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Job Demands–Resources Theory: Taking Stock and Looking Forward

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The job demands−resources (JD-R) model was introduced in the international literature 15 years ago (Demerouti, Bakker, Nachreiner, & Schaufeli, 2001). The model has been applied in thousands of organizations and has inspired hundreds of empirical articles, including 1 of the most downloaded articles of the *Journal of Occupational Health Psychology* (Bakker, Demerouti, & Euwema, 2005). This article provides evidence for the buffering role of various job resources on the impact of various job demands on burnout. In the present article, we look back on the first 10 years of the JD-R model (2001–2010), and discuss how the model matured into JD-R theory (2011–2016). Moreover, we look at the future of the theory and outline which new issues in JD-R theory are worthwhile of investigation. We also discuss practical applications. It is our hope that JD-R theory will continue to inspire researchers and practitioners who want to promote employee well-being and effective organizational functioning.

Keywords: burnout, job demands−resources theory, job performance, well-being, work engagement

We were delighted with the invitation to take stock of job demands–resources (JD-R) theory. Our article "Job resources buffer the impact of job demands on burnout" (Bakker, Demerouti, & Euwema, 2005) featured in the 2nd issue of Volume 10 of the *Journal of Occupational Health Psychology*, and turned out to be one of the most cited articles in the 20 years of the journal. The article reports on a study among more than 1000 employees of a large institute for higher education. The results showed work overload, emotional job demands, physical job demands, and work-home conflict are all risk factors for job burnout (particularly exhaustion and cynicism), but that the undesirable impact of job demands on burnout can be alleviated by job resources such as job autonomy, social support, quality of the relationship with the supervisor, and performance feedback.

The JD-R model was introduced in the English literature 15 years ago (Demerouti, Bakker, Nachreiner, & Schaufeli, 2001). Since then, the model has been applied in thousands of organizations, and inspired hundreds of empirical studies (for a recent overview and meta-analyses, see Bakker, Demerouti, & Sanz-Vergel, 2014; Crawford, LePine, & Rich, 2010; Halbesleben, 2010; Nahrgang, Morgeson, & Hofmann, 2011). Moreover, as indicated by one of the reviewers of this article, the JD-R model (and the job demands—resources distinction) has been used by many Occupational Health and Safety/Workplace Health & Safety regulators and government agencies around the world (especially in the United Kingdom, Europe, Canada, and Australia) to inform psychosocial education policies/activities and risk assessment approaches. In the present article, we look back on the first 10 years of the JD-R model (2001–2010) and discuss how the model matured into JD-R theory (2011–2016). Moreover, we look at the future of the theory and outline which new issues in JD-R theory are worthwhile of investigation. We also discuss practical applications. Whereas the JD-R model was originally used to explain burnout, it now accounts for various types of employee well-being. This is what we discuss first.

Looking Back on the First 10 Years (2001–2010)

By the turn of the century, burnout had become a serious issue in most Western countries, and scholars started to realize that the syndrome was not unique to those performing "people work" (Bakker, Demerouti, & Schaufeli, 2002; Demerouti, Bakker, Vardakou, & Kantas, 2003; Leiter & Schaufeli, 1996). *Burnout* was defined as a syndrome of chronic exhaustion, a cynical, negative attitude regarding work, and reduced professional efficacy that could occur in any job (Maslach, Schaufeli, & Leiter, 2001). During this time, the number of empirical studies on burnout increased rapidly, although a comprehensive theoretical framework explaining burnout was still lacking. Scholars around the world used a variety of personal and interpersonal approaches to explain burnout. For example, burnout was proposed to be the result of (a) a pattern of wrong expectations, (b) "progressive disillusionment," (c) a loss of coping resources, (d) emotionally

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demanding interactions with clients, and (e) a lack of reciprocity in the exchange relationship with clients (Maslach et al., 2001; Schaufeli & Buunk, 1996). Other, organizational approaches to burnout claimed that the syndrome was the result of a "reality shock" (after employees had entered the organization), or blamed the low quality of the work environment. In JOHP's year of inception, Lee and Ashforth (1996) published a meta-analysis of the correlates of job burnout and identified a wide range of job demands and job resources as possible causes of burnout.

Around the same time, Evangelia Demerouti conducted her PhD research in Oldenburg, Germany, under the supervision of work psychologist Friedhelm Nachreiner. They identified a wide range of job demands and resources that could be relevant for employees working in human services, industry, or transport, and conducted a series of cluster and discriminant analyses to investigate the structure of the work environment and its relationship with burnout. These analyses revealed that job demands and resources formed two different clusters with differential relationships to the two core dimensions of job burnout. Job demands turned out to be the most important correlates of exhaustion, whereas job resources were the most important correlates of cynicism (called *disengagement* in the Oldenburg Burnout Inventory). Evangelia Demerouti presented parts of this work at the small group meeting on burnout in Utrecht in 1997, where she met Arnold Bakker, who was a postdoctoral researcher at the time at Utrecht University. This was the beginning of a long relationship between both authors of the present article, in which they challenged each other to model all job demands, job resources, and burnout in one overall structural equation model so that all hypothesized relationships could be tested simultaneously. The first full version of the JD-R model was published in the *Journal of Applied Psychology* (Demerouti et al., 2001) and was cited approximately 4,000 times in Google Scholar (June 2016).

Importantly, the first study of the JD-R model indicated that the findings were highly similar for self- and observer-ratings of the work environment. Thus, two broad categories of working conditions could be identified—job demands and job resources—that were applicable to three different types of occupations, namely occupations in which employees worked with things, information, or people. This resulted in the first proposition of the model, namely that all types of job characteristics can be classified in one of two categorizes: job demands and job resources (Proposition 1). Job demands are defined as those physical, psychological, social, or organizational aspects of the job that require sustained physical and/or psychological effort and are therefore associated with certain physiological and/or psychological costs (Demerouti et al., 2001). Examples are a high work pressure and emotionally demanding interactions with clients or customers. Job resources refer to those physical, psychological, social, or organizational aspects of the job that are functional in achieving work goals, reduce job demands and the associated physiological and psychological costs, or stimulate personal growth, learning, and development (Bakker, 2011; Bakker & Demerouti, 2007). Examples of job resources are autonomy, skill variety, performance feedback, and opportunities for growth.

Proposition 2 of JD-R theory is that job demands and resources instigate two very different processes, namely a health-impairment process and a motivational process. Our original article (Demerouti et al., 2001) already showed that job demands were the unique predictors of exhaustion, whereas job resources were unique predictors of (dis)engagement. Later studies have provided ample evidence for these dual pathways and also suggested unique outcomes of the two processes. For example, Bakker, Demerouti, De Boer, and Schaufeli (2003) showed that job demands were the most important predictors of absence duration (an indication of health problems) through burnout and that job resources were the most important predictors of absence frequency (an indicator of motivation) through organizational commitment. Similarly, Bakker, Demerouti, and Verbeke (2004) showed that job demands predicted other-ratings of in-role performance through exhaustion, whereas job resources predicted other-ratings of extrarole performance, through engagement. In their 3-year longitudinal study among more than 2,500 dentists, Hakanen, Schaufeli, and Ahola (2008) found that job resources influenced future work engagement, which, in turn, predicted organizational commitment; whereas job demands predicted burnout over time, which, in turn, predicted future depression. Job resources also had a weak negative impact on burnout. Later studies have largely replicated the dual processes in the JD-R model, in diary studies (Simbula, 2010) and in longitudinal studies (see Bakker et al., 2014).

Influential job stress models such as the demands-control model (Karasek, 1979) and the effort−reward imbalance model—the latter featured in the first issue of JOHP (Siegrist, 1996)—were very different from the original JD-R model in that they only included a limited number of job demands and resources as predictors of job stress. However, these models did inspire us to investigate combinations of job demands and resources. The first article in which we reported statistical interactions was the JOHP article that came out about 10 years ago (Bakker et al., 2005) and that we briefly discussed in the opening paragraph. This was the first evidence for Proposition 3 (i.e., job resources can buffer the impact of job demands on strain). Later studies have provided more evidence for this interaction effect. For example, Xanthopoulou, Bakker, Dollard, et al. (2007) found in their study among home care professionals that several job resources (autonomy, social support, performance feedback, and opportunities for professional development) could buffer the relationship between job demands (emotional demands, patient harassment, workload, and physical demands) and burnout. This means that home care professionals did not experience high levels of exhaustion and cynicism after confrontation with demanding client interactions when they had access to sufficient resources. More evidence was found in a study among 148 organizations in the Netherlands (Bakker, Van Veldhoven, & Xanthopoulou, 2010). The study included more than 12,000 employees and showed that 88% of all possible interactions between many job demands and job resources were statistically significant. Taken together, these findings show that employees who have many job resources available can cope better with their job demands.

During his time at Utrecht University, Arnold Bakker developed with Wilmar Schaufeli the Utrecht Work Engagement Scale (UWES; Schaufeli & Bakker, 2003, 2010). The instrument became very popular over the past 15 years, partly caused by scholars' enthusiasm about the new positive psychology approach. Work engagement is the mental state where employees feel full with physical energy (vigor), are enthusiastic about the content of their work and the things they do (dedication), and are so immersed in their work activities that time seems to fly (absorption). The

UWES also offered new ways of investigating employee well-being and expanding JD-R theory. Instead of looking at what is wrong with employees, it was now possible to investigate under which conditions employees flourish at work.

Proposition 4 in JD-R theory is that job resources particularly influence motivation when job demands are high. This proposition is consistent with Hobfoll's (2001) notion that all types of resources gain their motivating potential and become particularly useful when needed. Jobs that combine high demands with high resources are so-called active jobs (cf. Karasek, 1979) that challenge employees to learn new things on the job and motivate them to use new behaviors. In our research among Finnish teachers and dentists (Bakker, Hakanen, Demerouti, & Xanthopoulou, 2007; Hakanen, Bakker, & Demerouti, 2005), we found that job resources such as appreciation, innovativeness, and skill variety were most predictive of work engagement when job demands (e.g., pupil misbehavior, unfavorable physical working environment) were high. Thus, job resources are particularly useful and motivating when needed.

Proposition 5 is that personal resources such as optimism and self-efficacy can play a similar role as job resources. *Personal resources* refer to the beliefs people hold regarding how much control they have over their environment. Individuals who are high in optimism and self-efficacy believe that good things will happen to them, and that they are capable to handle unforeseen events. As can be seen in Figure 1, we propose that personal resources have a direct positive effect on work engagement. In addition, personal resources are expected to buffer the undesirable impact of job demands on strain, and boost the desirable impact of (challenge) job demands on motivation. Research has provided only limited support for this proposition, which means that more research is needed to test the Job Demands × Personal Resources interaction. For example, Xanthopoulou, Bakker, and Fischbach (2013) showed that self-efficacy—but not optimism—related positively to work engagement, particularly when emotional demands and emotional dissonance were high. In addition, they showed that emotional demands and dissonance related negatively to work engagement when self-efficacy was low. Bakker and Sanz-Vergel (2013) showed that weekly self-efficacy and optimism were positively related to flourishing when weekly hindrance job demands were low (vs. high), and that these personal resources were positively related to weekly work engagement when weekly challenge job demands were high (vs. low).

Proposition 6 in JD-R theory is that motivation has a positive impact on job performance, whereas job strain has a negative impact on job performance. Motivation helps to be goal-oriented and focused on the work tasks. In addition, engaged workers have all the energy and enthusiasm to perform well. In contrast, workers with high levels of exhaustion or health complaints do not have the energetic resources to reach their work goals. Research supports these claims. For example, Taris (2006) showed in a meta-analysis that burnout is negatively related to performance. In addition, Bakker, Van Emmerik, and Van Riet (2008) showed that exhaustion negatively predicted objective performance. Regarding work engagement, Hopstaken, van der Linden, Bakker, and Kompier, (2015; Hopstaken, van der Linden, Bakker, Kompier, & Leung, 2016) showed in experimental studies that engaged individuals perform better on demanding tasks because they focus all their attention to the task, as indicated by pupil diameter data, brain activity, and self-report data. Furthermore, combining daily diary reports with objective financial data, Xanthopoulou, Bakker, Demerouti, and Schaufeli (2009a) showed that employees working in fast-food restaurants had better financial results on the days they had access to abundant job resources and were highly engaged in their job.

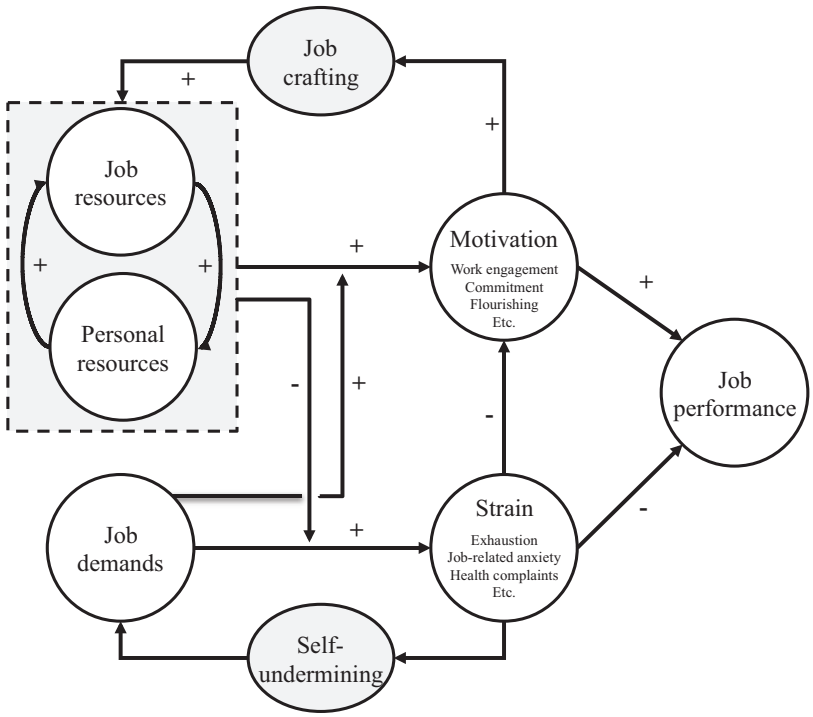

Figure 1. The job demands−resources model.

JD-R Theory Today (2011–2016)

Whereas the first 10 years of research with JD-R theory produced convincing evidence for the first six propositions in hundreds of studies (see Bakker & Demerouti, 2014; Bakker et al., 2014), scholars who conducted longitudinal studies started to find evidence for both causal and reversed causal effects between job demands, resources, and well-being. For example, Hakanen, Perhoniemi, and Toppinen-Tanner (2008) found that task-level job resources (craftsmanship, pride in the profession, and positive feedback from the results of the work) predicted dentists' work engagement, and work engagement predicted personal initiative over a period of three years. In addition, there was evidence for reversed causal effects. Among others, personal initiative positively influenced work engagement, and work engagement had a positive impact on future job resources. Similarly, Xanthopoulou, Bakker, Demerouti, and Schaufeli (2009b) found that job resources predicted personal resources (self-efficacy, optimism, and self-esteem) and work engagement, but they also found evidence for reversed causal effects from personal resources and work engagement to job resources. These studies suggest that engaged individuals are motivated to stay engaged, and create their own resources (e.g., autonomy, feedback, support) over time. This idea is again consistent with Hobfoll (2001), who argued that individuals are motivated to conserve their resources, and will try to expand these resources if possible.

Job Crafting and Gain Spirals

The original JD-R model particularly took a top-down perspective of job design in organizations, where management and the human resources department create the work environment for their employees by setting targets, describing job tasks, and providing resources. Thus, we assumed that organizations design the job demands and job resources of their employees and that employees, in turn, might flourish or experience strain after being exposed to these work environments. Our approach was similar with other job strain and motivational approaches (e.g., demands-control and effort-reward imbalance models; Hackman and Oldham's (1980) job characteristics model) and assumed that employees were largely reactive. However, if people would only be reactive, there would not be such a rich variety of working conditions of individuals who hold the same jobs. Think, for example of a colleague with a similar job position who works next door, but who differs largely in terms of daily tasks and social interactions. This is because individuals are often proactive and take the personal initiative to change their status quo (Frese & Fay, 2001; Griffin, Neal, & Parker, 2007).

Some scholars have argued that employees might proactively change their work tasks in order to make their work more meaningful. Wrzesniewski and Dutton (2001) coined the term *job crafting* to refer to proactive changes employees make in their work tasks (*task crafting*), the type of relationships engaged in at work (*relationship crafting*; frequency and duration of social interaction with clients, colleagues, and providers), and in the appraisal of their work (*cognitive crafting*; referring to the subjective meaning ascribed to the work). In our own work, we have defined job crafting as the proactive changes employees make in their job demands and resources (Tims, Bakker, & Derks, 2012). More specifically, we have argued and shown that employees may proactively increase their job resources (e.g., ask for feedback and help) and challenge job demands (e.g., start a new project, learn to master a new skill), and decrease their hindrance job demands (e.g., reduce workload and bureaucracy). In this way, employees can optimize their working environment and stay motivated (bottom-up approach).

Proposition 7 in JD-R theory is that employees who are motivated by their work are likely to use job crafting behaviors, which lead to higher levels of job and personal resources and even higher levels of motivation. Research of the last 5 years has provided convincing evidence for the effectiveness of job crafting. For example, Tims, Bakker, and Derks (2013) found that job crafting in the form of seeking challenges and resources predicted positive changes in the work environment, and indirectly related to increases in work engagement and job satisfaction, and decreases in burnout. Vogt, Hakanen, Brauchli, Jenny, and Bauer (2016) also used a longitudinal design and found that employees who proactively built a resourceful and challenging work environment for themselves, increased their own psychological capital (hope, resilience, self-efficacy, and optimism) and work engagement. Bakker, Tims, and Derks (2012) found that job crafting was positively related to peer-ratings of in-role performance, through work engagement (for an overview, see Demerouti & Bakker, 2014). Moreover, as is discussed subsequently, intervention studies have produced favorable effects in employee well-being and job performance by stimulating job crafting behaviors. Thus, engaged employees can create their own "gain spiral" of resources and work engagement through job crafting.

Self-Undermining and Loss Spirals

Similar to the reversed effects found in the motivational process, reversed causal and reciprocal effects have also been found in the health-impairment process. Job demands do not only cause strain, but employees who experience job strain also perceive and create more job demands over time (Zapf, Dormann, & Frese, 1996). For example, Demerouti, Bakker, and Bulters (2004) performed a longitudinal study with a sample of 335 employees and found that work pressure and exhaustion had causal and reversed causal relationships over time. Hence, not only did work pressure predict exhaustion; feeling exhausted also predicted subsequent levels of work pressure in a reciprocal relationship. Several other studies have provided evidence for such reversed causal effects. Bakker, Schaufeli, Sixma, Bosveld, and Van Dierendonck (2000) found that general practitioners who were more cynical toward their patients (cynicism) faced more patient demands 5 years later. Demerouti, Le Blanc, Bakker, Schaufeli, and Hox (2009) found that staff nurses from general hospitals who were confronted with many job demands—such as workload, patient demands and physical demands—reported higher levels of burnout (exhaustion and depersonalization) 1.5 years later. In addition, nurses who experienced higher levels of burnout were confronted with more job demands over time. Consistent with these findings, Ten Brummelhuis, Ter Hoeven, Bakker, and Peper (2011) found that financial consultants who scored higher on burnout reported a stronger increase in work overload, work hours, and work-home barriers over a period of 2 years.

These findings indicate that employees under stress perceive and create more job demands over time. Bakker and Costa (2014)

proposed that this process is the result of self-undermining behavior. *Self-undermining* refers to "behavior that creates obstacles that may undermine performance" (p. 115). Bakker and Costa argue that employees who engage in self-undermining most likely experience high levels of job strain (e.g., chronic exhaustion, health complaints). Therefore, they communicate poorly, make more mistakes and create more conflicts, which add up to the already high job demands. Employees with higher levels of job strain are also less able to manage their own emotions, and more likely to encounter conflicts at work. Self-undermining is the consequence of high levels of job strain and is the fuel of a vicious cycle of high job demands and strain (see Figure 1).

In a series of studies, Bakker and Wang (2016) showed that self-undermining was positively related with work pressure and emotional demands—implying that employees who create stress, confusion, and conflict create more job demands. Self-undermining was also positively related to exhaustion and negatively predicted supervisor-ratings of job performance. Although other research needs to confirm these findings, the research evidence and theory suggests that employees under stress may enter a loss spiral of job demands and exhaustion. Proposition 8 is therefore as follows: Employees who are strained by their work are likely to show self-undermining behaviors, which lead to higher levels of job demands, and even higher levels of job strain.

Unresolved Issues

Over the years, JD-R research and reviews have resulted in some unsettled issues that need to be addressed. In the following text, we briefly elaborate on six of these issues. These issues may be worthy of further investigation and should be considered when designing new studies.

1. Direct links between job demands and resources. In our research with the JD-R framework, we usually do not specify the sign of the relationship between job demands and job resources. Although both categories of working conditions covary in the work context, whether these are positively or negatively related is basically an empirical question (e.g., see Bakker & Demerouti, 2007) and may depend on factors like occupational sector, level of education, hierarchical level, and occupational status (employees on pay-role vs. self-employed). Employees in occupations with higher status or prestige (e.g., lawyers, professors, architects, engineers, top managers) with high responsibilities and a very high workload often also have many job resources at their disposal. This means that in these occupations, the correlation between job demands and resources will often be positive. In other, more mundane jobs, a high workload often implies that there is too little time for feedback, opportunities to grow, and skill variety, which results in limited job resources. Thus, in most cases the correlation between job demands and resources is negative. In future research, scholars may want to model the moderators of the job demands-resources relationship, and theoretically explain which type of effects can be expected. Does a high workload mean that there is too little time for the enactment or use of job resources? Does social support lead to lower objective cognitive and physical demands because the work is shared?

2. Dual process. JD-R theory proposes that the health impairment process (starting with job demands) is largely independent from the motivational process (starting with job resources). However, some studies have shown direct links between variables involved in both processes, which questions their independence. For example, some studies found a direct relationship between job resources and burnout (e.g., Schaufeli & Bakker, 2004) and between burnout and motivational outcomes. We believe that these cross-paths are largely due to suboptimal research designs. For example, cross-links are more likely in cross-sectional studies, in which common method variance is an important threat to the validity of the results. In addition, it should be noted that burnout—an often-studied mediating variable in the health-impairment process—includes a motivational component (cynicism, which is a negative attitude toward work), next to a more distinctive health or ability component (chronic exhaustion). Another possibility is that diminished health and motivation have mutual relations and eventually influence each other (see also Leiter, 1993).

3. Underlying mechanisms. According to Schaufeli and Taris (2014), the JD-R model falls short of explanatory underlying mechanisms, because it builds on other theories in order to explain why job characteristics influence employee well-being and organizational outcomes (p. 55). We believe that it is common scientific practice to build on each other's theories. Many models and theories have influenced JD-R theory, including early burnout models (Leiter, 1993), stress models (Selye, 1976), the demands-control model (Karasek, 1979), job characteristics theory (Hackman & Oldham, 1980), and conservation of resources theory (Hobfoll, 2001). In terms of underlying mechanisms, Hackman and Oldham (1980) have proposed that psychological states such as experienced meaningfulness of the work, experienced responsibility for the outcomes of work, and knowledge of actual results are critical mediators in the relationship between job resources on the one hand, and motivational and performance outcomes on the other. Self-determination theory proposes that the satisfaction of basic psychological needs for relatedness, competence, and autonomy explains why job resources are translated into work engagement (e.g., Van den Broeck, Vansteenkiste, De Witte, & Lens, 2008). A recent study suggests that obsessive and harmonious passion also partly explain why job demands and resources are related to job strain and motivation, respectively (Trépanier, Fernet, Austin, Forest, & Vallerand, 2014). Future research may further explore the psychological and physiological processes involved in the health impairment and motivational processes in JD-R theory. Where other theories can inform us regarding those processes, we should build on them, because it is in this way that we can create new knowledge.

4. Two types of job demands. In JD-R theory, job demands are defined as aspects of work that require effort and therefore are associated with physical and psychological costs. Job demands are proposed to play a crucial role in the health-impairment process but not in the motivational process. However, some authors have argued that job demands may also play a motivational role. LePine, Podsakoff, and LePine (2005) distinguish between hindrance and challenge job demands. *Hindrance job demands* are defined as job demands or work circumstances that involve excessive or undesirable constraints that interfere with or inhibit an individual's ability to achieve valued goals (Cavanaugh, Boswell, Roehling, & Boudreau, 2000). Examples of hindrance job demands are role conflict, role overload, and role ambiguity. In contrast, challenge job demands are defined as demands that cost effort but that potentially promote personal growth and achievement of the em-

ployee (Podsakoff, LePine, & LePine, 2007). Examples of challenge stressors are high levels of workload, time pressure, and responsibility (McCauley, Ruderman, Ohlott, & Morrow, 1994). These demands have the potential to be seen as rewarding work experiences well worth the discomfort involved, and are therefore considered as "good" stressors. However, research has shown that challenge demands may be experienced as hindrance demands (and vice versa) depending on the context. For instance, Bakker and Sanz-Vergel (2013) found that nurses experienced work pressure as a hindrance demand rather than as a challenge job demand. Moreover, some scholars have found that demands are sometimes appraised as both challenging and hindering (e.g., Searle & Auton, 2015; Webster, Beehr, & Love, 2011). New research may try to uncover the conditions under which job demands act as hindrances versus challenges.

5. Flexibility. The JD-R theory is a heuristic and flexible model. However, this flexibility could be also the Achilles' heel of the model, as this comes at the cost of specificity and the quality of its predictions. For instance, it may create ambiguity whether a specific job characteristic represents a demand or a resource, or whether an outcome is of a health-related or motivational nature. For instance, does the high level of responsibility for the outcomes of one's work represent a job demand or a job resource? Is satisfaction with working times a motivational or a health-related outcome? Perhaps the answer to these questions depends on the work context as responsibility for a teacher may have the function of a resource (learning of the children), whereas for a bus driver responsibility may act as a demand (safety of passengers). Although the essence of job demands is that they consume energy because they have to be fulfilled, job resources initiate motivation (i.e., the voluntary initiation of action to achieve goals) and buffer the effects of job demands on outcomes. This further means that the absence or presence of a job demand, like shift work, is not motivating as the individual has no other choice than to deal with it. Moreover, the absence of a job resource like autonomy does not represent a demand. Rather it means that the voluntary initiation of action to achieve goals is not facilitated by decision latitude. Therefore, it is essential to have a clear idea on what the function/role of each job characteristic is when applying the JD-R model.

6. Levels, levels, levels. In applied research in organizations, job demands and resources are usually assessed at the individual level. Yet, most organizations are interested in the levels of demands, resources, and well-being of whole teams or departments. For example, Jong and Ford (2016) used aggregated job demands and resources scores in a JD-R study involving almost 300,000 employees nested in 38 U.S. government agencies. Can individual scores on job demands and resources be aggregated to those higher levels? For one thing, what is needed to reliably interpret group scores on job demands and resources is consensus. If the average of a department is the result of two extreme subgroups in that department, the scores may not tell the whole story. Future applications of the JD-R theory should take the multilevel nature of data into consideration, and also investigate team job demands and resources, that is, perceptions of job characteristics at the team or departmental level. Only if there is sufficient consensus between the team members, scores can be taken as reflecting the common view of the quality of the job demands and resources.

The Future of JD-R Theory

What is the future of JD-R theory? Over the past 15 years, JD-R theory has grown from a relatively simple model outlining two unique processes to a theory including specific propositions regarding interactions between job demands and resources, self-starting employee behaviors, and outcomes. In this paragraph, we discuss promising avenues for future research and theoretical innovations.

Interactions Within JD-R Theory

Up to now, several studies have focused on possible combinations of job demands and job resources and reported statistical interactions (e.g., Bakker et al., 2005, 2007; Hakanen et al., 2005; Xanthopoulou, Bakker, Dollard, et al., 2007). However, as each job demand does not occur in isolation from all other job demands, it is conceivable that the effects of job demands accumulate and interact with each other (i.e., Job Demand × Job Demand). Van Woerkom, Bakker, and Nishii (2016) found that workload strengthens the positive relationship between emotional job demands and sickness absenteeism, indicating that emotional demands are more detrimental under conditions of high workload. This may occur because of loss spirals, as high demands regarding one specific aspect of the job may lead to losses of one's finite personal energetic resources (Ten Brummelhuis & Bakker, 2012), resulting in a weakening of resource reserves for confronting other job demands. Consistent with this idea, scholars have found that job demands act as challenges when other demands are kept low (Kemery, 2006; Wincent & Örtqvist, 2011).

On the positive side, Habe and Tement (2016) found that skill variety was positively related to absorption at work (one of the dimensions of work engagement), and this relationship was stronger under the condition of high autonomy. Next to a positive spiral, this may indicate that job resources, like autonomy and skill variety, are valued in their own right but both add to the motivational potential of a job (Hackman & Oldham, 1980). This is similar to Karanika-Murray, Antoniou, Michaelides, and Cox's (2009) suggestion to consider the multivariate impact of job characteristics on work-related health, as this may potentially convey a more accurate view of effects than one that looks at variables in isolation (synergistic or inhibitory effects; Warr, 1994). This necessitates a shift beyond the tendency to focus on one-cause-one-effect relationships to examining combinations of predictors (Kahn & Byosiere, 1992).

Furthermore, JD-R studies have consistently shown that employees show the best job performance in work environments that combine challenge job demands with job resources because such environments facilitate their work engagement (Bakker et al., 2007; Demerouti & Cropanzano, 2010). However, most studies examining interactions within the JD-R model specify the most favorable constellation of working conditions at a certain point in time (within time). We still miss evidence on whether the same constellation of working conditions will have favorable effects on employee well-being and outcomes over time. It is conceivable that even when many job resources are available, working under highly demanding conditions is not only engaging, but also exhausting in the long run.

Rigorous Tests of Causality

Although there are already several JD-R studies showing longitudinal relations between the components of the theory, longitudinal relations do not necessarily imply causation, as both the hypothetical predictor and outcome may be influenced by a third variable or confounder (MacKinnon & Pirlott, 2015). A more rigorous test of causality requires manipulation of the hypothetical causes, and the test whether this manipulation generated the expected effects—in contrast with a control group where no manipulation occurred. Although this is not always easy to realize in field studies, researchers should invest more effort in experimentally manipulating job characteristics to see whether such modifications have the predicted effects. Using a quasi-experimental job redesign intervention in a call center, Holman and Axtell (2016) showed that job redesign affected a broad range of employee outcomes (i.e., employee well-being, psychological contract fulfillment, and supervisor-rated job performance) through changes in two job characteristics (i.e., job control and feedback). In this way, they confirmed the causal effects of resources on employee outcomes.

Focusing specifically on the role of proactive employee behavior in JD-R theory, Dubbelt (2016) showed that a job crafting intervention (vs. control group) influenced work engagement through the job crafting behavior of seeking job resources. Similarly, in a series of interventions, Van Wingerden, Bakker, and Derks (2016, in press) showed that teachers who were trained to craft their jobs (vs. control groups) started to increase their structural job resources (e.g., asked for autonomy, created more opportunities to learn). These proactive behaviors lead to an optimized work environment, and higher levels of work engagement and performance. Future research may investigate whether the combination of top-down and bottom-up approaches is most fruitful in fostering employee work engagement and organizational performance (see also, Bakker, in press).

Personal Demands

Next to personal resources, JD-R theory can be expanded to include personal demands. *Personal demands* have been defined as "the requirements that individuals set for their own performance and behavior that force them to invest effort in their work and are therefore associated with physical and psychological costs" (Barbier, Hansez, Chmiel, & Demerouti, 2013, p. 751). Lorente Prieto, Salanova Soria, Martínez Martínez, and Schaufeli (2008, p. 359) suggested that "personality traits like perfectionism and emotional instability, as well as goal setting and levels of expectations, could be relevant personal demands to be studied in future research on this intriguing topic." Perhaps the personal demand that is most often studied in the context of JD-R theory is workaholism. Schaufeli, Bakker, Van der Heijden, and Prins (2009) found that workaholism acts as an individual risk factor that contributes, independently from the job context, to burnout and well-being (happiness, health, and job satisfaction). Guglielmi, Simbula, Schaufeli, and Depolo, (2012) found that workaholism was related to higher job demands and consequently to more burnout. In contrast, Barbier et al. (2013) focused on performance expectations, which represent expectations employees have regarding their own performance. They found that an increase in performance expectations over time predicts higher levels of future work engagement. This relationship was found on top of the effects of job and personal resources on work engagement. Performance expectations acted as a kind of internal challenge demand that triggered employees to increase effort at work in order to meet those expectations. Thus, depending on the nature of the personal demand, personal demands may be involved in the health-impairment process (like workaholism) or in the motivational process (like performance expectations) proposed by JD-R theory.

Objective Measures

Most JD-R studies have used self-reported job demands and resources as well as self-reported outcomes. The problem with such measures is that the same person (the focal employee) provides all information and that, therefore, statistical relationships between constructs may be inflated as a result of common source bias. We suggest that future studies will have more impact, also in other research fields (e.g., HR, economics), if scholars start integrating more objective indicators of the prevailing job demands and resources, and of the possible employee and organizational outcomes. The first study on the JD-R theory (Demerouti et al., 2001) used observer-ratings of job demands and job resources and found that observer-ratings are moderately high and positively related to self-ratings, and that JD-R observer-ratings were significantly related to group-level burnout. No further systematic evaluation of job demands and particularly resources has been published after this study.

However, there are several examples of studies that have used objective indicators to capture mainly job demands. For instance, Qin, Hom, Xu, and Ju (2014) examined whether the geographical distance between employees' workplace and home village, representing a proxy for a wide range of migration demands and resources, was related to higher turnover intentions for rural migrants. Another example is the study by Wingo, Halvorsen, Beckman, Johnson, and Reed (2016) among attending physicians, who examined whether workload measures (including hospital service census, patient length of stay, daily admissions, and daily discharges) were related to patient outcomes (like intensive care unit transfers, cardiopulmonary resuscitation/rapid response team calls, and patient deaths).

Other studies have focused on objective indicators of well-being and their link with work engagement. For example, Seppälä et al. (2012) found that work engagement was associated with healthy, adaptable cardiac autonomic activity, particularly increased parasympathetic activity. Hopstaken et al. (2015) reported that task engagement is related to pupil diameter, and Melamed, Shirom, Toker, and Shapira (2006) found that job burnout is negatively related to physical health indicators. Other parts of JD-R theory have been measured with peer-ratings, including peer-ratings of personal resources (Demerouti, Van Eeuwijk, Snelder, & Wild, 2011) and peer-ratings of job crafting behaviors (Peeters, Arts, & Demerouti, in press; Tims et al., 2012). Taken together, the research evidence suggests that affective outcomes of job demands and resources might be related to profiles of functioning in several biological systems and may thereby be relevant for the risk of development of physical illness. The challenge of future research is to examine not only the relationship between affective outcomes of the JD-R model and physical indicators but also to integrate the role of job demands and resources over time in such processes.

Leadership

Leaders may also influence the working environment of their employees and in this way indirectly influence employee well-being and job performance. In a series of studies, Breevaart and her colleagues (2014; Breevaart, Bakker, Demerouti, & Derks, 2016) investigated the role of transformational leadership behaviors—including inspirational motivation, individual consideration, and intellectual stimulation. In one interesting study, Breevaart et al. (2014) followed Norwegian naval cadets over the course of 34 days. As part of their leadership training, the cadets traveled from Northern Europe to North America by sail ship. We were interested in the daily impact of transformational leadership on follower work engagement. The results showed that transformational leaders had a positive influence on their followers' daily work engagement because these leaders created abundant job resources for followers (daily social support and autonomy). Followers could use these resources to deal with the daily job challenges (e.g., hurricanes, complex exercises at sea).

Studies in more conventional (blue and white collar) organizations have confirmed that transformational leadership is related to work engagement through increased job resources. In a follow-up study, Breevaart, Bakker, Demerouti, Sleebos, and Maduro (2014) found that followers reported more job resources (autonomy, feedback, opportunities for growth) when their leader showed more transformational leadership behaviors, and these resources contributed to followers' engagement and job performance. Expanding these findings, Fernet, Trépanier, Austin, Gagné, and Forest (2015) showed that transformational leadership results in fewer job demands (cognitive, emotional and physical demands) and more job resources (e.g., participation in decision-making, job recognition and quality of relationships), and indirectly contributes to more positive work attitudes and better job performance. Future studies may investigate the impact of various other types of leadership behaviors on job demands, resources, and employee well-being, including servant leadership, empowering leadership, transactional leadership, and ambidextrous leadership. It seems particularly interesting to investigate how leadership behaviors change from day to day, and how changes in these behaviors affect employee work engagement and job performance, through their impact on daily job demands and resources.

Employee Behaviors and Strategies

We have recently integrated employee behaviors in JD-R theory and have shown how employees may modify their job demands and resources through job crafting and self-undermining. However, there are other possible ways individual strategies may influence the processes suggested by JD-R theory. Individual strategies represent methods or plans that people choose to achieve a goal or solve a problem, which generally involve some planning or marshaling of resources for their most efficient and effective use (Demerouti, 2015). Insight into individual strategies may uncover what individuals do to alter job characteristics or the impact of job characteristics on their own well-being. Such strategies can be effective or noneffective and their effectiveness may depend on the situations in which the strategies are used. Demerouti (2015) suggests that coping, recovery from work-related effort, as well as selection, optimization, and compensation are all strategies to deal with diminishing resources. Flexibility in use of coping strategies is adaptive rather than maladaptive. That is, problem-focused coping seems adaptive in controllable situations, whereas coping oriented to avoidance is adaptive in situations that are difficult to control (Aluja Fabregat, Blanch Plana, & Biscarri Gassió, 2003; Demerouti, 2015). Although selection has been suggested to be an effective strategy to deal with diminishing resources (that come with aging), Demerouti, Bakker, and Leiter (2014) found that it was not effective to keep performance levels high when exhaustion was high. Also, recovery has generally been found to help replenishing energy resources, but the relaxation strategy seems less effective than the psychological detachment strategy (Demerouti, Bakker, Geurts, & Taris, 2009). Other possible strategies that may be relevant for JD-R theory are strength use (Van Woerkom, Oerlemans, & Bakker, 2016) and mobilizing ego resources (Op den Kamp, Tims, Bakker, & Demerouti, 2016). Integrating individual strategies into JD-R theory has both theoretical and practical implications and may uncover which behaviors help individuals to function well in a specific work context. These behaviors can then be stimulated or trained (see also, Bakker, in press).

Microprocesses in the JD-R Theory

Daniels (2006) was among the first to propose that generalized perceptions of job characteristics (of how a job usually is) should be distinguished from so-called enacted job characteristics, which comprise more dynamic job characteristics that can vary across work situations. A dynamic approach to job characteristics echoes other episodic approaches to work and affect (e.g., Oerlemans & Bakker, 2013; Weiss & Cropanzano, 1996), where the interpretations of specific events as they happen cause important changes in affective experiences. Not surprisingly, job demands and resources and related well-being have been found to fluctuate from day to day (Bakker, 2014; Ilies, Aw, & Pluut, 2015). Moreover, Beal and Weiss (2013), suggest that our (work) life experience consists of coherent segments (performance episodes) that are organized around goals. The most critical elements of these episodes are deeply encoded in memory and form our daily experience as it relates to performance at work. Therefore, to grasp the experience of work and understand the interplay between work events/situations/characteristics and experiences/well-being/motivation, we need to focus on work occasions, performance episodes, and discrete behaviors. Critical for effective functioning at work is whether employees can invest the right (cognitive) resources in the task, whether they are able and motivated to keep their attention to the task, and affective experiences during task execution. Combining JD-R theory with the situational specificity of performance episodes may result in better predictions and fruitful insights regarding the specific conditions (constellations of job demands and job resources) that trigger positive affective experiences and facilitate effective performances.

Multilevel Perspective

Integrating multilevel constructs in research can help to capture the complexity of organizational phenomena and develop more sophisticated theoretical models. Although the vast majority of research on the JD-R model has been conducted at the individual level, there are some attempts to investigate or integrate other levels of analysis. The first study on the JD-R model (Demerouti

et al., 2001) tested the assumptions of the model on the individual level using self-report data and on the job level using observer-ratings for job demands and resources and averaged scores (at the group level) for burnout and found similar relationships for both the individual and the group level. Moreover, individual scores on job demands and resources as well as their outcomes have been used to predict team-level outcomes like team sales performance (Bakker et al., 2008), and daily team-level financial results (Xanthopoulou, Bakker, Demerouti, & Schaufeli, 2007). Further, Bakker, Van Emmerik, and Euwema (2006) examined the impact of team-related job demands and resources on individual well-being. Dollard and Bakker (2010) showed how a higher, organizational level construct—workplace psychosocial safety climate—explained the origins of job demands and resources, worker psychological health, and employee engagement as lower level constructs. Finally, quantitative diary research has shown that working conditions and reactions to them may vary from day to day (Butler, Grzywacz, Bass, & Linney, 2005; Simbula, 2010) and that such variations may explain why employees who are engaged in their jobs sometimes have "off-days" or why employees who are usually exhausted feel satisfied on certain days. Simbula (2010) confirmed that the assumptions of JD-R theory hold also on the day level.

We applaud such attempts and encourage researchers to integrate multiple levels in their research using JD-R theory. This can be achieved not only by integrating in the model predictors or outcomes from another level, but also by testing whether constructs maintain their meaning across levels of analysis (i.e., isomorphic variables). In addition, and similar to the suggestions of Bakker (2015), multilevel models may differentiate between state and trait variables, integrate personality in the model, and outline how trait and state variables interact. From a theoretical point of view, multilevel constructs result in a better understanding of psychological phenomena unfolding within organizations. From a practical point of view, knowledge gathered by following a multilevel approach can help guide the development of more effective interventions.

Practical Applications of JD-R Theory

Over the years, JD-R theory has been applied in practice in many different forms, and it also stimulated several interventions. In this paragraph, we discuss some of the applications that we developed ourselves, and some applications we are aware of. As scholars we are often not aware of the practical versions of our theory, and applications may also take relatively simple forms, such as workshops and master classes to educate employees and managers about job demands and resources, and to identify the most important ones in their organizations. Such meetings can also be used to brainstorm about ways to redesign job demands and increase job resources.

JD-R Monitor

One popular application of JD-R theory is the JD-R monitor. This instrument includes an electronic questionnaire provided to employees on their smartphone, tablet, and/or computer. Employees fill out a series of questions assessing various job demands and resources, well-being, and behaviors/performance. After filling out the last question of the questionnaire, participants receive immediate online and personalized feedback on their smartphone, tablet or computer about their most important job demands and resources as well as their level of well-being and other outcomes. The feedback includes histograms of the specific demands and resources included in the questionnaire, in which the participant's scores are compared with those of a benchmark (comparison group). The JD-R monitor is always tailored to the organization where participants work. The feedback mode is interactive and employees can use it to discuss with their supervisor possible changes in their job or to ask for help in case of diminished well-being.

Organizational Assessment

Most organizations interested in employee well-being also want to know the level of job demands and resources in their organization. In an organizational assessment, crucial job demands and job resources are measured at the individual level, but overall firm's scores are compared with national and/or sector benchmarks. In addition, an organizational report includes the mean scores on job demands, resources, well-being, and performance for the different teams, departments, and/or locations. In organizational assessments, anonymity and confidentiality is guaranteed, and scores of groups smaller than 10 persons are usually not provided. Managers and leaders can use group profiles of job demands and resources to find out what the most important targets are for interventions in case of groups/departments with problems in performance, absence behavior or other indicators. Such interventions are usually designed in a dialogue between managers and employees, who brainstorm in workshops about possible solutions for suboptimal work environments. Interventions may take many other forms too. For example, Taris et al. (2003) evaluated the effectiveness of JD-R interventions in more than 100 Dutch domiciliary care agencies with more than 100 employees. The participating organizations mentioned several specific interventions—including the hiring of new personnel to decrease workload, task restructuring, employee participation in the planning of tasks and shifts, increased budgets for education and training, and the implementation of a job mobility program. Their results showed that employees in organizations that optimized job demands and job resources over a period of 2.5 years reported increased well-being after the interventions.

Other JD-R Applications

Over the years, many different applications have been developed, including serious games, job crafting interventions, and personal resources interventions. The serious game is an interactive instrument in which leaders or managers are instructed to supervise a group of employees working in a restaurant. Leaders may increase workload and performance, but learn that a high workload also coincides with more stress and absenteeism (which costs money). Further, leaders who play the game learn that resources can buffer the stressful impact of job demands. By playing the game, participants learn how the various components of the JD-R model dynamically unfold over time, as a function of the managerial actions. Further, we have described possible job crafting interventions elsewhere (Bakker, 2015; Demerouti & Bak-

ker, 2014). The central procedure in these interventions is that participants follow a training/workshop and learn about job demands, resources, and possible ways to modify these (i.e., job crafting). The 1-day or half-day training results in a personal crafting plan for each participant, in which he or she specifies the job crafting goals (e.g., increasing specific job resources or job challenges). Job crafting strategies are then implemented during several weeks. Recent studies have shown that these job crafting interventions can be effective (Gordon et al., 2016; Van den Heuvel, Demerouti, & Peeters, 2015; Van Wingerden et al., 2016, in press).

Conclusion

Since its inception, JD-R theory has inspired hundreds of studies. Our article in the 2005 issue of JOHP (Bakker et al., 2005) became one of the most downloaded articles of the journal. This article provided the first evidence for the buffering role of various job resources on the relationship between job demands and burnout. In the present article, we looked back on the first years of the JD-R model, and discussed how the model matured into JD-R theory. The model has been expanded by including the role of the individual in modifying the impact of job demands and resources on motivation and energy, in the form of personal resources, job crafting, and self-undermining. We suggested several contingency factors that may be used to improve the prediction of employee well-being and behaviors using JD-R theory (e.g., multiple levels of analysis, performance episodes). We also discussed some practical applications that have been developed on the basis of theory. We hope that JD-R theory will continue to inspire researchers and organizations that aim to increase employee well-being and effective organizational functioning.

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