Chapter 4
A Critical Review of the Job Demands-Resources Model: Implications for Improving Work and Health

Wilmar B. Schaufeli and Toon W. Taris

Abstract The Job Demands-Resources model (JD-R model) became highly popular among researchers. The current version of the model proposes that high job demands lead to strain and health impairment (the health impairment process), and that high resources lead to increased motivation and higher productivity (the motivational process). This chapter reviews the assumptions and development of the JD-R model and presents an overview of important findings obtained with the model. Although these findings largely support the model's assumptions, there are still several important unresolved issues regarding the JD-R, including the model's epistemological status, the definition of and distinction between "demands" and "resources," the incorporation of personal resources, the distinction between the health impairment and the motivational processes, the issue of reciprocal causation, and the model's applicability beyond the individual level. The chapter concludes with an agenda for future research and a brief discussion of the practical application of the model.

Keywords Job demands-resources model • Engagement • Burnout • Performance • Interventions • Job stress • Well-being

4.1 Introduction

Since its appearance in the wake of the twenty-first century, the Job Demands-Resources (JD-R) Model (Demerouti, Bakker, Nachreiner, & Schaufeli, 2001) has gained high popularity among researchers. Currently, the JD-R model is recognized as one of the leading job stress models, along with Karasek's (1979) Job Demands

W.B. Schaufeli (✉) • T.W. Taris
Department of Social and Organizational Psychology,
Utrecht Universality, The Netherlands
e-mail: w.schaufeli@uu.nl

G.F. Bauer and O. Hämmig, *Bridging Occupational, Organizational and Public Health: A Transdisciplinary Approach*, DOI 10.1007/978-94-007-5640-3_4,

Control (JD-C) model and Siegrist's (1996) Effort Reward Imbalance (ERI) model. For instance, a search in Google Scholar in September 2013 revealed that two seminal papers that discussed the JD-R model (Demerouti et al., 2001; Schaufeli & Bakker, 2004) had been cited more than 2,400 times.

How can this popularity be explained? One likely reason is that like the JD-C and ERI models, the JD-R model assumes that employee health and well-being result from a balance between positive (resources) and negative (demands) job characteristics. As these two earlier models had already sensitized the hearts and minds of researchers and practitioners to the notion of balance, the JD-R model fell on fertile ground. Yet, unlike these two models, the JD-R model does not restrict itself to *specific* job demands or job resources. It assumes that *any* demand and *any* resource may affect employee health and well-being (for an overview, see Appendix). Thus, the scope of the JD-R model is much broader than that of other models, because it potentially includes *all* job demands and job resources. The JD-R model is also more flexible and can be tailored to a much wider variety of work settings. The broad scope of the model appeals to researchers, just as its flexibility is attractive to practitioners.

A second, somewhat problematic, explanation for its popularity is the relatively loose way in which the label "Job Demands-Resources model" has been used. As we will show below, there is actually no single JD-R model. Instead of relating well-defined and specific sets of concepts to each other (as applies to the ERI and JD-C models), the JD-R model is heuristic in nature and represents a way of thinking about how job (and recently also personal) characteristics may influence employee health, well-being, and motivation. This implies that even if two studies show no overlap in terms of the study concepts, they could still be based on and test the same assumptions of the JD-R model.

The heuristic use of the JD-R model in combination with its broad scope and flexibility presumably accounts for its current proliferation in both research and practice. Yet, this wide applicability and usefulness do not imply that there is no room for improvement of the model. This chapter starts with a brief history of the JD-R model and then addresses unresolved issues and offers critical comments. The chapter concludes with some implications of the JD-R for improving work and health.

4.2 A Brief History of the JD-R Model

4.2.1 The Early JD-R Model

The JD-R model was first published under that label by Demerouti et al. (2001) in an attempt to understand the antecedents of burnout. Their model drew upon Lee and Ashforth's (1996) meta-analysis, in which eight "job demands" and thirteen "job resources" were identified as possible causes of burnout, and on the "structural model of burnout" that was presented in the Maslach Burnout Inventory test

manual (Maslach, Jackson, & Leiter, 1996, p. 36). Demerouti et al. (2001) defined *job demands* as "those physical, social, or organizational aspects of the job that require sustained physical or mental effort[1] and are therefore associated with certain physiological and psychological costs" (p. 501). Examples of job demands are work overload, heavy lifting, interpersonal conflict, and job insecurity. Following Hockey's (1997) model of compensatory control, the JD-R model assumes that when job demands are high, additional effort must be exerted to achieve the work goals and to prevent decreasing performance. This obviously comes with physical and psychological costs, such as fatigue and irritability. Workers may recuperate from mobilizing this extra energy and the associated costs by taking a break, switching tasks, or performing less demanding activities, for instance. However, when recovery is inadequate or insufficient, the result is a state of sustained activation that gradually exhausts the employee physically and/or mentally (Knardahl & Ursin, 1985). *Job resources* were defined as "those physical, social, or organizational aspects of the job that may do any of the following: (a) be functional in achieving work goals; (b) reduce job demands and the associated physiological and psychological costs; (c) stimulate personal growth and development" (Demerouti et al., 2001, p. 501). Examples of job resources are feedback, job control, and social support.

The early JD-R model proposed two processes for the development of burnout. First, long-term excessive job demands from which employees do not adequately recover may lead to sustained activation and overtaxing, eventually resulting in exhaustion – the energetic component of burnout. Second, a lack of resources precludes that job demands are met and that work goals are reached, which leads to withdrawal behavior. Indeed, withdrawal – or reduced motivation/disengagement, i.e., the motivational component of burnout – acts as a self-protective strategy to prevent further energy depletion. Consistent with this reasoning, research revealed main effects of demands and resources on burnout; whereas job demands were associated with exhaustion, lacking resources were linked to disengagement (see, among others, Bakker, Demerouti & Euwema, 2005; Bakker, Demerouti & Verbeke, 2004; Bakker, Demerouti, Taris, Schaufeli & Schreurs, 2003; Demerouti et al., 2001; Hansen, Sverke & Näswall, 2009; Xanthopoulou et al., 2007).

Next to these main effects, the JD-R model predicts that job resources mitigate the negative effect of job demands on exhaustion. This follows from the definition of job resources, which are assumed to reduce job demands as well as the associated exhaustion. Bakker, Demerouti, Taris et al. (2003) observed that the effect of job demands on exhaustion was especially strong if employees possessed few job resources and, in a similar vein, that the effect of job resources on cynicism was particularly strong if employees encountered many job demands. Subsequent research (Bakker et al., 2005; Xanthopoulou et al., 2007) showed that about 60 % of all possible interactions between individual job demands and job resources were significant and in the hypothesized direction, whereas no significant interaction effects

[1] Schaufeli and Bakker (2004, p. 296) replaced "mental effort" with "psychological (i.e., mental and emotional) effort," thus broadening the domain to include emotional labor as well.

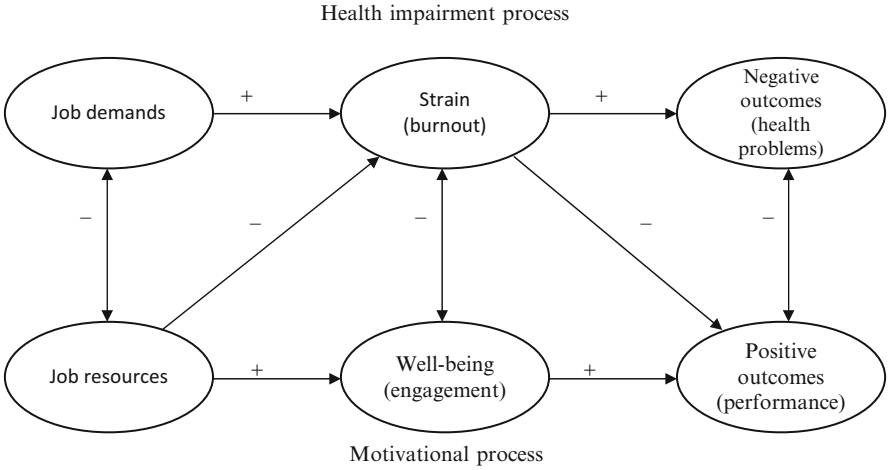

Fig. 4.1 The revised Job Demands-Resources (JD-R) model

ran counter to the expectations. These findings were successfully cross-validated in two private and one public hospital (Hansen et al., 2009), attesting to the robustness of the JD-R model.

Finally, the early JD-R model was extended to include performance measures, which were conceived as outcomes of burnout. Bakker, Van Emmerik, and Van Riet (2008) showed that cynicism predicted the sales performance of teams, whereas Bakker et al. (2004) found that cynicism and exhaustion were related to colleague-rated extra-role and in-role performance, respectively.

4.2.2 The Revised JD-R Model

Three years after its introduction, Schaufeli and Bakker (2004) presented a revised version of the JD-R model (Fig. 4.1). This model included work engagement in addition to burnout and considered burnout and work engagement to be mediators of the relation between job demands and health problems, and job resources and turnover intention, respectively. By doing so, Schaufeli and Bakker (2004) gave a positive-psychological twist to the JD-R model. That is, the revised JD-R model not only sought to explain a negative psychological state (i.e., burnout) but also its positive counterpart (work engagement). Work engagement refers to a positive, fulfilling, work-related state of mind that is characterized by vigor (that is, high levels of energy and mental resilience while working), dedication (referring to a sense of significance, enthusiasm, and challenge), and absorption (being focused and happily engrossed in one's work).

Analogous to the early JD-R model, the revised model assumes that burnout results from high job demands and poor job resources, except that now burnout is

treated as a unitary instead of a two-dimensional construct. Moreover, in line with the burnout literature (e.g., Melamed, Shirom, Toker, Berliner, & Shapira, 2006), it is assumed that burnout will lead to health problems, such as depression, cardiovascular disease, or psychosomatic complaints. Thus, burnout is expected to mediate the relation between job demands and employee health and well-being (at least partly), through the gradual draining of mental resources (i.e., burnout). This is the *energetic* or *health impairment process* of the revised JD-R model.

Similarly, a *motivational process* operates that is sparked by abundant job resources. The revised JD-R model emphasizes the inherently motivational qualities of job resources. Following effort-recovery theory (Meijman & Mulder, 1998), work environments that offer many resources foster workers' willingness to dedicate their efforts and abilities to the work task. Thus, job resources play an extrinsic motivational role, because they initiate the willingness to spend compensatory effort, thereby reducing job demands and fostering goal attainment. That is, job resources are instrumental in achieving work goals. However, they also play an *intrinsic* motivational role, because they satisfy basic human needs for autonomy, relatedness, and competence (Deci & Ryan, 2000; Van den Broeck, Vansteenkiste, De Witte, & Lens, 2008). For instance, feedback may promote learning, thereby increasing job competence, whereas decision latitude and social support satisfy needs for autonomy and relatedness, respectively. In both cases job resources stimulate a fulfilling, positive work-related state of mind (i.e., work engagement), either through the achievement of work goals or the satisfaction of basic needs. In turn, this affective-motivational state fosters positive organizational outcomes, such as organizational commitment and performance. So engagement is assumed to mediate the relation between job resources and organizational outcomes.

4.3 Cross-Sectional Evidence

Most early research on the JD-R was cross-sectional in nature. The first studies on the revised JD-R model were conducted in the Netherlands with call-center employees (Bakker, Demerouti, & Schaufeli, 2003), industrial workers (Bakker, Demerouti, de Boer, & Schaufeli, 2003), and health care staff and white collar workers (Schaufeli & Bakker, 2004) and provided strong evidence for the assumptions of the model. These findings were almost perfectly replicated for other countries, cultures and occupational groups, including Finnish teachers (Hakanen, Bakker, & Schaufeli, 2006), Australian volunteers (Lewig, Xanthopoulou, Bakker, Dollard, & Metzer, 2007), Austrian blue-collar and white-collar workers (Korunka, Kubicek, Schaufeli, & Hoonakker, 2009), Belgian blue-collar and white-collar workers (Hansez & Chmiel, 2010), Chinese blue-collar workers and health professionals (Hu, Schaufeli, & Taris, 2011), and Chinese family-owned business workers (Hu & Schaufeli, 2011). Moreover, the main parameters of the JD-R model were largely invariant across Dutch and Spanish employees (Llorens, Bakker, Schaufeli, & Salanova, 2006). In total these cross-sectional studies included 16 samples, and in only four cases partial

instead of full mediation was found for either burnout or engagement. Moreover, in 13 cases, significant crosslinks were found between either job resources and burnout or between burnout and organizational outcomes.

Hu et al. (2011) conducted a comprehensive study on interactions, focusing on the joint effects of demands and resources on burnout and engagement. Job resources buffered the negative effect of demands on burnout in only one of their two samples of health professionals. Moreover, employees experiencing high job demands and low job resources showed higher risks of burnout and reduced work engagement than employees in more favorable work conditions. However, after controlling for the additive effects of job demands and job resources, the predictive power of this synergetic effect decreased sharply. Apparently, the joint effect of job demands and job resources on burnout and engagement adds little beyond their additive effects.

4.4 Longitudinal Evidence

All in all, the cross-sectional evidence for the revised JD-R model is convincing, although the evidence for joint effects of demands and resources is rather weak. But what about the longitudinal evidence? A 3-year follow-up study among Finnish dentists (Hakanen, Schaufeli, & Ahola, 2008) supported both the motivational process and the health impairment process. Job resources influenced future work engagement, which, in turn, predicted organizational commitment; job demands predicted burnout over time, which in turn predicted future depression. Importantly, no reversed causation was observed – that is, neither burnout nor engagement predicted job demands or job resources. In a similar study among Dutch managers, increases in job demands and decreases in job resources predicted burnout across a 1-year period, whereas increases in resources predicted work engagement (Schaufeli, Bakker, & van Rhenen, 2009). Moreover, burnout predicted future absence duration (an indicator of health impairment), whereas work engagement predicted future absence frequency (an indicator of employee motivation). A 1-year follow-up study among Australian university staff showed that job resources predicted psychological strain (negatively) and organizational commitment (positively) but failed to confirm the effect of job demands on strain (Boyd et al., 2011). Again, no reversed causal effects were detected.

In conclusion, job demands and job resources have an impact over time on burnout and work engagement in the ways predicted by the revised JD-R model. Moreover, indications were found for the mediating role of burnout and work engagement.

4.4.1 The Integration of Personal Resources

Initially, the early and revised versions of the JD-R model only considered characteristics of the work environment. However, because most psychological approaches

assume that human behavior results from an interaction between personal and environmental factors, it was only to be expected that personal resources would be integrated into the JD-R model. Personal resources are defined as the psychological characteristics or aspects of the self that are generally associated with resiliency and that refer to the ability to control and impact one's environment successfully. Similar to job resources, personal resources are functional in accomplishing work goals, and they stimulate personal growth and development. To date, personal resources have been integrated into the JD-R model in five ways:

1. *Personal resources directly impact well-being.* As personal resources are defined in terms of resiliency and control, they may reduce burnout and increase engagement. In a study among Spanish teachers, Lorente, Salanova, Martinez, and Schaufeli (2008) found that emotional and mental competencies at the beginning of the academic year predicted levels of burnout and engagement at the end of that year, controlling for baseline levels of demands and resources. Similarly, Xanthopoulou, Bakker, Demerouti, and Schaufeli (2009) reported in an 18-month longitudinal study that personal resources (self-efficacy, optimism, and organization-based self-esteem) predicted later work engagement, next to job resources (control, supervisory coaching, feedback, and opportunities for development).

   Interestingly, Xanthopoulou et al. (2009) also found that work engagement predicted personal resources across time. This reciprocal relation points to a dynamic interplay of resources and engagement across time and, hence, to the existence of a gain cycle – that is, the (perceived) availability of resources fosters engagement, which in turn has a positive impact on (either the presence or the perception of) resources, etc. (Salanova, Schaufeli, Xanthoupoulou & Bakker, 2010). This notion of gain cycles originates from Hobfoll's (2002) Conservation of Resources theory, a motivational theory that explains how people strive to maintain and accumulate resources of various kinds, including job resources.
2. *Personal resources moderate the relation between job characteristics and well-being.* The definition of personal resources implies that they may buffer negative effects of job demands on burnout and exacerbate positive effects of job resources on engagement. This reasoning was supported in a study with a representative sample of Dutch employees, where intrinsic work motivation strengthened the negative effect of learning opportunities on exhaustion and increased the positive effect of job autonomy on work engagement (Van den Broeck, Van Ruysseveldt, Smulders, & De Witte, 2011). Further, Brenninkmeijer, Demerouti, Le Blanc, and Van Emmerik (2010) found that the detrimental effects of workload and interpersonal conflict on exhaustion were more pronounced for employees having a strong prevention focus (i.e., who are concerned with obligations and responsibilities). However, instead of exacerbating the positive effect of job resources on engagement, a strong promotion focus (i.e., high concern with possibilities for growth) was associated with lower levels of engagement. Brenninkmeijer et al. suggested that this may be due to a ceiling effect, since employees having a strong promotion focus already experience high levels of engagement, which may preclude further increases in engagement.

3. *Personal resources mediate the relation between job characteristics and well-being.* Conservation of Resources theory (Hobfoll, 2002) proposes that resources tend to accumulate. For instance, employees working in a resourceful environment are likely to develop feelings of self-confidence and optimism about their future at work. In turn, these personal resources will be positively related to work engagement. Three cross-sectional studies tested these expectations. Supporting this reasoning, Xanthopoulou, Bakker, Demerouti, and Schaufeli (2007) found that self-efficacy, optimism, and organization-based self-esteem partially mediated the positive relation between job resources and work engagement. Similar results were reported by Vink, Ouweneel, and Le Blanc (2011), who focused on four personal resources that constitute the concept of Psychological Capital (PsyCap): self-efficacy, optimism, hope, and resilience. Finally, Van den Broeck et al. (2008) reported that satisfaction of basic psychological needs (i.e., competence, autonomy, and belongingness) mediated the relations between job demands and exhaustion, between job resources and vigor, and between job resources and exhaustion. Apparently, job resources satisfy these basic needs, whereas job demands preclude their satisfaction. If these basic needs are satisfied, employees are likely to feel less exhausted and more vigorous.

   These findings were confirmed by two longitudinal studies. A study in a laboratory setting found that efficacy beliefs mediated the association between task resources (i.e., time and method control) and task engagement (Llorens, Schaufeli, Bakker, & Salanova, 2007). A recent three-wave study among Italian teachers supported these results: Job resources and self-efficacy affected work engagement both across a short (4 months) and a longer-term (8 months) time interval (Simbula, Guglielmi, & Schaufeli, 2011). Similar to the study by Xanthopoulou et al. (2009), these two longitudinal studies also provided evidence for reciprocal relations. Llorens et al. (2007) reported that engagement increased efficacy beliefs, which was in turn associated with increasing task resources over time. Simbula et al. (2011) found that engagement was associated with higher levels of self-efficacy across time. Again, these findings suggest the existence of a positive gain spiral in which efficacy beliefs play a central role.
4. *Personal resources influence the perception of job characteristics.* Social Cognitive Theory (Bandura, 1997) proposes that personal resources (such as self-efficacy) shape the way people understand their environment and react to it. In a somewhat similar vein, Judge, Bono, and Locke (2000) argued that employee core self-evaluation – a combination of self-esteem, generalized self-efficacy, locus of control, and low neuroticism – determines the way they perceive their job characteristics, which in turn would impact on job satisfaction and performance. In line with these ideas, Xanthopoulou et al. (2007) showed that job resources mediated the relation between personal resources (i.e., self-efficacy, optimism, and organizational based self-esteem) and work engagement.
5. *Personal resources act as a "third variable".* Finally, because personal resources may affect both perception of job characteristics (see point 4 above) and

employee well-being (see point 1 above), they may act as "third variables" that could explain the relation between both. This was investigated by Bakker et al. (2010), who hypothesized and found that extraversion among Australian academics was positively related to job resources and to organizational commitment, thus partly explaining their relation. Similarly, neuroticism was positively related to job demands and psychological strain.

These findings show that it is safe to assume that personal resources play a role in the JD-R model. However, which place they should take is as yet unclear. At present there is no systematic study of the role of personal resources available that tested and compared different conceptualizations of the relations between personal and job resources, job demands, and outcomes. Moreover, the results discussed above suggest that findings may vary across different types and different combinations of personal resources, job resources, job demands, and outcomes.

4.4.2 The JD-R Model as a Source of Inspiration

Instead of *testing* the JD-R model per se, many researchers have been inspired by it. Below we show (1) how the JD-R model has been used as an overall conceptual framework to integrate various studies, (2) how the model has been elaborated and refined, (3) how specific parts of the model have been studied, and (4) how diary studies have been used to investigate the dynamics of the model.

4.5 The JD-R Model as a Conceptual Framework

In a narrative review, Huhtala and Parzefall (2007) used the revised JD-R model as a conceptual framework for integrating empirical studies on employees' propensity to innovate. They argued that work-related resources influence employee innovativeness and creativity via work engagement. Whereas a certain level of stimulation (i.e., job demands) is beneficial, too high a level of challenge may turn into a stressor and subsequently lead to burnout and hinder innovativeness. Nahrgang, Morgeson, and Hofmann (2011) used the revised JD-R model to test a meta-analytic model of safety behavior at work. In their study of 203 samples, job demands (i.e., risks and hazards, physical demands, and complexity) and job resources (knowledge, autonomy, and a supportive environment) were indirectly associated with safety outcomes (such as accidents, injuries, and unsafe behavior) via burnout and engagement. Thus, consistent with the JD-R model, support was found for the health impairment process and the motivational process, as far as safety outcomes are concerned.

4.6 Elaborations and Refinements of the JD-R Model

A 46-sample meta-analysis by Crawford, LePine, and Rich (2010) differentiated two categories of job demands: "challenges" (such as workload, time pressure, responsibility) and "hindrances" (among others, role conflict, role ambiguity, and "red tape"). They argued that whereas both challenges and hindrances tend to be demanding, challenges have the potential to promote mastery, personal growth, and future gain, whereas hindrances could thwart personal growth, learning, and goal attainment. As expected, both types of demands were positively related to burnout. However, the relations between demands and engagement varied with the nature of the demand: Hindrances related negatively and challenges related positively to engagement. Moreover, and consistent with the JD-R model, job resources were negatively related to burnout and positively related to engagement. Similar findings were obtained in two independent Dutch and Flemish samples (Van den Broeck, De Cuyper, De Witte, & Vansteenkiste, 2010), although here the relation between challenge demands and exhaustion (a core dimension of burnout) was non-significant. These findings show that job demands may relate differentially to specific outcome variables.

Two studies applied the JD-R model to safety behaviors at work; both studies added novel constructs to the model. Hansez and Chmiel (2010) examined violations of safety behavior as outcomes of the health impairment and motivational processes, assuming that perceived management commitment to safety would affect these violations as well. Job demands and job resources were indirectly related to routine violations (i.e., using "short cuts" in which safety rules and regulations are surpassed) and situational violations (i.e., organizational failings regarding tools or equipment that provide an easier way of working), through job strain and work engagement. Dollard and Bakker (2010) examined the psychosocial safety climate (the organization's policies, practices, and procedures for the protection of worker's psychosocial health and safety) as an organizational resource that influences the work context. For instance, the lack of a psychosocial safety climate could lead to poorly designed jobs and chronic job demands, whereas a good climate would foster growth in other resources such as job control. Dollard and Bakker showed longitudinally that a good psychosocial safety climate predicted a decrease in psychological strain through lower job demands (work pressure and emotional demands) as well as an increase of work engagement through higher resources (skill discretion). Similar to Nahrgang et al.'s (2011) meta-analysis, this research shows that the JD-R model can be used successfully in studying workplace safety.

4.7 The Piecemeal Examination of the JD-R Model

Some studies explicitly referred to the JD-R model but included only job characteristics (demands and resources) and work engagement. For instance, Hakanen, Bakker, and Demerouti (2005) investigated the relation between job demands, job resources, and work engagement among Finnish dentists, focusing on four job

demands, five job resources, and the 20 corresponding demand-resource interactions. Four of these interactions were significant, showing that job resources (e.g., variability in professional skills) mitigated the effects of job demands (such as qualitative overload) on engagement. Similar findings were reported by Bakker, Hakanen, Demerouti, and Xanthopoulou (2007) in a study among Finnish teachers. They found that job resources (social support and appreciation) buffered the negative effect of job demands (pupils' misconduct). Moreover, job resources boosted engagement particularly when job demands were high. Both of these studies highlight the importance of job resources for dealing with demands and staying engaged.

Other studies focused exclusively on the health impairment process or the motivational process of the JD-R model. For instance, Rothmann and Essenko (2007) confirmed among South African university support staff that burnout mediated the relation between job demands and job resources on the one hand, and ill-health on the other. Likewise, Knudsen, Ducharme, and Roman (2009) showed that emotional exhaustion partly mediated the relation between job demands and job resources and turnover intention among leaders of addiction treatment organizations in the United States. Both sets of findings are clearly in line with the JD-R model. Further, a Finnish study on the impact of job demands and skill variety (a resource) showed that both were associated with burnout levels 13 years later (Hakanen, Bakker, & Jokisaari, 2011), confirming the predictions of the JD-R model.

Finally, using Spanish and Dutch samples, Salanova and Schaufeli (2008) focused on the motivational process and showed that in both samples work engagement fully mediated the relation between job resources and personal initiative. A Finnish longitudinal study (Hakanen, Perhoniemi, & Toppinen-Tanner, 2008) not only replicated this finding but also showed that personal initiative, in turn, had a positive impact on work unit innovativeness. Most importantly, positive reciprocal relations were observed across time between job demands and work engagement, and between work engagement and personal initiative. This points to the existence of gain spirals at work, in which two concepts mutually reinforce each other.

4.8 The Day-to-Day Dynamics of the JD-R Model

Most studies on the JD-R model employed between-group designs – that is, differences *between* employees were evaluated. However, recent work has investigated how the relations between job characteristics, psychological states, and outcomes develop *within* employees across time. This research usually takes the form of diary studies, in which a group of employees is followed during a small number of consecutive days. Each day all participants complete a brief questionnaire (typically at the end of the working day) that assesses the daily (state) level of the study variables. Usually the participants fill out another questionnaire at the start of the study that assesses the more general (trait) level of the same variables. This procedure allows for studying changes in day-level variables, controlling for their baseline levels.

This allows questions to be examined such as: Is the level of work engagement higher on days when more job resources are available as compared to days with fewer resources, independently of the employee's base-line level of work engagement?

Relevant to this issue, Kühnel, Sonnentag, and Bledow (2012) showed that day-specific job resources (positive psychological climate and job control) and personal resources (being recovered in the morning) promoted work engagement over the course of one working week. Moreover, on days when employees perceived high job control, day-specific time pressure was positively associated with work engagement, whereas on days when less control was perceived, time pressure was negatively associated with engagement. This demonstrates that job control facilitates employee coping with job demands and also that the co-occurrence of demands and resources boosts engagement. The latter agrees with findings from between-subjects research (e.g., Bakker et al., 2007; Hakanen et al., 2005).

In a diary study among staff at a Greek fast food company, Xanthopoulou et al. (2009) also found that daily fluctuations in job resources (autonomy, supervisory coaching, and team climate) were positively related to daily levels of work engagement across one working week. On days with more available resources, employees were not only more engaged, but they also felt more optimistic and self-efficacious, and they performed better in terms of financial turnover than on days when these resources were low. Thus, the more supportive the boss was, the more engaged the employees were and the more food was sold. In a similar study among flight attendants, Xanthopoulou, Heuven, Demerouti, Bakker, and Schaufeli (2008) found that work engagement mediated the relation between colleague support and in-role performance.

These three diary studies exemplify the dynamic nature of the motivational process of the JD-R model as it unfolds across time. It appears that day-specific work engagement varies over the working week and that these variations can be explained by day-specific job demands and job resources. Moreover, day-specific work engagement mediates the relation between daily job resources and daily performance, and job resources and personal resources have a joint effect on work engagement. These findings fully agree with the predictions of the JD-R model.

4.9 Critical Comments and Unresolved Issues

Now that we have seen how the JD-R model has evolved over time and what kind of research it has generated since its introduction at the turn of the century, it is time to make some critical comments and to point put some unresolved issues that might fuel future research. Six issues stand out as especially important and/or interesting.

4.9.1 First Issue: The Epistemological Status of the JD-R Model

As illustrated above, the JD-R model is an open, heuristic model rather than a specific model that includes well-defined sets of particular demands, resources, mental

states, and outcomes. In previous research, job demands, job and personal resources, and outcomes have been represented by quite different concepts, as can be seen from the Appendix. The fact that all sorts of demands, resources, and outcomes can be included is a strength as well as a weakness of the model. It adds to its flexibility, in that it can be used in many different contexts, but this comes at the cost of limited generalizability. For instance, when a time pressure × control interaction effect on work engagement is found (see Kühnel et al., 2012), this does not imply that similar interactions exist between *all* demands and *all* resources for *all* outcome variables.

In fact, additional explanatory theoretical frameworks are usually needed to argue why *particular* demands interact with *particular* resources. For instance, in Kühnel et al.'s (2012) case, Karasek's (1979) JD-C model fulfilled that role. Other theoretical frameworks have been used in similar ways to substantiate the psychological role of particular demands, resources, and outcomes in the JD-R model. Example frameworks are Hobfoll's (2002) Conservation of Resources Theory, Fredrickson's (2001) Broaden-and-Build Theory, Bandura's (1997) Social Cognitive Theory, and Deci and Ryan's (2000) Self-Determination Theory. These and other psychological theories are needed to *explain* the underlying psychological processes that are involved given the specific demands, resources, and outcomes that are included in the JD-R model at hand. Thus, rather than being an explanatory model, the JD-R model is a *descriptive* model that specifies relations between classes of variables without providing any particular psychological explanation, except that (1) *by definition*, job demands consume energy and may therefore eventually lead to exhaustion and related health problems (the health impairment process), and (2) *by definition*, job resources have motivational potential and may therefore lead to work engagement, which may result in positive organizational outcomes (the motivational process). These theoretical claims of the JD-R model follow from the way job demands and job resources are conceptualized and therefore do not explain the relations under study.

Summarizing, the JD-R model specifies *what kind* of job and personal characteristics lead to *what kind* of psychological states and outcomes but does not tell us *why* this would be so. The fact that the model only provides limited insight into the psychological mechanisms involved might be considered an important limitation. At the same time, this lack of explanatory power can easily be remedied by drawing upon alternative theoretical frameworks. On the plus side, the JD-R model provides an elegant and parsimonious description of the way demands, resources, psychological states, and outcomes are associated. As such it can be used pragmatically in many occupational settings to improve employee health and well-being and organizational effectiveness (see below).

4.9.2 Second Issue: The Nature of Job Demands and Job Resources

The conceptual difference between job demands and job resources is not as clear-cut as it may seem at first glance. For instance, consider the situation in which an employee experiences a lack of resources. This implies that more effort has to be

spent to achieve work goals. Since the JD-R model argues that the expenditure of effort is a hallmark of job demands, this reasoning leads to the paradoxical conclusion that lack of resources may be construed as a job demand. But why – despite this conceptual indistinctiveness – do job demands and job resources usually constitute two separate factors? Most likely this is because demands are *valued* negatively and resources are *valued* positively. The latter is in line with the definition of resources in the COR theory – namely, as things that people centrally value (Hobfoll, 2002). The value-based nature of demands and resources would call for a redefinition of these concepts, namely: (1) job demands are *negatively valued* physical, social, or organizational aspects of the job that require sustained physical or psychological effort and are therefore associated with certain physiological and psychological costs, and (2) job resources are *positively valued* physical, social, or organizational aspects of the job that are functional in achieving work goals, reduce job demands, or stimulate personal growth and development.

This redefinition also solves the problem that not all job demands in the JD-R model seem to be equal. It is an empirical fact that the relation between job demands and engagement is usually not statistically significant, but occasionally it may also be positive or negative. In an attempt to explain this equivocal finding, Crawford et al. (2010) distinguished between challenges and hindrances that are appraised by employees as positive and negative, respectively. Crawford et al.'s meta-analysis showed that hindrances were negatively related to engagement, whereas for challenges a positive relation was found. Thus, the relation between demands and work engagement depends on the nature of the demand. In our redefinition, "challenges" would be conceptualized as "resources," because they are valued positively. As a result, the assumption of the JD-R model would still be valid that job resources (now including challenging demands) are positively related to engagement and negatively related to burnout. Note that the additional assumption should be made that job demands (now excluding challenges) are negatively related to work engagement.

Analogously, for certain employees a resource like job control might be experienced negatively, i.e., as a threat rather than as an opportunity for learning and development. According to our redefinition, a negatively appraised resource (threat) would be conceptualized as a demand. It should be noted that *as a rule* demands are appraised negatively, whereas resources are appraised positively, but occasionally demands can be challenging and resources can be threatening.

To investigate the validity of this redefinition of demands and resources, future research should focus on "challenges" (positively valued demands) and on "threats" (negatively valued resources). For instance, the amount of effort (i.e., the amount of energy spend) and the appraisal (i.e., its positive or negative valence) of demands can be assessed. In that way, typical "challenges" can be identified.

4.9.3 Third Issue: The Role of Personal Resources

As discussed above, personal resources may play at least five different roles in the job characteristics – well-being nexus. These roles are not mutually exclusive, and

for all of them some empirical evidence exists. Hence, personal resources can be integrated into the JD-R model in various ways; at present there is no single best way of extending the JD-R model to include personal resources. For instance, they can be integrated as mediators, moderators, "third variables," antecedents of job demands and job resources, or as any combination of these. Different types of explanatory models (see above) can be used to specify the role of personal resources. This illustrates the heuristic nature of the JD-R model once more: Personal resources do matter, but the specific explanatory framework determines how they should be integrated into the model.

So far only personal resources have been integrated into the JD-R model, but personal vulnerability factors (such as neuroticism, workaholism, and pessimism) could also be included. Again, it is likely that there is no single best way to integrate vulnerability factors of this kind into the model. It is possible that workaholism leads to more job demands, because workaholics are actively looking for more work (Machlowitz, 1980). However, workaholism may also moderate the relation between job demands and burnout; for people scoring high on workaholism this relation would be stronger, because workaholics do not recover appropriately from their work (Law, Sweeney, & Summers, 2008).

4.9.4 Fourth Issue: The Distinction Between the Health Impairment and the Motivational Process

The JD-R model suggests that the health impairment and motivational processes are independent, but it is quite possible that they represent two sides of the same coin. That is, when health and well-being deteriorate, motivation decreases, and vice versa. In the first part of this chapter we mentioned that most studies on the JD-R model found negative relations between (1) job demands and job resources, (2) burnout and engagement, and (3) job resources and burnout, thus confirming the link between both processes. This implies that in order to understand one process, the other process should also be taken into account, and vice versa. Stated differently, the health impairment and motivational processes should be studied *jointly*. However, especially the motivational process has been studied in isolation (see above), whereby the role of job demands and burnout has been neglected.

For a proper understanding of the motivational process, future research should also acknowledge the direct and indirect impact of job demands on work engagement. This applies even more strongly when adopting the value-based redefinition of job demands given above, because positively valued demands should have motivational potential and are therefore likely to boost work engagement.

4.9.5 Fifth Issue: Reciprocal Causation

The JD-R model proposes straightforward unidirectional causal relations among demands, resources, and outcomes. However, many longitudinal studies demonstrated

reciprocal causation, particularly regarding the motivational process (e.g., Hakanen, Perhoniemi, & Toppinen-Tanne, 2008; Llorens et al., 2007; Schaufeli et al., 2009, Xanthopoulou et al., 2008). This suggests the existence of gain cycles in which resources (job and personal) and work engagement mutually influence each other. This reciprocal causation underlines the dynamic nature of the JD-R model. Obviously, assuming linear causation is overly simplistic, meaning that future research should focus more systematically on the dynamic relations among the concepts in the model. For instance, Social Cognitive Theory (Bandura, 1997) suggests that superior job performance boosts engagement and self-efficacy, because it promotes motivation-enhancing mastery experiences. Future research could also address gain spirals. For such a spiral to exist, there should not only be reciprocal causation but one variable (e.g., a specific job demand) should also increase the *level* of another variable (work engagement), and vice versa (Salanova et al., 2010).

4.9.6 Sixth Issue: Multilevel Issues

Essentially, the JD-R model presents an individual-level approach, but it has also been applied to higher aggregation levels. For instance, Bakker et al. (2008) and Xanthopoulou et al. (2009) applied the JD-R model to employees working in teams. However, in doing so they violated the compatibility principle (Ajzen, 2005), which stipulates that all variables in a model must be operationalized at the same level of specificity. For example, collective constructs (e.g., team resources) should be studied in relation to other collective constructs (e.g., team engagement or team performance). Recently, Torrente, Salanova, Llorens, and Schaufeli (2012) examined the associations between resources, engagement, and performance at the team level. They followed the compatibility principle by using a referent shift from individual to team level when operationalizing their constructs; for instance, by referring to “my team,” instead of “I.” As predicted by the JD-R model, team work engagement mediated the association between social resources perceived at the team level and team performance as assessed by the supervisor.

The fact that the JD-R model also applies at the supra-individual level (i.e., in teams and perhaps even in entire organizations) assumes social-psychological processes involving shared perceptions (e.g., regarding team demands and resources) and shared experiences (e.g., collective engagement and burnout). One example is the process of emotional contagion that might explain the cross-over of burnout and work engagement in work teams (Bakker, Van Emmerik, & Euwema, 2006). Instead of merely aggregating individual scores of job characteristics, psychological states, and outcomes, future research on the JD-R model at the team and organizational level should use commensurate collective measures and consider the social-psychological principles accounting for these collective perceptions and experiences.

4.10 Practical Implications

How can the JD-R model be used to improve employee health and well-being? Its most important practical contribution is a broad and flexible framework for assessing job and personal characteristics that affect employee health and well-being and their associated outcomes, including job performance. Unlike other approaches such as Siegrist's (1996) Effort-Reward Imbalance model and Karasek (1979) Demand-Control model, the JD-R model:

(1) Is *non-limitative* in terms of the study concepts. That is, rather than focusing on a very specific array of factors that are presumed to account causally for a specific set of outcomes, it is potentially applicable to an extremely wide set of job and personal characteristics and outcomes thereof. Practically, this implies that *the model can be tailored to the specific needs of an organization, given any specific situation*. This adds greatly to the model's relevance across a wide variety of settings. For instance, in a hospital setting undergoing organizational change, specific demands (e.g., role conflict, downsizing, job insecurity, harassment by patients), resources (e.g., trust in management, task variety, communication and information) and outcomes (e.g., turnover intention, service quality, organizational commitment, injuries and accidents) can be included. In an industrial setting the focus can be on different demands (e.g., physical demands, work overload, time pressure), resources (e.g., financial rewards, job challenge, feedback) and outcomes (e.g., absenteeism, in- and extra role performance, workability). Thus, the variables in the JD-R model can be selected on the basis of the specific needs of a particular organization;
(2) Considers both negative (burnout, strain, health impairment) and positive (engagement, productivity) outcomes and processes (i.e., the health impairment and motivational processes). *This balanced approach increases its recognition and, hence, acceptability by employees, unions, teams, supervisors, managers, and executives alike* – a very desirable feature when applying the JD-R model in organizations;
(3) Appeals to different occupational groups involved in the management of the human resources of an organization. That is, whereas the "negative" stress perspective appeals to occupational health professionals, the "positive" motivational perspective is attractive to human resources professionals. Thus, *the JD-R model may bridge the gap between occupational health management* (which is concerned with reducing sickness absenteeism and occupational hazards, and improving employee well-being) and human resources management (which is concerned with increasing employee motivation and performance). The two perspectives are not only equally valid from the perspective of the JD-R model, they are also intertwined. As the JD-R model considers the health impairment and motivational processes as two sides of the same coin, it is perfectly suited to guide the integration of occupational health and human resources policies in organizations (i.e., Integral Health Management approach; see Zwetsloot & Pot, 2004); and

(4) *Complements (and in a sense encompasses and integrates) previous approaches and ideas concerning the relations between work characteristics.* As indicated above, as a jack-of-all-trades, the JD-R model is also a master of none: Its generality comes at the cost of lack of specificity, in that additional explanatory theoretical frameworks are needed to account for the associations between specific demands, resources and outcomes. That is, the model helps researchers and practitioners to obtain a quick grasp of what they may expect in a particular situation and what concepts should be targeted to improve worker health, well-being, and performance. However, whereas the JD-R model provides researchers and practitioners with a relatively simple framework that informs them roughly about the associations among concepts, to understand the precise mechanisms underlying these associations more specific frameworks are needed, e.g., that describe *why* feedback and instrumental support would increase job engagement. This implies that the JD-R model *complements, encompasses, and integrates* rather than *replaces* older theory on the associations between work and personal characteristics and work outcomes.

4.10.1 The JD-R Monitor

As an example of the practical usage of the JD-R, we briefly discuss a JD-R-based on-line tool that is currently used commercially in the Netherlands (Schaufeli & Dijkstra, 2010). A large pool of reliable and valid short scales that assess job demands, job resources, personal resources, psychological states, and positive and negative outcomes is available and can be included to "dress up" the JD-R model, depending on the information needed. Based on the online tool, several kinds of information are provided: (1) immediate *online personal feedback* in the form of a comparison between the respondent's scores on each scale with the scores of a benchmark (e.g., a national average or the average score of employees working in the same occupation or sector), (2) relative scores of *organizational units* (e.g., teams, departments, plants) on each scale, compared with those of other units and the entire organization, (3) relative scores of the *entire organization* on each scale as compared with the national average and/or similar organizations, and (4) a specific set of job demands, job resources, and personal resources that are identified as possible *antecedents of employee well-being and organizational outcomes*. This type of information might be used for drafting interventions at personal, team, and organizational level. The JD-R monitor is used in a specific seven-step cyclical process for evidence-based organizational consultancy (Fig. 4.2).

4.10.1.1 Step 1: The Problem

An organization may have a very general question, such as: How do the employees experience their work? But the problem could also be more specific, such as: How

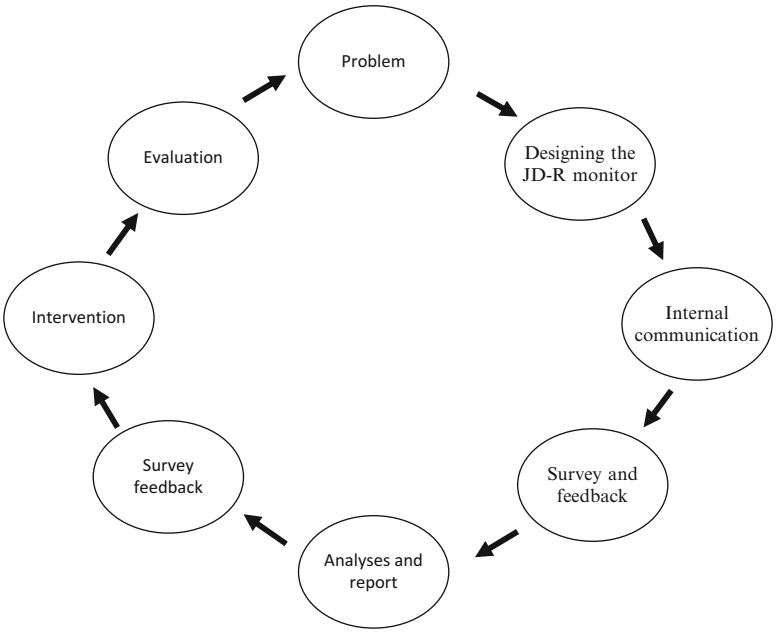

Fig. 4.2 The process of using a JD-R survey

can employee's levels of work engagement be increased? What are the risk factors for burnout? How can we retain our employees? Or, how can we keep older employees fit for work?

4.10.1.2 Step 2: Designing the JD-R-Monitor

Together with key persons, such as HR officers, management, work council members, and occupational physicians, the most relevant job stressors, personal and job resources, stress reactions, and outcomes are selected and included in the JD-R monitor. No matter what the final content of the JD-R-monitor will be, its basic stature remains the same (see Fig. 4.1).

4.10.1.3 Step 3: Internal Communication

Before carrying out the survey, an internal communication campaign is launched. This usually includes holding a kick-off meeting with all employees, sending out flyers and announcements via the company's intranet, and publishing background articles in the company's magazines. The basic goal of the campaign is to emphasize the importance of the survey and to underline the commitment of various stakeholders, including top management and unions.

4.10.1.4 Step 4: Survey and Individual Feedback

All employees receive an e-mail with a link to the online JD-R monitor. It takes employees approximately 15–30 min to complete the survey, and response rates usually range from 65 % to 85 %, depending how well the project is communicated to the employees. Anonymity is guaranteed, and nobody in the organization has access to the data of the employees. Immediately after completing the JD-R monitor, the employee receives an automatically generated feedback report, which compares the employee's scores with a benchmark's scores (see above). Moreover, in case of an unfavorable score, the feedback text invites the employee to take action. For instance, if a score indicates a poor career perspective, a weblink to the company's career counseling service is provided for making an appointment.

4.10.1.5 Step 5: Analysis and Reporting

The company report is based on aggregated data, which means that average scores for the entire company and for its various units are calculated. Like the individual feedback report, the company report gives an overview of the scores for each element of the JD-R monitor, including a comparison with a benchmark (see above). Based on these benchmarks and on an in-depth analysis of possible antecedents, the report gives recommendations for improvements in terms of reducing job stress, stimulating work engagement, and improving organizational outcomes.

4.10.1.6 Step 6: Survey Feedback

The report is discussed throughout the company at various levels, not only in the board room but also with employees at the team or department level, or in focus groups. Feeding back the results and discussing these critically with management, supervisors, and employees is crucially important to build commitment and trust for implementing interventions.

4.10.1.7 Step 7: Interventions

In principle, based on the results of the JD-R monitor, two types of measures can be taken. First, the employees can take measures themselves (see step 4) to improve their own personal or job resources or decrease their demands. Our experience shows that about 10–15 % of the employees do so spontaneously; they talk to their bosses or their colleagues to address certain issues, contact a career counseling service, or consult their occupational physician. But also team and organization-based

interventions can be implemented. These may take on many different forms, ranging from the training programs for employees and supervisors to team-building, job re-design, or culture change.

4.10.1.8 Step 8: Evaluation

After the intervention, the organization can go through steps 1–7 again, for example to check whether the implemented intervention has been effective. The JD-R monitor is then utilized in a second cycle to investigate, for instance, if work engagement has indeed increased as a result of the measures taken. By comparing the scores before and after the intervention an unambiguous answer to this question can be given. In the ideal case, the JD-R monitor is integrated in the annual HR cycle to monitor the quality of the company's human capital, so that evidence-based HR policy decisions can be made.

4.10.1.9 Concluding Remarks

This chapter discussed (a) the development of JD-R model, (b) the empirical research that tested its assumptions, (c) the model's limitations and issues for future research, and (4) its practical application. Perhaps the most distinctive feature of the JD-R model is its generality and flexibility, meaning that the model can be used in a broad array of situations. However, this comes at a cost. Whereas the JD-R model provides a conveniently simple classification of job characteristics in terms of demands and resources and can easily be extended to include other concepts, in-depth understanding of the processes accounting for specific associations between study concepts requires that researchers draw on theories that specifically pertain to these concepts. This usually presents no major issue, as such theories are readily available today.

As regards the future of the JD-R model, there is no reason to assume that the popularity of the revised model among practitioners and researchers will diminish in the short run. However, in this chapter we identified six issues that must be addressed; they may have implications for future development and practical application of the model. Chief among these are reconceptualization of demands and resources in terms of positively and negatively valued work characteristics, extension of the model to include personal resources (and vulnerabilities) and reciprocal causation, including the notion of gain spirals. Note that we do not argue that these issues discredit the JD-R model. Rather, we consider these issues and ideas as clear evidence of the flexibility of the model; clearly, it can accommodate many different ideas and findings, and may even generate new ideas and approaches. As such, it seems to serve its initial purpose of being a *heuristic* model very well.

Appendix

Job Demands	Job resources
• Centralization	• Advancement
• Cognitive demands	• Appreciation
• Complexity	• Autonomy
• Computer problems	• Craftsmanship
• Demanding contacts with patients	• Financial rewards
• Downsizing	• Goal clarity
• Emotional demands	• Information
• Emotional dissonance	• Innovative climate
• Interpersonal conflict	• Job challenge
• Job insecurity	• Knowledge
• Negative spillover from family to work	• Leadership
• Harassment by patients	• Opportunities for professional development
• Performance demands	• Participation in decision making
• Physical demands	• Performance feedback
• Problems planning	• Positive spillover from family to work
• Pupils' misbehavior	• Professional pride
• Qualitative workload	• Procedural fairness
• Reorganization	• Positive patient contacts
• Remuneration	• Quality of the relationship with the supervisor
• Responsibility	• Safety climate
• Risks and hazards	• Safety routine violations
• Role ambiguity	• Social climate
• Role conflict	• Social support from colleagues
• Sexual harassment	• Social support from supervisor
• Time pressure	• Skill utilization
• Unfavorable shift work schedule	• Strategic planning
• Unfavorable work conditions	• Supervisory coaching
• Work pressure	• Task variety
• Work-home conflict	• Team cohesion
• Work overload	• Team harmony
	• Trust in management
Outcomes (negative)	Personal resources
• Absenteeism (self-report and company registered)	• Emotional and mental competencies
• Accidents and injuries	• Extraversion
• Adverse events	• Hope
• Depression	• Intrinsic motivation
• Determination to continue	• Low neuroticism
• Unsafe behaviors	• Need satisfaction (autonomy, belongingness, competence)
• Negative work-home interference	• Optimism
• Physical ill health	• Organization-based self-esteem
• Psychosomatic health complaints	• Regulatory focus (prevention and promotion focus

(continued)

(continued)

- Psychological strain (General Health Questionnaire, GHQ)
- Turnover intention

Outcomes (positive)

- Extra-role performance (self- or other-rated)
- Innovativeness
- In-role performance (self- or other-rated)
- Life satisfaction
- Organizational commitment
- Perceived health
- Positive work-home interference
- Service quality
- Team sales performance
- Workability
- Happiness

- Resilience
- Self-efficacy
- Value orientation (intrinsic and extrinsic values)

References

Ajzen, I. (2005). Laws of human behavior: Symmetry, compatibility, and attitude- behavior correspondence. In A. Beauducel, B. Biehl, M. Bosniak, W. Conrad, G. Schönberger, & D. Wagener (Eds.), *Multivariate research strategies* (pp. 3–19). Aachen: Shaker.

Bakker, A. B., Boyd, C. M., Dollard, M., Gillespie, N., Winefield, A. H., & Stough, C. (2010). The role of personality in the job demands-resources model. *Career Development International, 15*, 622–636.

Bakker, A. B., Demerouti, E., de Boer, E., & Schaufeli, W. (2003). Job demands and job resources as predictors of absence duration and frequency. *Journal of Vocational Behavior, 62*, 341–356.

Bakker, A. B., Demerouti, E., & Euwema, M. C. (2005). Job resources buffer the impact of job demands on burnout. *Journal of Occupational Health Psychology, 10*, 170–180.

Bakker, A. B., Demerouti, E., & Schaufeli, W. B. (2003). Dual processes at work in a call centre: An application of the job demands-resources model. *European Journal of Work and Organizational Psychology, 12*, 393–417.

Bakker, A. B., Demerouti, E., Taris, T. W., Schaufeli, W. B., & Schreurs, P. J. G. (2003). A multi-group analysis of the job demands-resources model in four home care organizations. *International Journal of Stress Management, 10*, 16–38.

Bakker, A. B., Demerouti, E., & Verbeke, W. (2004). Using the job demands-resources model to predict burnout and performance. *Human Resource Management, 43*, 83–104.

Bakker, A. B., Hakanen, J. J., Demerouti, E., & Xanthopoulou, D. (2007). Job resources boost work engagement particularly when job demands are high. *Journal of Educational Psychology, 99*, 274–284.

Bakker, A. B., Van Emmerik, H., & Euwema, M. (2006). Crossover of burnout and engagement in work teams. *Work and Occupations, 4*, 464–489.

Bakker, A. B., Van Emmerik, H., & Van Riet, P. (2008). How job demands, resources, and burnout predict objective performance: A constructive replication. *Anxiety, Stress & Coping, 21*, 309–324.

Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York: Freeman.

Boyd, C. M., Bakker, A. B., Pignata, S., Winefield, A. H., Gillespie, N., & Stough, C. (2011). A longitudinal test of the job demands-resources model among Australian university academics. *Applied Psychology: An International Review, 60*, 112–140.

Brenninkmeijer, V., Demerouti, E., Le Blanc, P., & Van Emmerik, H. (2010). Regulatory focus at work: The moderating role of regulatory focus in the job demands-resources model. *Career Development International, 15*, 708–728.

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

Deci, E. L., & Ryan, R. M. (2000). The "what" and "why" of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry, 11*, 319–338.

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

Dollard, M. F., & Bakker, A. B. (2010). Psychosocial safety climate as a precursor to conducive work environments, psychological health problems, and employee engagement. *Journal of Occupational and Organizational Psychology, 83*, 579–599.

Fredrickson, B. L. (2001). The role of positive emotions in positive psychology: The broaden-and-build theory of positive emotions. *American Psychologist, 56*, 218–226.

Hakanen, J., Bakker, A. B., & Demerouti, E. (2005). How dentists cope with their job demands and stay engaged: The moderating role of job resources. *European Journal of Oral Sciences, 113*, 479–487.

Hakanen, J., Bakker, A. B., & Jokisaari, M. (2011). A 35-year follow-up study on burnout among Finnish employees. *Journal of Occupational Health Psychology, 16*, 345–360.

Hakanen, J., Bakker, A. B., & Schaufeli, W. B. (2006). Burnout and work engagement among teachers. *Journal of School Psychology, 43*, 495–513.

Hakanen, J. J., Perhoniemi, R., & Toppinen-Tanner, S. (2008). Positive gain spirals at work: From job resources to work engagement, personal initiative and work-unit innovativeness. *Journal of Vocational Behavior, 73*, 78–91.

Hakanen, J. J., Schaufeli, W. B., & Ahola, K. (2008). The job demands-resources model: A three-year cross-lagged study of burnout, depression, commitment, and work engagement. *Work & Stress, 22*, 224–241.

Hansen, N., Sverke, M., & Näswall, K. (2009). Predicting nurse burnout from demands and resources in three acute care hospitals under different forms of ownership: A cross-sectional questionnaire survey. *International Journal of Nursing Studies, 46*, 95–106.

Hansez, I., & Chmiel, N. (2010). Safety behavior: Job demands, job resources, and perceived management commitment to safety. *Journal of Occupational Health Psychology, 15*, 267–278.

Hobfoll, S. E. (2002). Social and psychological resources and adaptation. *Review of General Psychology, 6*, 307–324.

Hockey, G. R. J. (1997). Compensatory control in the regulation of human performance under stress and high workload: A cognitive-energetical framework. *Biological Psychology, 45*, 73–93.

Hu, Q., & Schaufeli, W. B. (2011). Job insecurity and renumeration in Chinese family-owned business workers. *Career Development International, 16*, 6–19.

Hu, Q., Schaufeli, W. B., & Taris, T. W. (2011). The job demands-resources model: An analysis of additive and joint effects of demands and resources. *Journal of Vocational Behavior, 79*, 181–190.

Huhtala, H., & Parzefall, M. R. (2007). Promotion of employee wellbeing and innovativeness: An opportunity for a mutual benefit. *Creativity and Innovation Management, 16*, 299–307.

Judge, T. A., Bono, J. E., & Locke, E. A. (2000). Personality and job satisfaction: The mediating role of job characteristics. *Journal of Applied Psychology, 85*, 237–249.

Karasek, R. (1979). Job demands, job decision latitude and mental strain: Implications for job redesign. *Administrative Science Quarterly, 24*, 285–306.

Knardahl, S., & Ursin, H. (1985). Sustained activation and the pathophysiology of hypertension and coronary heart disease. In J. F. Orlebeke, G. Mulder, & L. J. P. van Doornen (Eds.), *Psychophysiology of cardiovascular control: Models, methods, and data* (pp. 151–167). New York: Plenum.

Knudsen, H. K., Ducharme, L. J., & Roman, P. M. (2009). Turnover intention and emotional exhaustion "at the top": Adapting the job demands-resources model to leaders of addiction treatment organizations. *Journal of Occupational Health Psychology, 14*, 84–95.

Korunka, C., Kubicek, B., Schaufeli, W., & Hoonakker, P. L. T. (2009). Burnout and work engagement: Do age, gender, or occupation level matter? Testing the robustness of the job demands-resources model. *Positive Psychology, 4*, 243–255.

Kühnel, J., Sonnentag, S., & Bledow, R. (2012). Resources and time pressure as day-level antecedents of work engagement. *Journal of Occupational and Organizational, 85*, 181–198.

Law, D. W., Sweeney, J. T., & Summers, S. L. (2008). An examination of the influence of contextual and individual variables on public accountants' exhaustion. In V. Arnold (Ed.), *Advances in accounting behavioral research* (Vol. 11, pp. 129–153). Bingley, England: Emerald.

Lee, R. T., & Ashforth, B. E. (1996). A meta-analytic examination of the correlates of the three dimensions of job burnout. *Journal of Applied Psychology, 81*, 123–133.

Lewig, K. A., Xanthopoulou, D., Bakker, A. B., Dollard, M., & Metzer, J. C. (2007). Burnout and connectedness among Australian volunteers: A test of the job demands-resources model. *Journal of Vocational Behavior, 71*, 429–445.

Llorens, S., Bakker, A. B., Schaufeli, W. B., & Salanova, M. (2006). Testing the robustness of the job demands-resources model. *International Journal of Stress Management, 13*, 378–391.

Llorens, S., Schaufeli, W. B., Bakker, A., & Salanova, M. (2007). Does a positive gain spiral of resources, efficacy beliefs and engagement exist? *Computers in Human Behavior, 23*, 825–841.

Lorente, L., Salanova, M., Martinez, I., & Schaufeli, W. B. (2008). Extension of the job demands-resources model in the prediction of burnout and engagement among teachers over time. *Psicotema, 20*, 354–360.

Machlowitz, M. (1980). *Workaholics: Living with them, working with them*. New York: Simon & Schuster.

Maslach, C., Jackson, S. E., & Leiter, M. (1996). *Maslach burnout inventory* (3rd ed.). Palo Alto, CA: Consulting Psychologists Press.

Meijman, T. F., & Mulder, G. (1998). Psychological aspects of workload. In P. J. D. Drenth, H. Thierry, & C. J. de Wolff (Eds.), *Handbook of work and organizational psychology* (2nd ed., pp. 5–33). Hove, England: Psychology Press.

Melamed, A., Shirom, A., Toker, S., Berliner, S., & Shapira, I. (2006). Burnout and risk of cardiovascular disease: Evidence, possible causal paths, and promising research directions. *Psychological Bulletin, 132*, 327–353.

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*, 71–94.

Rothmann, S., & Essenko, N. (2007). Job characteristics, optimism, burnout, and ill health of support staff in a higher education institution in South Africa. *South African Journal of Psychology, 37*, 135–152.

Salanova, M., & Schaufeli, W. B. (2008). A cross-national study of work engagement as a mediator between job resources and proactive behavior. *International Journal of Human Resource Management, 19*, 116–131.

Salanova, M., Schaufeli, W. B., Xanthoupoulou, D., & Bakker, A. B. (2010). The gain spiral of resources and work engagement: Sustaining a positive worklife. In A. B. Bakker & M. P. Leiter (Eds.), *Work engagement: A handbook of essential theory and research* (pp. 118–131). New York: Psychology Press.

Schaufeli, W. B., & Bakker, A. B. (2004). Job demands, job resources, and their relationship with burnout and engagement: A multi-sample study. *Journal of Organizational Behavior, 25*, 293–315.

Schaufeli, W. B., Bakker, A. B., & van Rhenen, W. (2009). How changes in job demands and resources predict burnout, work engagement, and sickness absenteeism. *Journal of Organizational Behavior, 30*, 893–917.

Schaufeli, W. B., & Dijkstra, P. (2010). *Bevlogen aan het werk*. [Engaged at work]. Zaltbommel, Netherlands: Thema.

Siegrist, J. (1996). Adverse health effects of high-effort/low-reward conditions. *Journal of Occupational Health Psychology, 1*, 27–41.

Simbula, S., Guglielmi, D., & Schaufeli, W. B. (2011). A three wave study on job resources, self-efficacy and work engagement among Italian school teachers. *European Journal of Work and Organizational Psychology, 20*, 285–305.

Torrente, P., Salanova, M., Llorens, S., & Schaufeli, W. B. (2012). Teams make it work: How team work engagement mediates between social resources and performance in teams. *Psicotema, 24*, 106–112.

Van den Broeck, A., De Cuyper, N., De Witte, H., & Vansteenkiste, M. (2010). Not all demands are equal: Differentiating job hindrances and job challenges in the job demands-resources model. *European Journal of Work and Organizational Psychology, 19*, 735–759.

Van den Broeck, A., Van Ruysseveldt, J., Smulders, P., & De Witte, H. (2011). Does intrinsic value orientation strengthen the impact of job resources? A perspective from the job demands-resources model. *European Journal of Work and Organizational Psychology, 20*, 581–609.

Van den Broeck, A., Vansteenkiste, M., De Witte, H., & Lens, W. (2008). Explaining the relationships between job characteristics, burnout, and engagement: The role of basic psychological need satisfaction. *Work & Stress, 22*, 277–294.

Vink, J., Ouweneel, A., & Le Blanc, P. (2011). Psychologische energiebronnen voor bevlogen werknemers: Psychologisch kapitaal in het job demands-resources model. *Gedrag & Organisatie, 24*, 101–120.

Xanthopoulou, D., Bakker, A. B., Demerouti, E., & Schaufeli, W. B. (2007). The role of personal resources in the job demands-resources model. *International Journal of Stress Management, 14*, 121–141.

Xanthopoulou, D., Bakker, A. B., Demerouti, E., & Schaufeli, W. B. (2009). Work engagement and financial returns: A diary study on the role of job and personal resources. *Journal of Organizational and Occupational Psychology, 82*, 183–200.

Xanthopoulou, D., Bakker, A. B., Dollard, M. F., Demerouti, E., Schaufeli, W. B., Taris, T. W., et al. (2007). When do job demands particularly predict burnout? The moderating role of job resources. *Journal of Managerial Psychology, 22*, 766–785.

Xanthopoulou, D., Heuven, E., Demerouti, E., Bakker, A. B., & Schaufeli, W. B. (2008). Working in the sky: A diary study on work engagement among flight attendants. *Journal of Occupational Health Psychology, 13*, 345–356.

Zwetsloot, G., & Pot, F. (2004). The business value of health management. *Journal of Business Ethics, 55*, 115–124.