previous research, we hypothesized that:

Hypothesis 5. The relation between specific job demands such as cognitive (*Hypothesis 5a*), emotional (*Hypothesis 5b*), and physical (*Hypothesis 5c*) demands with employee sustainable performance will be curvilinear (i.e., inverted U-shaped).

Hypothesis 6. The relation between specific job resources such as cognitive (*Hypothesis 6a*), emotional (*Hypothesis 6b*), and physical (*Hypothesis 6c*) resources with employee sustainable performance will be curvilinear (i.e., inverted U-shaped).

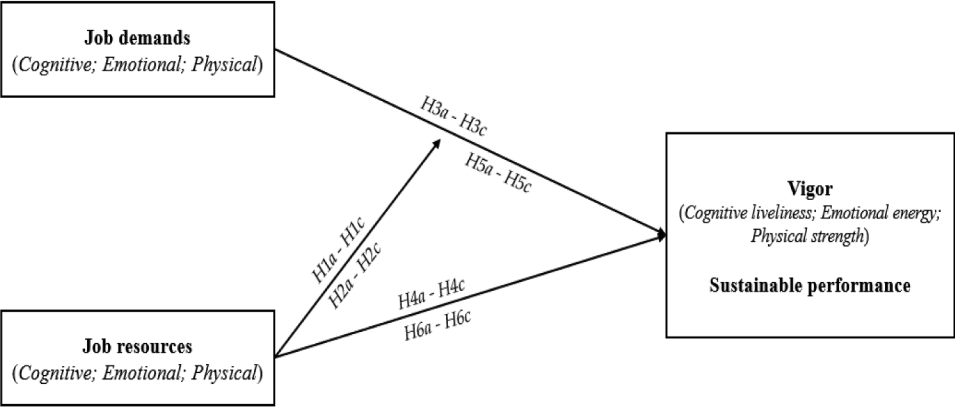The conceptual model of the current study is depicted in Figure 1.

Figure 1. The conceptual model for the present study.

Method

Procedure and participants

The present study was a cross-sectional survey study performed among Chinese employees employed across different occupational sectors. The study was carried out in agreement with the ethics code of the American Psychological Association and the Declaration of Helsinki. Ethical approval was obtained from the ethical review board of the Faculty of Social and Behavioral Sciences, Utrecht University (Approval Number: 21–0035). The data collection process was conducted in cooperation with a Chinese professional agency. An online self-reported survey with informed consent was sent by the online platform to each member's account. The potential participants were asked to fill out the questionnaire consisting of questions related to demographic characteristics, job demands, job resources as well as vigor and sustainable performance at work. Unfortunately, response rates could not be computed due to the data collection procedure.

In total, 1,175 participants returned a completed questionnaire. The demographic characteristics of the respondents showed that 531 (45.2%) were male and 644 (54.8%) were female. Ages ranged from 20 to 62 years ($M = 30.0$, $SD = 6.0$) and 67.9% of the respondents were married or cohabiting. The mean number of contract working hours of the respondents was 8.0 hours per day ($SD = 0.8$), and 25.5% of them did not have subordinates. The most common job categories were specialized technology (23.4%), information technology (17.5%), and finance (11.1%). Finally, 74.7% of the respondents held a bachelor's degree, 13.0% held a master's degree, and 1.3% held a doctoral degree, whereas the remaining part had reached a senior high school or professional training school educational level.

Measures

Variables included in the present study are cognitive, emotional, and physical job demands and job resources on the one hand, and employee vigor and employee sustainable performance on the other. Where possible, validated Chinese versions of existing instruments were used to tap the concepts of interest. In the remaining cases, a translation-back translation procedure was followed to develop Chinese versions of instruments that were initially developed in another language (Brislin, 1970; Douglas et al., 2007). Furthermore, we adopted the suggestions from Podsakoff and his team (Podsakoff et al., 2012; Podsakoff et al., 2024) to minimize common method bias of self-administered questionnaires. The independent and dependent variables in the present study were separated proximally in the questionnaire, and the multiple-point Likert scales used in the present study contained different scale formats and scale anchors. The informed consent letter introduced the

goal of the study and stated that the research was conducted anonymously. Several quality control/attention check items were included to ensure respondents were attentive throughout the survey. *Job demands* were assessed using the Demand-Induced Strain Questionnaire (DISQ 3.1; De Jonge, 2018), which has been well-validated in different languages and various occupational sectors (e.g., De Jonge et al., 2012; De Jonge & Huter, 2021; Ji et al., 2021). The three subscales addressed cognitive, emotional, and physical demands, each with three items. The items included: "I display high levels of concentration and precision" (Cognitive demands; Cronbach's α = 0.62); "I deal with people (e.g., clients, colleagues, or supervisors) whose problems touch me emotionally" (Emotional demands; Cronbach's α = 0.77); and "I perform a lot of physically strenuous tasks to carry out my job" (Physical demands; Cronbach's α = 0.78). Participants were asked to indicate how often their work required them to undertake each of the tasks (1 = "Never or Very rarely," 5 = "Very often or Always").

Job resources were also measured by the DISQ 3.1 (De Jonge, 2018) using cognitive, emotional, and physical resources. Cognitive resources were assessed using four items such as "I have the opportunity to determine my own work method" (Cronbach's α = 0.58); emotional resources were assessed using three items, such as "I get emotional support from others (e.g., clients, colleagues, or supervisors) when a threatening situation at work occurred." (Cronbach's α = 0.74); and physical resources were measured by three items in such as "I am able to take a physical break when things get physically strenuous" (Cronbach's α = 0.65).

Employee vigor was assessed using the Shirom-Melamed Vigor Measure (SMVM) developed by Shirom (2003). All three subscales of the SWVM were included in this study, namely *Cognitive liveliness* (CL) (three items, e.g., "I feel I can think rapidly;" Cronbach's α = 0.85), *Emotional energy* (EE) (four items, e.g., "I feel able to be sensitive to the needs of coworkers and customers;" Cronbach's α = 0.81), and *Physical strength* (PS) (five items, e.g., "I feel I have physical strength;" Cronbach's α = 0.91). Participants were asked to rate the ten statements on a 7-point Likert scale ranging from (1) "never or almost never" to (7) "always or almost always."

Employee sustainable performance was measured with the 10-item employee sustainable performance (E-SuPer) scale. Construct validity, discriminant validity, concurrent validity, and internal consistency of this scale were cross-culturally tested and confirmed (Ji et al., 2021). An example item is "I expect to be able to continuously achieve the objectives of my job," The rating range was from (1) "Strongly disagree" to (5) "Strongly agree." Cronbach's α of this scale was 0.82.

Demographic characteristics used in the present study were gender (0 = male, 1 = female), age (in years), marriage (1=single, 2=married or cohabitating, 3=others), supervision obligation (numbers of subordinates), contract working hours per day (in hours), and educational level (1 = primary school, 7 = doctoral degree).

Statistical analysis

First, means, standard deviations, and Pearson zero-order correlations were computed to obtain an initial overview of the survey data. Second, a series of hierarchical multivariate regression analyses (HMRAs) were performed for investigating the model presented in Figure 1, which indicates the relations between job demands and job resources on the one hand, and the three vigor dimensions and sustainable performance on the other. It should be noted that all multiplicative interactions between demands and resources were of cognitive, emotional, or physical kind according to the theoretical background of DISC theory. Therefore, in line with previous research, a series of hierarchical regression analyses were conducted for each dimension of employee vigor and sustainable performance (cf. De Jonge & Dormann, 2006; Van de Ven et al., 2013).

Before computing multiplicative interaction terms, all main terms involved in interactions were standardized in advance to avoid multicollinearity (Aiken et al., 1991). In the first step (Model 1), the demographic characteristics were entered as control variables. In the second step (Model 2), the standardized main terms were included (i.e., physical, cognitive, and emotional demands and resources). In the third step (Model 3), the interaction terms were added to the

model using multiplicative terms (e.g., cognitive demands × cognitive resources). Moreover, to further check and clarify the specific relations between job demands and job resources with employee vigor and employee sustainable performance, nonlinear (i.e., curvilinear) relations have also been tested. In this case, the hierarchical regression consisted of Model 1, entering all controlled demographic variables, Model 2, entering standardized main terms, and Model 3 entering the *quadratic* main terms to test if curvilinear relations exist with employee vigor and employee sustainable performance. This regression procedure is also called polynomial regression (Ostertagová, 2012).

It should be noted that an additive model (i.e., main terms) was compared with an interactive model (i.e., interaction terms) and a curvilinear model (i.e., quadratic terms; see also De Jonge et al., 2000). Unstandardized beta-coefficients (*B*) and their significance for individual predictor variables were presented, as well as the standard error (*SE*) and explained variance (R^2) of the final regression model. Incremental *F*-tests (F_{-inc}) and R^2 Change values were presented for regression model comparisons. All statistical analyses were performed with SPSS version 28 (IBM Corp, 2021).

Results

Descriptive statistics

Means, standard deviations, and Pearson zero-order correlations are presented in Table 1. All dimensions of job resources were positively related to employee vigor and employee sustainable performance (with *r* ranging from 0.34 to 0.52, $p < .001$), and employee vigor was positively related to employee sustainable performance (with *r* ranging from 0.55 to 0.64, $p < .001$). In addition, cognitive job demands were positively related to all three employee vigor outcomes (*CL*: $r = 0.20$; *EE*: $r = 0.17$; *PS*: $r = 0.09$, $p < .001$) and employee sustainable performance ($r = 0.17$, $p < .001$). Added to this, emotional job demands were negatively related to physical strength ($r = -0.17$, $p < .001$) and employee sustainable performance ($r = -0.09$, $p < .001$). Finally, physical job demands were negatively associated with emotional energy ($r = -0.06$, $p = .04$).

Assessment of common method bias

To check the common method bias problem empirically, we tested the fit of a one-factor model (i.e., all scale indicators loaded on a single factor). A confirmatory factor analysis (CFA) was conducted by RStudio (RStudio Team, 2020) to check whether or not method variance accounts for a significant amount of covariation among the measures (cf. Podsakoff et al., 2024). The one-factor model in the CFA demonstrated a poor fit ($\chi2 = 7971.634$, $df = 740.000$, $p < .001$, $\chi2/df = 10.772$, CFI = 0.619, TLI = 0.599, RMSEA = 0.091, NNFI = 0.599), indicating that common method bias was not a major issue in this study.

Job demands and job resources as predictors of employee vigor and employee sustainable performance

To examine Hypotheses 1 and 2, we conducted a series of hierarchical regression analyses to test the interactions of job demands and job resources on employee vigor and employee sustainable performance. Furthermore, an exploratory analysis aiming to clarify specific relations between job demands and job resources with employee vigor and employee sustainable performance was conducted. Following Hypotheses 3 to 5, we assumed that, besides linear relations, curvilinear relations between job demands and job resources on the one hand and employee vigor and employee sustainable performance on the other might also exist.

Table 1. Means, standard deviations, and Pearson zero-order correlations among the study variables ($N = 1175$).

	M	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1 Gender	1.55	0.50	1															
2 Age	30.04	5.96	-0.13**	1														
3 Marriage	1.73	0.50	-0.03	0.36**	1													
4 Supervision	6.60	12.75	-0.06*	0.26**	0.19**	1												
5 Working hours	8.34	3.14	-0.05	0.04	0.05	0.00	1											
6 Education	5.02	0.60	0.00	-0.03	0.00	0.06*	0.00	1										
7 Cogn.Dem	3.91	0.57	0.01	0.03	-0.02	0.10**	0.07*	0.06	1									
8 Emo.Dem	3.41	0.73	0.05	-0.06*	-0.06*	0.06*	0.01	0.03	0.42**	1								
9 Phy.Dem	2.16	0.67	-0.14**	0.05	0.06*	0.06*	0.09**	-0.17**	0.14**	0.14**	1							
10 Cogn.Res	3.64	0.61	-0.08**	0.10**	0.16**	0.18**	0.05	0.06	-0.01	-0.17**	-0.10**	1						
11 Emo.Res	3.47	0.68	-0.03	0.14**	0.19**	0.11**	0.06*	0.05	0.00	-0.25**	-0.07*	0.46**	1					
12 Phy.Res	3.56	0.70	-0.03	0.03	0.11**	0.10**	0.02	0.05	0.02	-0.12**	0.03	0.42**	0.34**	1				
13 Cogn.L	4.87	0.98	-0.10**	0.13**	0.20**	0.21**	0.04	0.11**	0.20**	-0.05	-0.05	0.46**	0.48**	0.29**	1			
14 Emo.E	5.22	0.82	0.03	0.14**	0.19**	0.20**	0.10**	0.13**	0.17**	0.01	-0.06*	0.40**	0.50**	0.35**	0.60**	1		
15 Phys.S	5.00	0.97	-0.06*	0.15**	0.23**	0.18**	0.06*	0.04	0.09**	-0.17**	-0.05	0.46**	0.52**	0.34**	0.62**	0.60**	1	
16 SuPer	3.92	0.45	-0.08**	0.21**	0.20**	0.23**	0.10**	0.06*	0.17**	-0.09**	-0.05	0.48**	0.49**	0.34**	0.64**	0.55**	0.58**	1

Cogn. = cognitive; Emo. = emotional; Phys. = physical; Dem. = demands; Res. = resources; L = liveliness; E = Energy; S = Strength; SuPer = Sustainable performance. * $p < .05$; ** $p < .01$ (two-tail).

Predictors of cognitive liveliness

Concerning cognitive liveliness, results showed that both the multiplicative and curvilinear models revealed significant levels, and were superior compared to the additive model in terms of model fit. One significant interaction effect between emotional job demands and emotional job resources was found ($B = -0.05$, $SE = 0.02$, $p = .01$). However, simple slope analyses did not confirm the slopes in both low and high conditions of emotional job resources, see Figure 2a.

In a non-linear manner, the regression coefficients reveal that the quadratic term of cognitive job demands was positively related to cognitive liveliness ($B = 0.04$, $SE = 0.02$, $p = .02$), indicating a U-shaped relation between cognitive job demands and cognitive liveliness. This finding reveals that an increase in cognitive job demands was initially related to lower levels of cognitive liveliness, but the relation changes direction, even becomes reversed, after increasing scores of cognitive job demands (as the U-shaped trend presented in Figure 2b suggests,). The inflection point (i.e., the score at which the curve starts changing tendency; $Z_{\text{inflection}} = -b_1/2b_2$, Kubicek et al., 2014) was estimated at –1.48 above the mean level of cognitive job demands, see Figure 2b.

Predictors of emotional energy

In terms of the predictors of emotional energy, both multiplicative and curvilinear models showed significant effects, and again were superior compared to the additive model in terms of model fit. First, two significant interaction terms were detected. The interaction term between emotional job demands, emotional job resources, and emotional energy was significant ($B = -0.05$, $SE = 0.02$, $p = .002$). However, the shape of this interaction effect was against our theoretical predictions as the plot showed a reversed effect of emotional job resources (Figure 3a). Specifically, the simple slope test revealed that higher emotional job demands were related to higher emotional energy when emotional job resources were low ($-1 SD$; $b = 0.15$, $t = 4.83$, $p < .001$), but not when emotional job resources were high ($+1 SD$; $b = 0.04$, $t = 1.31$, $p = .19$). Second, the interaction between physical job demands and physical job resources (Figure 4a) with emotional energy was statistically significant ($B = -0.04$, $SE = 0.02$, $p = .05$). Simple slope tests revealed that lower physical job demands were related to higher emotional energy when physical job resources were high ($+1 SD$; $b = -0.07$, $t = -2.53$, $p = .01$), but not when physical job resources were low ($-1 SD$; $b = -0.001$, $t = -0.03$, $p = .97$).

In terms of non-linearity, quadratic emotional job demands ($B = 0.03$, $SE = 0.01$, $p = .02$) and quadratic physical job demands ($B = 0.04$, $SE = 0.01$, $p = .01$) were significantly related to emotional energy. The positive sign of both coefficients indicates a U-shaped relation between emotional job demands and emotional energy, as well as a U-shaped relation between physical job demands and emotional energy. Results show that low and certain high levels of emotional and physical job demands were related to higher levels of emotional energy. Conversely, low and, to a lesser extent,
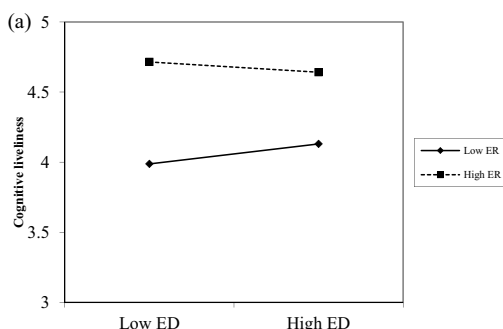

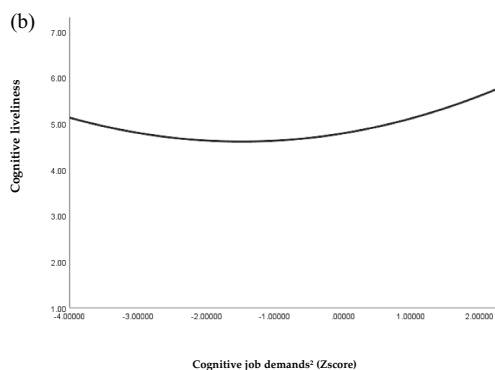**Figure 2a.** Emotional demands and emotional resources with cognitive liveliness.

Figure 2b. Cognitive job demands^2 (zscore).

high levels of emotional and physical job demands were associated with lower levels of emotional energy. Specifically, as the inflection point for the curve was estimated at -0.16, higher emotional job demands were related to gradually higher emotional energy levels (see Figure 3b). Moreover, the U-shaped relationship between the physical job demands and emotional energy shows that higher values of the physical job demands were related to lower values of emotional energy, but after a physical job demands value of 0.74 was exceeded, this trend became reversed (see Figure 4b).
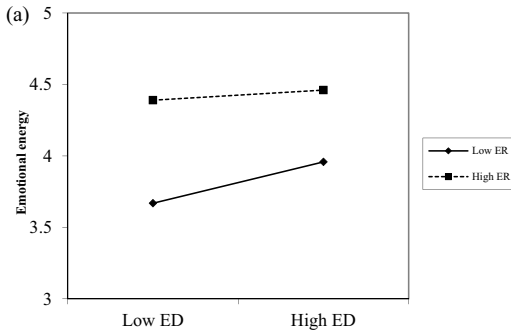

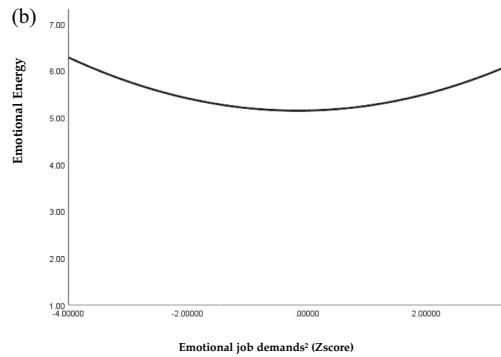Figure 3a. Emotional demands and emotional resources with emotional energy.

Figure 3b. Emotional job demands^2 (zscore).

Predictors of physical strength

Regarding physical strength, only an additive model revealed statistically significant effects. As far as the main effects are concerned, results indicated that all three dimensions of job resources were positively associated with physical strength. Besides, cognitive job demands ($B = 0.12$, $SE = 0.03$, $p < .001$) were found to be positively associated with physical strength.

Predictors of employee sustainable performance

As for predicting employee sustainable performance, only an additive model demonstrated significant effects. Yet, results showed that all three dimensions of job resources were positively associated with employee sustainable performance. Experiencing more job resources were related to higher employee sustainable performance. Additionally, cognitive job demands ($B = 0.08$, $SE = 0.01$, $p < .001$) were found to be positively associated with higher employee sustainable performance.
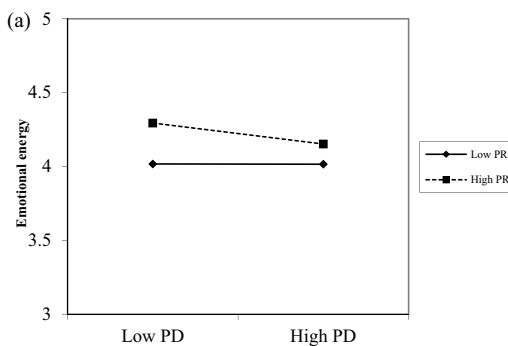

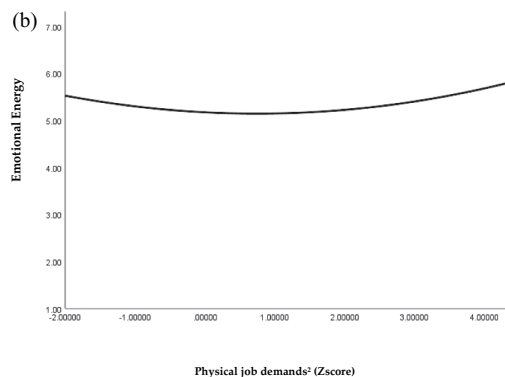Figure 4a. Physical demands and physical resources with emotional energy.

Figure 4b. Physical job demands^2 (zscore).

Table 2. Hierarchical regression models of employee vigor and sustainable performance ($N = 1175$).

	Dependent Variable											
	Cognitive Liveliness (Multiplicative)		Cognitive Liveliness (Curvilinear)		Emotional Energy (Multiplicative)		Emotional Energy (Curvilinear)		Physical Strength (Additive)		Sustainable Performance (Additive)	
Source	B	SE	B	SE	B	SE	B	SE	B	SE	B	SE
Control Variables												
Gender	–0.15**	0.05	–0.16***	0.05	0.09*	0.04	0.08*	0.04	-0.05	0.05	–0.03	0.02
Age	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01***	0.00
Marriage	0.18***	0.05	0.17***	0.05	0.11**	0.04	0.11**	0.04	0.20***	0.05	0.04	0.02
Supervision	0.01***	0.00	0.01***	0.00	0.01***	0.00	0.00***	0.00	0.01*	0.00	0.00***	0.00
Working hours	0.00	0.01	0.00	0.01	0.02**	0.01	0.01**	0.01	0.01	0.01	0.01*	0.00
Education	0.08*	0.04	0.09*	0.04	0.09**	0.03	0.10***	0.03	-0.01	0.04	0.01	0.02
Demands and Resources												
Cognitive demands	0.20***	0.03	0.21***	0.03	0.10***	0.02	0.10***	0.02	0.12***	0.03	0.08***	0.01
Emotional demands	0.02	0.03	0.01	0.03	0.09***	0.02	0.08***	0.02	–0.07**	0.03	–0.01	0.01
Physical demands	–0.04	0.02	–0.04	0.02	–0.04	0.02	-0.06**	0.02	–0.03	0.02	–0.02*	0.01
Cognitive resources	0.25***	0.03	0.24***	0.03	0.12***	0.02	0.12***	0.02	0.20***	0.03	0.11***	0.01
Emotional resources	0.31***	0.03	0.30***	0.03	0.31***	0.02	0.30***	0.02	0.33***	0.03	0.13***	0.01
Physical resources	0.04	0.03	0.07*	0.03	0.10***	0.02	0.13***	0.02	0.10***	0.03	0.05***	0.01
Multiplicative												
Cogn. demands × cog. resources	–0.02	0.02			–0.03	0.02						
Emo. demands × emo. resources	–0.05**	0.02			-0.05**	0.02						
Phys. demands × phys. resources	–0.02	0.02			–0.04*	0.02						
Curvilinear												
Cognitive. demands²			0.04*	0.02			0.01	0.01				
Emotional. demands²			0.03	0.02			0.03*	0.01				
Physical. demands²			0.00	0.02			0.04**	0.01				
Cognitive. resources²			0.01	0.02			0.01	0.02				
Emotional. resources²			–0.01	0.02			0.00	0.02				
Physical. resources²			0.01	0.02			0.00	0.00				
Model fit	$R^2 = 0.38$ $\Delta R^2 = 0.01$ $F(15,1159) = 46.69***$ $F_{-inc} = 3.79**$		$R^2 = 0.38$ $\Delta R^2 = 0.01$ $F(18,1156) = 38.92***$ $F_{-inc} = 2.10*$		$R^2 = 0.38$ $\Delta R^2 = 0.01$ $F(15,1159) = 46.53***$ $F_{-inc} = 7.39***$		$R^2 = 0.38$ $\Delta R^2 = 0.01$ $F(18,1156) = 38.53***$ $F_{-inc} = 3.40**$		$R^2 = 0.38$ $F(12,1162) = 58.82***$		$R^2 = 0.39$ $F(12,1162) = 62.40***$	

Cogn. = cognitive; Emo. = emotional; Phys. = physical. * $p < .05$; ** $p < .01$ (two-tailed).

As summarized in Table 2, three interactive terms and three quadratic terms were statistically significant in predicting employee vigor outcomes (i.e., cognitive liveliness and emotional energy). However, two out of three follow-up simple slope tests were not confirmed, and the shapes of the significant quadratic terms were not in line with our expectations. Rather than inverted U-shaped, three U-shaped curvilinear relations were detected.

Discussion

Building upon previous empirical findings of the DISC Model (De Jonge & Dormann, 2003, De Jonge et al., 2006) and the Vitamin Model (Warr, 1987), the main purpose of the present study was twofold. Firstly, based on the assumptions of the DISC Model, we predicted that job resources would moderate (i.e., *strengthen*) the positive relation of job demands with successively employee vigor and employee sustainable performance, especially when the type of job resources correspond with the type of job demands. Secondly, based on the assumptions of the Vitamin Model, we predicted that non-linear (i.e., *inverted U-shaped*) relations between job demands and job resources with employee vigor and employee sustainable performance would exist.

A cross-sectional survey study was conducted among 1,175 Chinese employees working in different industries. Our empirical findings did not provide further evidence for the proposed strengthening effects of job resources in the relations between job demands and employee vigor and employee sustainable performance, which is not in line with our expectations. Hypotheses 1 and 2 were not confirmed accordingly. Furthermore, based on the core propositions of the Vitamin Model, non-linear relations between job demands/job resources and employee vigor and employee sustainable performance have been examined. Results showed that non-linear relations between job demands and outcomes do exist but were U-shaped rather than showing the expected *inverted* U-shape. Again, this is not in line with our expectations. Therefore, Hypotheses 3 to 6 were not confirmed either. Although the findings were against our expectations, it is worth noting that so-called "non-linear conceptual matching" relations were found between cognitive job demands and cognitive liveliness, as well as between emotional job demands and emotional energy with U-shaped plots.

Theoretical implications

Although most of our hypotheses were not confirmed, the present findings do have several important theoretical implications. First, based on the matching principle of the DISC Model as well as its proposition of functional self-regulation, when employees are faced with a particular type of job demand, they will in the first place opt for corresponding types of job resources to regulate and achieve so-called functional activation-enhancers (cf. De Jonge et al., 2014, Van den Tooren et al., 2011). Current findings reveal that these two moderation effects may be affected by some specific conditions or characteristics in the following ways.

First, we suggest that the role of job resources as moderators could be dependent on occupational settings and characteristics, as well as the outcomes under study. In the present study, involving 1,175 employees from various industries, we would argue that the large occupational heterogeneity could be a reason affecting the detection of moderating effects in job resources (Häusser et al., 2010). In other words, it is plausible that different occupational domains might determine the role of job demands (i.e., challenging or hindering), as well as whether and how job resources could moderate the relations between identical job demands and outcomes. Previous studies suggest that whether a specific job demand is interpreted as challenging or hindering may depend on the occupational sector (e.g., Bakker et al., 2014). For example, emotional job demands may be perceived as challenges for nurses because they are satisfied with engaging with clients at a personal level, but perceived as hindrances by other occupational groups (i.e., call center agents and police officers; Van den Tooren & De Jonge, 2010). Consistent with this view, emotional labor researchers have argued that emotional work may not necessarily be stressful but could also be rewarding and create positive outcomes (Brotheridge & Grandey, 2002; Côté, & Morgan, 2002). Furthermore, physical job resources can serve to protect against the negative effect of physical demands in more common work domains, while they can act as activating resources in the occupational domain of elite sport. For instance, the findings of Balk et al. showed that matching sport-related physical resources did play a role as a moderator (i.e., activation-enhancer) between physical demands and physical strength among elite athletes. However, contrary to studies conducted in common work domains, it is interesting that physical resources are often considered to be stress-buffers in the relation between physical job demands and physical health (e.g., De Jonge & Dormann, 2006; Van de Ven et al., 2008; Van de Ven et al., 2013; Van den Tooren & De Jonge, 2010; Van den Tooren et al., 2011). For that reason, and also in line with our findings, we suggest the need to use a more homogenous sample group or a specific occupational setting to reveal the precise interplay between job demands and job resources. Thus, we encourage future researchers to include these special features (i.e., homogenous sample group or specific occupational setting) in their studies.

Second, the non-linear relations found appeared to go against our expected inverted U-shaped pattern based on the Vitamin Model's propositions. The curvilinear patterns of cognitive job demands with cognitive liveliness and emotional job demands with emotional energy were detected in neither

CE (i.e., *Constant Effect*) nor AD (i.e., *Additional Decrement*) shape. Instead, two U-shaped patterns appeared. Thus, both low and high levels of cognitive demands were related to high levels of employee cognitive liveliness, whereas moderate levels seemed to be related to low levels of liveliness. This curvilinear trend was also found for the relation between emotional job demands and emotional energy. Although unexpected, our findings support original assumptions on curvilinearity within the challenge – hindrance framework (Cavanaugh et al., 1998). Our results indicate that the challenge demand – outcome relation may be less straightforward than reported in previous studies (e.g., Teuchmann et al., 1999; Schmitt et al., 2015; Sheng et al., 2019). According to the findings uncovered by Schilbach et al. (2021), individuals who reported medium levels of challenge demands exhibited more stability of the lower level of psychological distress which was associated with greater psychological resilience. A recent study by Pindek et al. (2022) confirmed the existence of non-linear relations between workload on the one hand, and employee mental well-being on the other. Similarly, the present findings also indicated that even cognitive and emotional job demands could be considered challenging job demands, a certain level should be achieved (i.e., should not be too low), otherwise, employees might still be perceived as "general" job demands, which might not bring gain effects to their work (e.g., Reijseger et al., 2013, 2017; Sawang et al., 2009; Sawang, 2012).

Moreover, the present study extended the matching principle of the DISC Model from linear to non-linear, which is an important asset (see also De Jonge et al., 2024). Specifically, we found that non-linear conceptual matches existed between cognitive job demands and cognitive liveliness (i.e., cognitive vigor), as well as between emotional job demands and emotional energy (i.e., emotional vigor). So, specific job demands seem to be more inclined to match the same dimension of employee vigor outcomes under non-linear conditions, too. Therefore, the present study further confirmed the applicability and generalizability of the matching principle, not only in a linear way as investigated by previous studies but also in a non-linear manner that was first explored by the present study. Although we did find several counter-intuitive results in this respect, it is an attempt that certainly deserves further attention in future research.

Practical implications

Our findings have practical implications as well. First, although the enhancing effects of job resources were not confirmed by our study, the matching principle and main effects of (matching) job resources can still be considered valid. Sufficient and matching job resources were found to predict corresponding employee vigor outcomes, and more job resources were related to higher employee sustainable performance. This implies that optimizing matching job resources may be an effective approach to improving employees' vigor and performance (De Jonge et al., 2014). Therefore, organizations and employers need to make sure that employees have access to sufficient job resources in their daily work. Ideally, these job resources should match the type of job demands employees encounter. For example, when an employee is confronted with high emotional job demands (i.e., having to perform emotionally draining work), measures can be taken to provide the employee with adequate emotional job resources (i.e., emotional support from colleagues or supervisors).

In addition, our findings reveal the existence of curvilinear relations between (1) cognitive and emotional job demands, and (2) cognitive liveliness and emotional energy. So, decreasing job demands might not always be desirable. Following this line of reasoning, it may be crucial to establish occupation-specific cutoff norms for low, middle, and high levels of both cognitive and emotional job demands. These norms could be used for executing detailed job analyses and subsequent workplace interventions. For example, it would be better to apply appropriate diagnostic or intervention tools to set (i.e., increase or decrease) job demands to an optimal level, instead of a general high or low level (cf. Haldorai et al., 2022). Moreover, managers and supervisors should be aware of employees' threshold of tolerance for job demands and identify the strengths and weaknesses of their subordinates to make sure that the level of job demands (i.e., challenge job demands) experienced by each employee is always at an optimal (or at least suitable) level.

Strengths, limitations, and future research directions

A strength of this study is that it combined the core propositions of the DISC Model and Vitamin Model, such that the matching principle of the DISC Model was extended from a linear to a non-linear way. For the first time, the existence of the so-called "non-linear matching principle" has been examined and approved. Another strength of this study is that it focused on different kinds of job demands and job resources as predictors of the relatively new construct of employee sustainable performance. This aligns with a recent call of previous studies on employee sustainable performance (De Jonge & Peeters, 2019, Ji et al., 2021) to further explore its relations with job characteristics such as job demands and job resources. The current findings suggest that job demands and job resources can not only contribute to employee current work performance (e.g., Bakker et al., 2014), but can also enhance and foster employee performance in the long haul (cf. Ji et al., 2021).

Admittedly, the present study contains several limitations, simultaneously providing directions for future research. The first limitation is that our data were collected via a self-report survey, which might trigger common method bias (Podsakoff et al., 2012, Spector et al., 2022). However, so far there is no consensus on the severity of this type of bias (Podsakoff et al., 2024, Spector et al., 2022). We tried to minimize method variance by separating the independent and dependent variables proximally in the questionnaire, as well as using different scale formats and scale anchors. In addition, we checked it empirically by means of a one-factor CFA model (cf. Podsakoff et al., 2024). Notwithstanding this, we would say respondents are one of the best sources of their own perceptions of both the work situation and their well-being. Nevertheless, we would recommend future studies go beyond self-report measures by using more objective measures (e.g., biological, physical, or medical indices, or other reports such as from supervisors or colleagues) or multiple research methods to conduct a further investigation (e.g., additional interviews or diary studies).

Second, the current study used a cross-sectional research design, meaning that causal inferences are not warranted. Performing a longitudinal follow-up study would improve the possibility of investigating causal relations between (1) job demands and job resources and (2) employee vigor and employee sustainable performance.

Third, the participants of the current study were recruited from various occupational sectors and educational/training levels in China. They also spanned a good range of job demand and job resource levels. The sample of the current study consists of heterogeneous occupations, which is necessary to find complex curvilinear effects proposed and found in the current study (Chung-Yan, 2010). Yet, the moderating function of job resources would be considered occupation-specific or people-specific (McClenahan et al., 2007, Häusser et al., 2010). So, we encourage future research to replicate the present study among other professional groups to further determine the shape of curvilinear effects of job demands and job resources as well as to further investigate the matching effects of job resources. On a more general note, future studies should also keep examining both linear and non-linear relations between job characteristics and employee well-being to get a more specific and detailed picture of well-being determinants.

Conclusion

In this article, we investigated the core propositions of the DISC Model and Vitamin Model, and we extended the matching principle of the DISC Model from a linear to a non-linear way. Our results underscore the applicability and prominence of the matching principle of the DISC Model, not only in a linear way that was investigated by previous studies but also in a non-linear manner explored by the present study (i.e., the non-linear matching principle). Although several intriguing, unexpected issues clearly call for more in-depth research on this topic, we conclude that match does really matter in explaining vigor and performance at work.

Acknowledgments

Disclosure statement

Funding

Ethical approval

The study was conducted in agreement with the ethics code of the American Psychological Association and the Declaration of Helsinki. Ethical approval was obtained from the ethical review board of Utrecht University (Approval Number: 21–0035). The data obtained are treated confidentially and stored anonymously, which strictly complies with General Data Protection Regulations. Informed consent was obtained from all individual participants included in the study.

Data accessibility statement

The data set in this study is not publicly available due to privacy or ethical considerations, redacted data is available from the corresponding author upon reasonable request.

References

Aiken, L. S., West, S. G., & Reno, R. R. (1991). *Multiple regression: Testing and interpreting interactions*. Sage.

Bakker, A. B., & Demerouti, E. (2018). Multiple levels in job demands-resources theory: Implications for employee well-being and performance. In E. Diener, S. Oishi, & L. Tay (Eds.), *Handbook of well-being*. DEF Publishers.

Bakker, A. B., Demerouti, E., & Sanz-Vergel, A. I. (2014). Burnout and work engagement: The JD–R approach. *Annual Review of Organizational Psychology and Organizational Behavior*, *1*(1), 389–411. https://doi.org/10.1146/annurev-orgpsych-031413-091235

Brislin, R. W. (1970). Back-translation for cross-cultural research. *Journal of Cross-Cultural Psychology*, *1*(3), 185–216. https://doi.org/10.1177/135910457000100301

Brotheridge, C. M., & Grandey, A. A. (2002). Emotional labor and burnout: Comparing two perspectives of "people work". *Journal of Vocational Behavior*, *60*(1), 17–39. https://doi.org/10.1006/jvbe.2001.1815

Carmeli, A., Ben-Hador, B., Waldman, D. A., & Rupp, D. E. (2009). How leaders cultivate social capital and nurture employee vigor: Implications for job performance. *Journal of Applied Psychology*, *94*(6), 1553–1561. https://doi.org/10.1037/a0016429

Cavanaugh, M. A., Boswell, W. R., Roehling, M. V., & Boudreau, J. W. (1998). *"Challenge" and "hindrance" related stress among U.S. managers*. Center for Advanced Human Resource Studies Working Paper. Cornell University.

Chung-Yan, G. A. (2010). The nonlinear effects of job complexity and autonomy on job satisfaction, turnover, and psychological well-being. *Journal of Occupational Health Psychology*, *15*(3), 237–251. https://doi.org/10.1037/a0019823

Côté, S., & Morgan, L. M. (2002). A longitudinal analysis of the association between emotion regulation, job satisfaction, and intentions to quit. *Journal of Organizational Behavior*, *23*(8), 947–962. https://doi.org/10.1002/job.174

Daniels, K., & De Jonge, J. (2010). Match making and match breaking: The nature of match within and around job design. *Journal of Occupational and Organizational Psychology*, *83*(1), 1–16. https://doi.org/10.1348/096317909X485144

De Jonge, J. (2018). *The DISQ questionnaire English short version 3.1*. Eindhoven University of Technology.

De Jonge, J., Demerouti, E., & Dormann, C. (2014). Current theoretical perspectives in work psychology. In M. C. W. Peeters, J. de Jonge, & T. W. Taris (Eds.), *An introduction to contemporary work psychology* (pp. 89–114). Wiley & Sons.

De Jonge, J., Demerouti, E., & Dormann, C. (2024). Current theoretical perspectives in work psychology. In M. Peeters, J. de Jonge, & T. Taris (Eds.), *An introduction to contemporary work psychology, second edition* (pp. 118–144). Wiley-Blackwell.

De Jonge, J., & Dormann, C. (2003). The DISC model: Demand-induced strain compensation mechanisms in job stress. In M. F. Dollard, H. R. Winefield, & A. H. Winefield (Eds.), *Occupational stress in the service professions* (pp. 43–74). Taylor & Francis.

De Jonge, J., & Dormann, C. (2006). Stressors, resources, and strain at work: A longitudinal test of the triple-match principle. *Journal of Applied Psychology*, *91*(6), 1359–1374. https://doi.org/10.1037/0021-9010.91.5.1359

De Jonge, J., & Dormann, C. (2017). Why is my job so stressful? Characteristics, processes, and models of stress at work. In N. Chmiel, F. Fraccaroli, & M. Sverke (Eds.), *An introduction to work and organisational psychology: An international perspective* (pp. 80–101). Wiley-Blackwell.

De Jonge, J., Dormann, C., Janssen, P. P., Dollard, M. F., Landeweerd, J. A., & Nijhuis, F. J. N. (2001). Testing reciprocal relationships between job characteristics and psychological well-being: A cross-lagged structural equation model. *Journal of Occupational and Organizational Psychology*, *74*(1), 29–46. https://doi.org/10.1348/096317901167217

De Jonge, J., & Huter, F. F. (2021). Does match really matter? The moderating role of resources in the relation between demands, vigor and fatigue in academic life. *The Journal of Psychology*, *155*(6), 548–570. https://doi.org/10.1080/00223980.2021.1924603

De Jonge, J., & Peeters, M. C. W. (2019). The vital worker: Towards sustainable performance at work. *International Journal of Environmental Research and Public Health*, *16*(6), 910. https://doi.org/10.3390/ijerph16060910

De Jonge, J., Peeters, M. C. W., & Le Blanc, P. M. (2006). Emotionele arbeid en positieve uitkomsten: de rol van specifieke hulpbronnen in het werk. [Emotion work and positive work outcomes: The role of specific job resources]. *Gedrag en Organisatie*, *19*(4), 345–367. https://doi.org/10.5117/2006.019.004.003

De Jonge, J., Peeters, M. C. W., & Taris, T. W. (2019). Feeling vital or fatigued: Relations with demands and resources in a university context. *International Journal of Environmental Research and Public Health*, *16*(16), 2893. https://doi.org/10.3390/ijerph16162893

De Jonge, J., Reuvers, M., Houtman, I. L. D., Bongers, P. M., & Kompier, M. A. J. (2000). Linear and nonlinear relations between psychosocial job characteristics, subjective outcomes, and sickness absence: Baseline results from SMASH. *Journal of Occupational Health Psychology*, *5*(2), 256–268. https://doi.org/10.1037/1076-8998.5.2.256

De Jonge, J., Spoor, E., Sonnentag, S., Dormann, C., & Van den Tooren, M. (2012). "Take a break?!" Off-job recovery, job demands, and job resources as predictors of health, active learning, and creativity. *European Journal of Work and Organizational Psychology*, *21*(3), 321–348. https://doi.org/10.1080/1359432X.2011.576009

Demerouti, E., Bakker, A. B., Nachreiner, F., & Schaufeli, W. B. (2001). The job demands-resources model of burnout. *Journal of Applied Psychology*, *86*(3), 499–512. https://doi.org/10.1037/0021-9010.86.3.499

Docherty, P., Kira, M., & Shani, A. (Eds.). (2009). *Creating sustainable work systems: Developing social sustainability*. Routledge.

Dorenbosch, L. (2014). Striking a balance between work effort and resource regeneration. In I. Ehnert, W. Harry, & K. J. Zink (Eds.), *Sustainability and human resource management* (pp. 155–180). Springer.

Douglas, S. P., & Craig, C. S. (2007). Collaborative and iterative translation: An alternative approach to back translation. *Journal of International Marketing*, *15*(1), 30–43. https://doi.org/10.1509/jimk.15.1.030

Haldorai, K., Kim, W. G., & Phetvaroon, K. (2022). Beyond the bend: The curvilinear effect of challenge stressors on work attitudes and behaviors. *Tourism Management*, *90*, 104482. https://doi.org/10.1016/j.tourman.2021.104482

Häusser, J. A., Mojzisch, A., Niesel, M., & Schulz-Hardt, S. (2010). Ten Years on: A review of recent research on the job demand–control (-support) model and psychological well-being. *Work & Stress*, *24*(1), 1–35. https://doi.org/10.1080/02678371003683747

IBM Corp. (2021). *IBM SPSS statistics for windows, version 28.0*. IBM Corporation.

Ji, T., De Jonge, J., Peeters, M. C. W., & Taris, T. W. (2021). Employee sustainable performance (E-super): Theoretical conceptualization, scale development, and psychometric properties. *International Journal of Environmental Research and Public Health*, *18*(19), 10497. https://doi.org/10.3390/ijerph181910497

Ji, T., De Jonge, J., Taris, T. W., Kawakami, N., & Peeters, M. C. W. (2023). Walking the tightrope between work and home: The role of job/home resources in the relation between job/home demands and employee health and well-being. *Industrial Health*, *61*(1), 24–39. https://doi.org/10.2486/indhealth.2021-0276

Karasek, R. A., Jr. (1979). Job demands, job decision latitude, and mental strain: Implications for job redesign. *Administrative Science Quarterly*, *24*(2), 285–308. https://doi.org/10.2307/2392498

Kubicek, B., Korunka, C., & Tement, S. (2014). Too much job control? Two studies on curvilinear relations between job control and eldercare workers' well-being. *International Journal of Nursing Studies*, *51*(12), 1644–1653. https://doi.org/10.1016/j.ijnurstu.2014.05.005

Kubicek, B., Paskvan, M., & Bunner, J. (2017). The bright and dark sides of job autonomy. In C. Korunka & B. Kubisek (Eds.), *Job demands in a changing world of work: Impact on workers' health and performance and implications for research and practice* (pp. 45–63). Springer. https://doi.org/10.1007/978-3-319-54678-0_4

Mauno, S., Kinnunen, U., & Ruokolainen, M. (2007). Job demands and resources as antecedents of work engagement: A longitudinal study. *Journal of Vocational Behavior*, *70*(1), 149–171. https://doi.org/10.1016/j.jvb.2006.09.002

McClenahan, C. A., Giles, M. L., & Mallett, J. (2007). The importance of context specificity in work stress research: A test of the demand-control-support model in academics. *Work & Stress*, *21*(1), 85–95. https://doi.org/10.1080/02678370701264552

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

Ostertagová, E. (2012). Modelling using polynomial regression. *Procedia Engineering*, *48*, 500–506. https://doi.org/10.1016/j.proeng.2012.09.545

Perrott, B. E. (2015). Building the sustainable organization: An integrated approach. *Journal of Business Strategy*, *36*(1), 41–51. https://doi.org/10.1108/JBS-06-2013-0047

Pindek, S., Shen, W., Gray, C. E., & Spector, P. E. (2022). Clarifying the inconsistently observed curvilinear relationship between workload and employee attitudes and mental well-being. *Work & Stress*, *37*(2), 195–221. https://doi.org/10.1080/02678373.2022.2120562

Podsakoff, P. M., MacKenzie, S. B., & Podsakoff, N. P. (2012). Sources of method bias in social science research and recommendations on how to control it. *Annual Review of Psychology*, *63*(1), 539–569. https://doi.org/10.1146/annurev-psych-120710-100452

Podsakoff, P. M., Podsakoff, N. P., Williams, L. J., Huang, C., & Yang, J. (2024). Common method bias: It's bad, it's complex, it's widespread, and it's not easy to fix. *Annual Review of Organizational Psychology and Organizational Behavior*, *11*(1), 17–61. https://doi.org/10.1146/annurev-orgpsych-110721-040030

Pomaki, G., & Maes, S. (2002). Predicting quality of work life: From work conditions to self-regulation. In E. Gullone & R. A. Cummins (Eds.), *The universality of subjective well-being indicators* (pp. 151–173). Kluwer Academic Publishers.

Reijseger, G., Peeters, M. C. W., Taris, T. W., & Schaufeli, W. B. (2017). From motivation to activation: Why engaged workers are better performers. *Journal of Business and Psychology*, *32*(2), 117–130. https://doi.org/10.1007/s10869-016-9435-z

Reijseger, G., Schaufeli, W. B., Peeters, M. C. W., Taris, T. W., Van Beek, I., & Ouweneel, E. (2013). Watching the paint dry at work: Psychometric examination of the Dutch boredom scale. *Anxiety, Stress & Coping*, *26*(5), 508–525. https://doi.org/10.1080/10615806.2012.720676

RStudio Team. (2020). *RStudio: Integrated development for R*. RStudio, PBC.

Sawang, S. (2012). Is there an inverted U-shaped relationship between job demands and work engagement: The moderating role of social support? *International Journal of Manpower*, *33*(2), 178–186. https://doi.org/10.1108/01437721211225426

Sawang, S., Brough, P., & Barbour, J. (2009). Curvilinear relationships between the job demands-resources (JD-R) model, and work engagement: A police service case study. In J. E. Kehoe, P. H. Langford, & N. J. Reynolds (Eds.), *Proceedings of the 8th Industrial and Organisational Psychology Conference* (pp. 123–128). Australian Psychological Society.

Schilbach, M., Baethge, A., & Rigotti, T. (2021). Do challenge and hindrance job demands prepare employees to demonstrate resilience? *Journal of Occupational Health Psychology*, *26*(3), 155–174. https://doi.org/10.1037/ocp0000282

Schmitt, B., Brakus, J. J., & Zarantonello, L. (2015). From experiential psychology to consumer experience. *Journal of Consumer Psychology*, *25*(1), 166–171. https://doi.org/10.1016/j.jcps.2014.09.001

Sheng, X., Wang, Y., Hong, W., Zhu, Z., & Zhang, X. (2019). The curvilinear relationship between daily time pressure and work engagement: The role of psychological capital and sleep. *International Journal of Stress Management*, *26*(1), 25–35. https://doi.org/10.1037/str0000085

Shirom, A. (2003). Feeling vigorous at work? The construct of vigour and the study of positive affect in organizations. In P. L. Perrewé & D. C. Ganster (Eds.), *Research in occupational stress and well-being: Vol. 3. Emotional and physiological processes and positive intervention strategies* (pp. 135–164). Emerald Group Publishing Limited.

Shirom, A. (2007). Explaining vigor: On the antecedents and consequences of vigor on positive affect at work. In C. Cooper & D. Nelson (Eds.), *Positive organizational behavior* (pp. 86–101). Sage Publications.

Spector, P. E., Gray, C. E., & Rosen, C. C. (2022). Are biasing factors idiosyncratic to measures? A comparison of interpersonal conflict, organizational constraints, and workload. *Journal of Business and Psychology*, *38*(5), 983–1002. https://doi.org/10.1007/s10869-022-09838-8

Spreitzer, G., & Porath, C. (2012). Creating sustainable performance. *Harvard Business Review*, *90*(1–2), 92–9. http://gr8synergy.com/nimpathways/wp-content/uploads/2016/04/Creating-Sustainable-Performance.pdf

Teuchmann, K., Totterdell, P., & Parker, S. K. (1999). Rushed, unhappy, and drained: An experience sampling study of relations between time pressure, perceived control, mood, and emotional exhaustion in a group of accountants. *Journal of Occupational Health Psychology*, *4*(1), 37–54. https://doi.org/10.1037/1076-8998.4.1.37

Van den Tooren, M., & De Jonge, J. (2010). The role of matching job resources in different demanding situations at work: A vignette study. *Journal of Occupational and Organizational Psychology*, *83*(1), 39–54. https://doi.org/10.1348/096317909X462257

Van den Tooren, M., De Jonge, J., & Dormann, C. (2011). The demand-induced strain compensation model: Background, key principles, theoretical underpinnings, and extended empirical evidence. In A. Caetano, S. A. Silva, & M. J. Chambel (Eds.), *New challenges for a healthy workplace in human services* (pp. 13–59). Rainer Hampp Verlag.

Van de Ven, B., Van den Tooren, M., & Vlerick, P. (2013). Emotional job resources and emotional support seeking as moderators of the relation between emotional job demands and emotional exhaustion: A two-wave panel study. *Journal of Occupational Health Psychology*, *18*(1), 1–8. https://doi.org/10.1037/a0030656

Van de Ven, B., Vlerick, P., & De Jonge, J. (2008). The interplay of job demands, job resources and cognitive outcomes in informatics. *Stress and Health*, *24*(5), 375–382. https://doi.org/10.1002/smi.1192

Warr, P. B. (1987). *Work, unemployment, and mental health*. Clarendon Press.

Warr, P. B. (1990). Decision latitude, job demands, and employee well-being. *Work & Stress*, *4*(4), 285–294. https://doi.org/10.1080/02678379008256991

Warr, P. B. (2011). *Work, happiness, and unhappiness*. Psychology Press.

Wieland, R., Klemens, S., Scherrer, K., Timm, E., & Krajewski, J. (2004). *Moderne IT-Arbeitswelt gestalten. Anforderungen, Belastungen und Ressourcen in der IT-Branche*. [Structuring the modern IT world of work. Demands. strains and resources in the IT branch.] Techniker Krankenkasse: Hamburg.

Wielenga-Meijer, E. G. A., Taris, T. W., Wigboldus, D. H. J., & Kompier, M. A. J. (2012). Don't bother me: Learning as a function of task autonomy and cognitive demands. *Human Resource Development International*, *15*(1), 5–23. https://doi.org/10.1080/13678868.2011.646898