

## A CONFIRMATORY INVESTIGATION OF A JOB DEMANDS-RESOURCES MODEL USING A CATEGORICAL ESTIMATOR<sup>1</sup>

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*Summary.*—A confirmatory investigation of a job demands-resources model was conducted with alternative methods, in a sample of 15,633 working adults aggregated from various economic sectors. The proposed model is in line with job demands-resources theory and assumes two psychological processes at work which are collectively coined “the dual process.” The first process, the energetic, presents that job demands lead to ill-health outcomes due to burnout. The second process, the motivational, indicates that job resources lead to organizational commitment due to work engagement. Structural equation modelling analyses were implemented with a categorical estimator. Mediation analyses of each of the processes included bootstrapped indirect effects and kappa-squared values to apply qualitative labels to effect sizes. The relationship between job resources and organizational commitment was mediated by engagement with a large effect. The relationship between job demands and ill-health was mediated by burnout with a medium effect. The implications of the results for theory and practice were discussed.

Numerous models have investigated work stress, such as the effort-reward imbalance model (Siegrist, 1996; van Vegchel, de Jonge, Bosma, & Schaufeli, 2005), the person-environment fit model (French, Kaplan, & Harrison, 1982) and the demand-control model (Karasek, 1979). However, the pinnacle of current work stress models is most likely the development of the job demands-resources (JD-R) model of Demerouti, Bakker, Nachreiner, and Schaufeli (2001) and the subsequent articulation of the dual process (Schaufeli & Bakker, 2004; Bakker & Demerouti, 2007).

### *The Job Demands-Resources Model*

The job demands-resources model proposes that the development of burnout follows two processes, the first being the demanding aspects of work, in which job demands lead to exhaustion, and the second, a lack of job resources leading to withdrawal behaviour or disengagement through the erosion of motivation. Demerouti, *et al.* (2001, p. 501), and Schaufeli and Bakker (2004, p. 296) refer to job demands as “those physical, psychological, social, or organizational aspects of the job that require sustained

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physical and psychological effort and are therefore associated with certain physiological and psychological costs." Workload, role ambiguity, role conflict, and stressful events are examples of job demands (Wright & Hobfoll, 2004). Demerouti, *et al.* (2001, p. 20) describe job resources as "the organizational aspects of a job that are functional in achieving work goals and could reduce job demands." *Inter alia*, job resources include social support (supervisory and collegial), job enhancement opportunities in the form of increased control and autonomy, participation in decision making, reinforcement contingencies (Burke & Richardsen, 1993), as well as recognition, opportunities for advancement, and rewards (Rothmann, 2002). Importantly, it has been found that job demands and job resources may differ depending on the occupational context (Bakker & Demerouti, 2007). The job demands-resources model therefore is capable of integrating a different range of potential job demands and job resources, depending on the specific context under investigation (Bakker & Demerouti, 2007; Demerouti, *et al.*, 2001). Moreover, Bakker, Hakanen, Demerouti, and Xanthopoulou (2007) state that the idea that specific job demands and job resources have to match in order to show moderating effects in the prediction of well-being is inaccurate, i.e., a match is not a prerequisite for buffering effects. Other research (Bakker, Demerouti, & Euwema, 2005) has noted similar findings, and this further affirms that, by definition, job resources can act as a buffer in the relationship between any job demand and any type of outcome in the job demands-resources model.

#### *Burnout, Work Engagement, and the Dual Process*

Schaufeli and Enzmann (1998, p. 36) defined burnout as "a persistent, negative, work-related state of mind in 'normal individuals' that is primarily characterized by exhaustion, which is accompanied by distress, a sense of reduced effectiveness, decreased motivation, and the development of dysfunctional attitudes and behaviours at work." Burnout develops as a result of an imbalance in job demands and resources, which leads to exhaustion, and then cynicism develops—a set of negative, indifferent or overly detached attitudes (Schaufeli & Enzmann, 1998). Conversely, work engagement reflects the trend toward positive psychology (Mauno, Kinnunen, & Ruokolainen, 2007). Schaufeli and Bakker (2004, p. 296) define work engagement as "a positive, fulfilling work-related state of mind that is characterised by vigor, dedication, and absorption," which is strongly influenced by job resources. However, the core components of engagement have been established as vigor and dedication (Schaufeli & Taris, 2005).

Previous research findings support two clear psychological processes at work in the job demands-resources model, namely one by means of job demands and the second job resources which, through burnout and en-

agement, affect organizational outcomes such as health and turnover intention (Bakker, Demerouti, Taris, Schaufeli, & Schreurs, 2003; Schaufeli & Bakker, 2004; Bakker & Demerouti, 2007). Bakker and Demerouti (2007, p. 315) collectively coined the two aforementioned processes "the dual process." The processes at work in the dual process are titled the "energetic process" (also known as the health impairment process) and the "motivational process" (Schaufeli & Bakker, 2004, p. 296). In the energetic process, job demands are associated with health problems via burnout. On the other hand, the motivational process connects job resources to positive organizational outcomes (e.g., organizational commitment) through work engagement (Jackson, Rothmann, & van de Vijver, 2006).

High job demands (without adequate job resources to buffer) will lead to fatigue and eventual burnout in employees. Job resources include a motivational potential, which entails that a lack of job resources will have an adverse effect on motivation, which will ultimately result in disengagement. As previously theorised and empirically substantiated, job resources have a negative relationship with burnout, and burnout is negatively related to commitment (cf. Hakanen, Bakker, & Schaufeli, 2006). Xanthopoulou, Bakker, Dollard, Demerouti, Schaufeli, Taris, *et al.* (2007) suggested that the organization's first concern, in the battle to reduce the health impairment process, should be the avoidance of overwhelming job demands on the employee.

#### *South African Context*

Work-related well-being research studies within the South African context have been limited to specific industries and sectors. These studies have included educators in the North West Province (Montgomery, Mostert, & Jackson, 2005; Jackson, *et al.*, 2006), non-professional counselors in South African banks (Fourie, Rothmann, & van de Vijver, 2008), and police members in the North West Province (Mostert & Joubert, 2005; Mostert, Cronje, & Pienaar, 2006; Rothmann & Jorgensen, 2007). All these studies found an adequate fit for proposed models of employee well-being in their investigations.

Rothmann, Mostert, and Strydom (2006) performed a psychometric investigation of the Job Demands-Resources Scale (JD-RS, developed by Jackson & Rothmann, 2005) within the South African context and established significant differences between job resources and job demands in different organizations, also endorsing the idea that organizations have different contextually relevant job resources and demands, as suggested in Bakker and Demerouti (2007).

#### *New Methodology and Best Practice*

Previous job demands-resources model studies all implemented the

Maximum Likelihood (ML) estimator in model investigations. Flora and Curran (2004) stated that statistical methods which assume continuous distributions, such as the ML estimator, are often applied to observed measures with ordinal scales. In these circumstances, there is increased potential of a critical mismatch between the assumptions underlying the statistical model and the empirical characteristics of the data to be analysed. Therefore, even though the ML estimator can be used and will perform well, it is technically not the most suitable estimator when categorical outcomes are being analysed, especially on Likert-type scales that consist of less than five points. Newsom (2012) stated that there is growing consensus that categorical variables should be analysed with the weighted least squares (WLS) approach, i.e., categorical estimators.

Some studies have allowed correlated errors between variables, often between burnout and engagement. The concern with the correlation of error terms is that it creates problems with model interpretation and also increases model fit at the expense of the likelihood of model replication (cf. Smolkowski, 2007). Item parcelling methods, i.e., averaging or summing of item scores, have also been implemented in some studies, and there has been controversy surrounding this practice's ability to increase model fit. The use of parcels leads to *inter alia* fewer data points that have to be fitted and the use of the parcelling strategy with incorrectly specified factor structures can result in failure to reject a miss-specified model, as well as an inability to identify sources of misfit (Bandalos & Finney, 2001; Bandalos, 2002).

Previous studies investigating the mediating effects of burnout and engagement in the dual process all have implemented the classic methods of Baron and Kenny (1986), and the Sobel test. The latter-mentioned mediation tests result in claims of partial or full mediation. However, bootstrapping is considered a more statistically valid and powerful option (MacKinnon, Lockwood, & Williams, 2004; Williams & MacKinnon, 2008; also see Hayes, 2009, for an in-depth discussion). Rucker, Preacher, Tormala, and Petty (2011) advocated that attention in mediation analysis should also be shifted towards the magnitude and significance of indirect effects; even though there is value in total effects, an overemphasis on total effects before or after controlling for a mediator could lead to misleading and even false conclusions. They also addressed concerns regarding claims for partial and full mediation. Although hesitant to attach descriptive labels to quantitative values, Preacher and Kelley (2011) suggested that kappa-squared values should be calculated to interpret in the same light as squared correlation coefficients to describe mediation effect sizes, i.e., using the guidelines of Cohen (1988, pp. 79-81) where small, medium, and large effect sizes are stated as 0.01, 0.09 and 0.25, respectively.

The aforementioned methodological concerns were mostly due to limitations in statistical packages commonly used in the social sciences, and these methodological issues were mostly elucidated after the fact. However, significant advancements have been made and these approaches can now be implemented and rectified with less effort.

The research model of the present study follows the basic premise of the dual process (Schaufeli & Bakker, 2004; Hakanen, *et al.*, 2006). The proposed model of the current investigation is illustrated below (Fig. 1).

The job demands-resources model is capable of comprising various and differing job demands and job resources (Demerouti, *et al.*, 2001) and may be adapted by researchers to fit the context under investigation, i.e., to specify any applicable demands and resources desired to that context (Llorens, Bakker, Schaufeli, & Salanova, 2006). This study attempted to include variables, i.e., demands and resources, that could apply generically to most if not all organizations in different sectors within South Africa. Hence it was decided to only include “work overload” in the job demands variable. Work overload is commonly cited as an organizational stressor (Leiter & Schaufeli, 1996; Hakanen, *et al.*, 2008; Boyd, Bakker, Pignata, Winefield, Gillespie, & Stough, 2011) which leads to exhaustion and negatively influences motivation and even the motivation to deal with demands in other domains (Aryee, Srinivas, & Tan, 2005). Emotional load was not included as a job demand since it has been shown to be more prevalent in specific occupations such as teaching, nursing, and healthcare

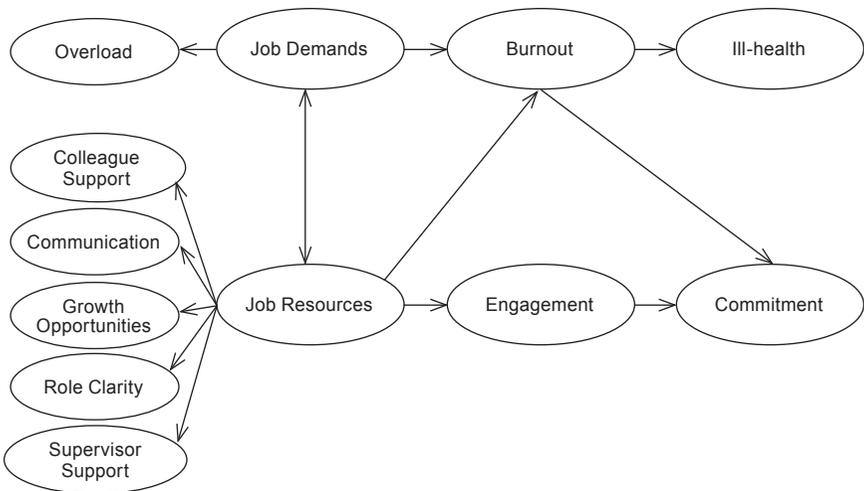


FIG. 1. The research model of the current study.

sectors, but basically is absent in others (cf. Bakker & Demerouti, 2007).

As to which job resources to include in job demands-resources research models, these decisions seem to be arbitrary and there appears to be no official rule sets. However, Bakker and Demerouti (2007) specify that job resources are located at four levels, i.e., the level of the organization at large, the level of interpersonal and social relations, the level of organization of work, and at the task level. Bearing in mind that any number of job resources could be specified in this model, five resources were included—at least one resource from each of the aforementioned, which could apply to the generic organization: supervisor support, colleague support (interpersonal and social relations), role clarity (organization of work), growth opportunities (task level) and communication (organization at large). The following theoretical hypotheses were posed:

Hypothesis 1a: Job resources and job demands will be negatively related. 1b: Job resources will have a negative relationship to burnout. 1c: Burnout will have a negative relationship to organizational commitment.

Hypothesis 2: Burnout mediates the energetic process, i.e., the relationship between job demands and ill-health.

Hypothesis 3: Work engagement mediates the motivational process, i.e., the relationship between job resources and commitment.

## METHOD

### *Research Design*

A cross-sectional design was used to achieve the research objective (Shaughnessy, Zechmeister, & Zechmeister, 2003). Several thousand individual cross-sectional surveys were completed in various projects by employees in different sectors and organizations between January 2008 and November 2010. No individual organization was allowed longer than a three-month period to participate in the data collection process. Therefore, although the data collection stage of this study is indicated as nearly three years in total, it should not be construed that surveys were open to all organizations for the entire period. The individual organizational survey data from each of the organizations were aggregated into one final data set as the project progressed to present the current sample ( $n = 15,633$ ). An organization's survey data was only added to the final data set if the response rate for that specific individual organization was at least 70%. Fortunately this was the case for all organizations and no data had to be rejected. Given the approach of developing a *generic* JD-R model, representation of various organizational contexts is deemed a strong point.

### *Participants*

Individuals from various South African organizations were recruited. Employees of all ages and occupational levels, with the exception of the

academic sector, where respondents were academic lecturers from different faculties, were sampled as part of different employee health and well-being surveys.

This study was conducted among 15,663 employees (see Table 1), 9,697 (62%) men and 5,966 (38%) women. Ages of participants varied from 18 to 65 years (retirement age), where the stratified levels between ages 18 and 49 years were similar in size, i.e., ages 18 to 29 included 4,144 participants, 30 to 39 included 4,414 individuals, and 40 to 49 included 4,341 participants. The participants were mostly married (62%). Concerning education, all levels were captured, but Grade 12 (a formal high school education) was the most prevalent at 7,914 (50.5%), and those participants with a three-year degree / diploma numbered 2,842 (18.1%). The sector that comprised the majority of the sample was the financial sector with 6,371 (41%) participants, followed by the mining (33%) and manu-

TABLE 1  
CHARACTERISTICS OF PARTICIPANTS ( $n = 15,663$ )

Item	Category	Frequency	Percentage (%)
Gender	Male	9,697	61.90
	Female	5,966	38.10
Age	18-20	82	0.50
	20-29	4,064	25.90
	30-39	4,414	28.20
	40-49	4,341	27.70
	50-59	2,324	14.80
	60-65	200	1.30
Race	African	4,334	27.70
	White	5,638	36.00
	Coloured*	609	3.90
	Indian	395	2.50
	Other	12	0.10
Home language	Afrikaans	5,982	38.20
	English	4,652	29.70
	Sepedi	504	3.20
	Sesotho	1,200	7.70
	Setswana	849	5.40
	Siswati	181	1.20
	Tshivenda	112	0.70
	isiZulu	1,018	6.50
	isiNdebele	100	0.60
	isiXhosa	741	4.70
Xitsonga	202	1.30	
Other	121	0.80	

(continued on next page)

\*This is an official term in South Africa, designating citizens of mixed ethnic origin.

TABLE 1 (CONT'D)  
CHARACTERISTICS OF PARTICIPANTS ( $n = 15,663$ )

Item	Category	Frequency	Percentage (%)
Highest qualification	Grade 8	2,003	12.80
	Grade 9	119	0.80
	Grade 10	679	4.30
	Grade 11	299	1.90
	Grade 12	7,914	50.50
	3-year degree/diploma	2,842	18.10
	4-year degree/diploma	1,075	6.90
	Master's Degree	659	4.20
	Doctoral Degree	70	0.40
Province	Gauteng	7,390	47.20
	Mpumalanga	2,293	14.60
	North West Province	3,171	20.20
	Limpopo	143	0.90
	Free State	887	5.70
	Northern Cape	74	0.50
	Western Cape	691	4.40
	Eastern Cape	343	2.20
	KwaZulu-Natal	630	4.00
Sector	Academic	94	0.60
	Call centres	150	1.00
	Financial	6,371	40.70
	Government	263	1.0
	Manufacturing	3,466	22.10
	Mining	5,197	33.20
	Other	122	0.80

facturing (22%) sectors. The Gauteng province had the most respondents with a total of 7,390 (47.2%), which was to be expected seeing that the Gauteng province is the economic centre of the country and the most densely populated. Second to the Gauteng province was the North West Province with 3,171 respondents, and the most under-represented province was the Northern Cape with 74 individuals (0.5%, also the least densely populated).

#### Measures

*Survey.*—The South African Employee Health and Wellness Survey (SAEHWS) was developed as a web-based, or paper-and-pencil, self-administered survey to be applied in employee health and well-being assessments due to the need for a context-specific tool. The SAEHWS fuses organizational climate assessment with other important variables influencing the climate in order to achieve maximum management information while implementing one measurement/assessment only (Rothmann & Roth-

mann, 2007). The internal consistency of all the subscales of the SAEHWS is acceptable (i.e.,  $\alpha \geq 0.70$ ; Nunnally & Bernstein, 1994). Within the South African context, the SAEHWS has also been used in other studies (cross-sectional and longitudinal) with acceptable alpha coefficients and correlation results adding to the reliability and validity of its use (Niemand, 2008; van Wyk, 2008; Van Schalkwyk, Els, & Rothmann, Jr., 2011; de Beer, 2012).

*Subscales.*—In line with Schaufeli and Taris (2005), Burnout ( $\alpha = .81$ ) was measured by its two core components: Exhaustion and Mental distance (cynicism). Exhaustion ( $\alpha = .83$ ) has four items, e.g., “I feel tired before I arrive at work”; Mental distance (Cynicism;  $\alpha = .79$ ) has four items, e.g., “I am uncertain whether my work is important”; Overload as Job demand ( $\alpha = .79$ ) has four items, e.g., “Do you have too much work to do?” Job resources by Supervisor support ( $\alpha = .84$ ) has three items, e.g., “Can you count on your direct supervisor when you come across difficulties in your work?” Colleague support ( $\alpha = .74$ ) has three items, e.g., “Can you count on your colleagues when you come across difficulties in your work?” Role clarity ( $\alpha = .70$ ) has three items, e.g., “Do you know exactly what your responsibilities are?” Communication ( $\alpha = .81$ ) has three items, e.g., “Is it clear to you who you should address within the department/organization for specific problems?” Growth opportunities ( $\alpha = .75$ ) has three items, e.g., “Does your job offer you opportunities for personal growth and development?” Ill-health ( $\alpha = .90$ ) has eight items, e.g., “Over the last three months how often have you experienced any of the following symptoms or changes in behaviour:” Commitment ( $\alpha = .91$ ) has five items, e.g., “I feel a strong sense of belonging to my organization.” Work engagement ( $\alpha = .89$ ) has seven items (three vigor and four dedication items), e.g., “I am full of energy in my work” (Vigor) and “I find my work full of meaning and purpose” (Dedication). Concerning the ordinal scales, the job resources and job demands items were measured on 4-point Likert-type scales with anchors 1: Never and 4: Always. Commitment, burnout, and engagement items were measured on 6-point Likert-type scales, with anchors 1: Never and 6: Always. Ill-health items were measured on a 4-point Likert-type scale with anchors 1: Never and 4: Frequently.

#### *Statistical Analyses*

Structural equation modelling methods, as implemented by Mplus 6.1 (Muthén & Muthén, 2008-2010), were used for data analyses. Mplus was chosen because of its unique ability to specify continuous and/or categorical latent variables in model investigations. The default estimator for models that contain categorical outcomes in Mplus is the mean and variance-adjusted weighted least-squares method (WLSMV; Muthén, du Toit, & Spisic, 1997; Muthén & Muthén, 2008-2010), a categori-

cal estimator. The input type was the covariance matrix. Item parcelling methods were not implemented, implying that the observed variables were the items in the survey. The items were used to create latent variables in the measurement model and higher order latent variables were then created, e.g., job resources.

As mentioned previously, the correlation of error terms would not be allowed in this investigation to increase model fit. The following fit indices were considered: Comparative Fit Index (CFI), Tucker-Lewis Index (TLI) and the Root Mean Square Error of Approximation (RMSEA). For the CFI and TLI, acceptable fit is considered at a value of 0.90 and above (Hoyle, 1995). According to Cudeck and Browne (1993), for the RMSEA, a value of 0.05 or less indicates a good fit, but values of 0.08 and less are also to be considered an acceptable model fit. However, the above cut-off points should only be considered to be rough guidelines (see Marsh, 2007 and Marsh, Hau, al& Grayson, 2005 for more information concerning the latter).

To investigate the theoretical paths of Hypothesis 1, the standardised path coefficient sizes and their significance were considered and reported. To investigate the significance of Hypotheses 2 and 3's indirect effects, the *model indirect* function of Mplus was used with the bootstrapping re-sampling option enabled and set to 2,000 samples; typically this value is set to at least 1,000 (Hayes, 2009); bias-corrected 95% confidence intervals were also reported (Shrout & Bolger, 2002). The categorical estimator, WLSMV, was also used for the bootstrapping analyses. Furthermore, in line with suggestions from Preacher and Kelley (2011),  $\kappa^2$  (kappa-squared) values were calculated to assist in establishing a basis to help communicate the magnitude of the mediating effect sizes.<sup>2</sup>

## RESULTS

The research model was specified, as well as all variables set as *categorical* in Mplus, and the model was found to fit the data acceptably. The CFI (0.92) and TLI (0.92) surpassed the rule of thumb of 0.90 for an indication of good model fit (Hoyle, 1995). Furthermore, the RMSEA value of 0.06 is below the guideline of 0.08, which confirmed an acceptable model fit (Cudeck & Browne, 1993). Table 2 shows the correlational statistics of the latent variables in the total sample.

The correlation table shows a negative correlation between all the

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<sup>2</sup>Preacher and Kelley developed easy-to-use R functions to assist in calculating effect sizes, with the MBESS (Kelley & Lai, 2010; Kelley, 2007a, 2007b) R package (R Development Core Team, 2010). However, calculations with latent variables were not yet possible. Due to this specific limitation and current limitations of other statistical software packages in this regard, the  $\kappa^2$  values had to be calculated "by hand." Subsequently, one of the authors of *this* article created a public online calculator to calculate  $\kappa^2$  values—interested parties can see Rothmann, Jr. (2011) for more information.

TABLE 2  
ZERO-ORDER PEARSON CORRELATION MATRIX ( $r$ ) OF THE LATENT VARIABLES ( $n = 15,633$ )

Variable	$r$											
	1	2	3	4	5	6	7	8	9	10	11	
1. Job demands												
2. Growth opportunity	-.13											
3. Supervisor support	-.12	.56										
4. Colleague support	-.10	.47	.46									
5. Role clarity	-.13	.58	.57	.48								
6. Communication	-.12	.55	.54	.45	.56							
7. Job resources	-.17	.76	.75	.62	.77	.72						
8. Burnout	.42	-.63	-.62	-.52	-.64	-.60	-.83					
9. Engagement	-.14	.65	.64	.53	.66	.62	.85	-.71				
10. Ill-health	.31	-.46	-.45	-.38	-.47	-.44	-.61	.73	-.52			
11. Commitment	-.14	.42	.42	.35	.43	.40	.56	-.52	.61	-.38		

Note.— $p < .001$  for all correlations.

measured job resources (growth opportunities, supervisor and colleague support, role clarity, and communication) and the indicator of job demands (overload). Moreover, job demands correlated positively with both burnout and ill-health. Also, engagement and commitment correlated negatively with demands.

The results indicated the following regarding the paths investigated in relation to Hypothesis 1 (see Fig. 2). Hypothesis 1a showed that a negative relationship exists between job demands and job resources ( $\beta = -0.17$ ,  $p < .001$ ). The negative relationship between job resources and burnout was significant (Hypothesis 1b:  $\beta = -0.79$ ;  $p < .001$ ). Furthermore, the negative relationship between burnout and organizational commitment (Hypothesis 1c) was also supported ( $\beta = -0.18$ ;  $p < .001$ ). Other significant considerations were the dual process paths: for the energetic process, job demands to burnout ( $\beta = 0.29$ ;  $p < .001$ ), and burnout to ill-health ( $\beta = 0.73$ ;  $p < .001$ ); for the motivational process, job resources to engagement ( $\beta = 0.85$ ;  $p < .001$ ), and engagement to commitment ( $\beta = 0.48$ ;  $p < .001$ ).

Hypothesis 2 was supported: burnout mediated the relationship of job demands and ill-health with an indirect effect of 0.25 ( $p < .001$ ; 95%CI = 0.20, 0.23). Similarly, Hypothesis 3 was also supported, i.e., engagement mediated the relationship between job resources and commitment with an indirect effect of 0.56 ( $p < .001$ ; 95%CI = 0.39, 0.44). The  $\kappa^2$  value for the mediating effect of engagement between job resources and commitment was calculated to be  $\kappa^2 = 0.26$  (a large effect), and a value of  $\kappa^2 = 0.23$  (a medium effect) for the mediating effect of burnout between job demands and ill-health.

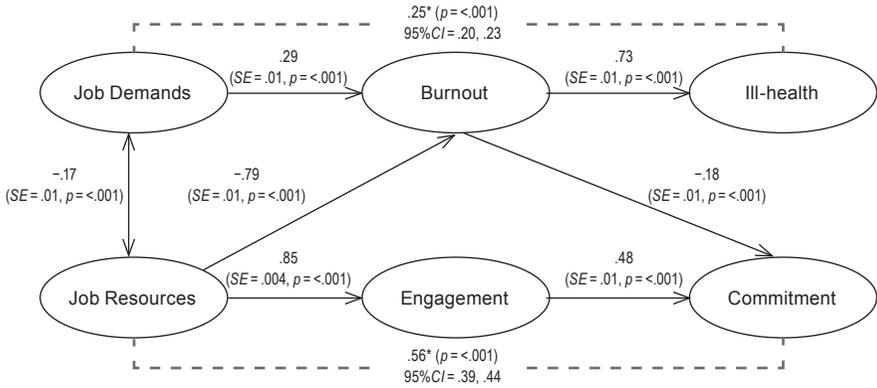


FIG. 2. The research model with standardized path coefficients and indirect effects.  $\chi^2 = 61721.99$ ; CFI = .92; TLI = .92; RMSEA = .06.\*Indirect effect with bootstrapped 95% Confidence intervals.

DISCUSSION

The current study investigated a strictly confirmatory scenario of a job demands-resources (JD-R) model (Bakker, *et al.*, 2003; Demerouti, *et al.*, 2001; Hakanen, *et al.*, 2006; Schaufeli & Bakker, 2004), specifically following the premise of the dual process and whether it can be found to apply to the South African context with a large sample aggregated from different sectors. The specified model fit the data set well. This research followed a conservative empirical approach and implemented newly suggested mediation practices. Therefore this appears to be the first study to use a categorical estimator (i.e., WLSMV), no correlation of error terms, and no item parcelling methods in research investigating a job demands-resources model. This presents a unique contribution to the existing literature in that it also establishes a job demands-resources model with this methodology, which adds to the robustness also of the theoretical model.

The various path relationships were all supported and found to be similar to paths in other research on the job demands-resources model (cf. Demerouti, *et al.* 2001; Schaufeli & Bakker, 2004; Hakanen, *et al.*, 2006; Bakker & Demerouti, 2007). The clearest of the relationships to emerge from *this* study were the negative relationship between job resources and burnout, and the positive relationship between job resources and engagement. The relationship between burnout and ill-health was also supported. As in previous studies, evidence was also found for the buffering effect between job resources and job demands (cf. Hakanen, *et al.*, 2006; Schaufeli & Bakker, 2004).

Furthermore, in line with suggestions from Rucker, *et al.* (2011) and

Preacher and Kelley (2011), the mediating effects of both burnout and engagement were confirmed, and their respective effect sizes from *this* study can be reported as a “medium effect” (burnout) and a “large effect” (engagement). Other studies have also found evidence for these mediating effects with other methods (cf. Schaufeli & Bakker, 2004; Hakanen, *et al.*, 2006; Llorens, *et al.*, 2006). These results provide evidence for the dual process within the South African context, and provide descriptive effect-size labels, by means of kappa-squared values, for the mediating factors for the first time in any context.

Based on these results, job resources was shown to be an important variable associated with higher engagement and reduced burnout, resulting in more favourable health as well as more favourable organizational commitment. According to Xanthopoulou, *et al.* (2007), reducing overwhelming job demands to obviate the health impairment process should be a primary focus of the organization.

The most apparent limitation of this study is its cross-sectional design. Hence it is generally advised that causality should not be inferred. However, other research studies have tested the JD-R model longitudinally and found favourable results (see Hakanen, Schaufeli, & Ahola, 2008; Boyd, *et al.* 2011). Such a longitudinal investigation should also be performed within the South African context.

A further limitation of this study is that it made use of self-reports that were conducted by computerised design—a practice which evokes the possibility of common method variance or systematic bias. It is advised that future studies aim to gather objective data in conjunction with the self-report survey, such as absenteeism, leave days, work performance, and information on physical health status. Prospective studies could also investigate the predictive ability of this model with regard to objective physical ill-health conditions or self-reported stress-related symptoms. Future studies should also focus on equivalence testing of this model, specifically pertaining to factors such as gender, sector and language group.

Management can investigate the job demands-resources model in their work contexts via well-designed surveys or questionnaires, and then ascertain the work stress climate in their organizations. The results would indicate the state of employee well-being, namely which demands and which resources (or lack thereof) play the major roles. Industrial and organizational psychologists or similar professionals within the organization could devise interventions based on the results to rectify any imbalances and as such address the job demands and resources in attempts to increase engagement and decrease burnout in order to avoid psychological and physical ill-health outcomes. Furthermore, management could build on the positives in the organizational climate, i.e., those job resources that are working well,

and optimize those to reduce strain and promote engagement and eventual positive organizational outcomes such as commitment.

## REFERENCES

- ARYEE, S., SRINIVAS, E. S., & TAN, H. H., (2005) Rhythms of life: antecedents and outcomes of work–family balance in employed parents. *Journal of Applied Psychology*, 90, 132-146.
- BAKKER, A. B., & DEMEROUTI, E. (2007) The Job Demands-Resources model: state of the art. *Journal of Managerial Psychology*, 22, 309-328.
- 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., TARIS, T., SCHAUFELI, W. B., & SCHREURS, P. (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., 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.
- BANDALOS, D. L. (2002) The effects of item parceling on goodness-of-fit and parameter estimate bias in structural equation modeling. *Educational Psychology Papers and Publications*. Retrieved from <http://digitalcommons.unl.edu/edpsychpapers/65>.
- BANDALOS, D. L., & FINNEY, S. J. (2001) Item parceling issues in structural equation modeling. In G. A. Marcoulides & R. E. Schumacker (Eds.), *Advanced structural equation modeling: new developments and techniques*. Mahwah, NJ: Erlbaum.
- BARON, R. M., & KENNY, D. A. (1986) The moderator-mediator distinction in social psychological research: conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, 51, 1173-1182.
- 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.
- BURKE, R. J., & RICHARDSEN, A. M. (1993) Psychological burnout in organizations. In R. T. Golembiewski (Ed.), *Handbook of organizational behaviour*. New York: Marcel Dekker. Pp. 263-299.
- COHEN, J. (1988) *Statistical power analysis for the behavioral sciences*. (2nd ed.) New York: Academic Press.
- CUDECK, R., & BROWNE, M. W. (1993) Alternative ways of assessing model fit. In K.A. Bollen & J. Scott Long (Eds.), *Testing structural equation models*. Newbury Park, CA: Sage.
- DE BEER, L. T. (2012) Job demands-resources theory, health, and well-being in South Africa. Unpublished manuscript, North-West University, Potchefstroom, South Africa.
- 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.
- FLORA, D. B., & CURRAN, P. J. (2004) An empirical evaluation of alternative methods of estimation for confirmatory factor analysis with ordinal data. *Psychological Methods*, 9, 466-491.
- FOURIE, L., ROTHMANN, S., & VAN DE VIJVER, A. J. R. (2008) A model of work wellness for non-professional counsellors in South Africa. *Stress and Health*, 24, 35-47.

- FRENCH, J. R. P., JR., KAPLAN, R. D., & HARRISON, R. V. (1982) *The mechanisms of job stress and strain*. Chichester: Wiley.
- HAKANEN, J., BAKKER, A. B., & SCHAUFELI, W. B. (2006) Burnout and work engagement among teachers. *The Journal of School Psychology*, 43, 495-513.
- 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.
- HAYES, A. F. (2009) Beyond Baron and Kenny: statistical mediation analysis in the new millennium. *Communication Monographs*, 76, 408-420.
- HOYLE, R. H. (1995) The structural equation modeling approach: basic concepts and fundamental issues. In R. H. Hoyle (Ed.), *Structural equation modeling, concepts, issues, and applications*. Thousand Oaks, CA: Sage. Pp. 1-15.
- JACKSON, L. T. B., & ROTHMANN, S. (2005) Work-related well-being of teachers in a district of the North West Province. *Perspectives in Education*, 23, 107-122.
- JACKSON, L. T. B., ROTHMANN, S., & VAN DE VIJVER, A. J. R. (2006) A model of work-related well-being for educators in South Africa. *Stress and Health*, 22, 263-274.
- KARASEK, R. A. (1979) Job demand, job decision latitude, and mental strain: implications for job redesign. *Administrative Science Quarterly*, 24, 285-308.
- KELLEY, K. (2007a) Confidence intervals for standardized effect sizes: theory, application, and implementation. *Journal of Statistical Software*, 20, 1-24.
- KELLEY, K. (2007b) Methods for the behavioral, educational, and social sciences: an R package. *Behavior Research Methods*, 39, 979-984.
- KELLEY, K., & LAI, K. (2010) *MBESS (Version 3.2.0)*. Retrieved from <http://www.cran.r-project.org/>. [Computer software and manual]
- LEITER, M. P., & SCHAUFELI, W. B. (1996) Consistency of the burnout construct across occupations. *Anxiety, Stress, and Coping*, 9, 229-243.
- LLORENS, S., BAKKER, A. B., SCHAUFELI, W., & SALANOVA, M. (2006) Testing the robustness of the job demands-resources model. *International Journal of Stress Management*, 13, 378-391.
- MACKINNON, D. P., LOCKWOOD, C. M., & WILLIAMS, J. (2004) Confidence limits for the indirect effect: distribution of the product and resampling methods. *Multivariate Behavioral Research*, 39, 99-128.
- MARSH, H. W. (2007) Application of confirmatory factor analysis and structural equation modeling in sport/exercise psychology. In G. Tenenbaum & R. C. Eklund (Eds.), *Handbook of sport psychology* (3rd ed.). New York: Wiley. Pp. 774-798.
- MARSH, H. W., HAU, K. T., & GRAYSON, D. (2005) Goodness-of-fit Evaluation in Structural Equation Modeling. In A. Maydeu-Olivares & J. McCardle (Eds.), *Contemporary psychometrics: a Festschrift to Roderick P. McDonald*. Hillsdale, NJ: Erlbaum. Pp. 225-340.
- MAUNO, S., KINNUNEN, U., & RUOKOLAINEN, M. (2007) Job demands and job resources as antecedents of work engagement: a longitudinal study. *Journal of Vocational Behavior*, 70, 149-171.
- MONTGOMERY, A., MOSTERT, K., & JACKSON, L. T. B. (2005) Burnout and health of primary school educators in the North West Province. *South African Journal of Education*, 25, 266-272.
- MOSTERT, K., CRONJE, S., & PIENAAR, J. (2006) Job resources, work engagement, and the mediating role of positive work-home interaction of police officers in the North West Province. *Acta Criminologica*, 19, 64-87.

- MOSTERT, K., & JOUBERT, A. F. (2005) Job stress, burnout, and coping strategies in the South African Police Service. *South African Journal of Economic and Management Sciences*, 8, 39-53.
- MUTHÉN, B., DU TOIT, S. H. C., & SPISIC, D. (1997) Robust inference using weighted least squares and quadratic estimating equations in latent variable modeling with categorical and continuous outcomes. Accepted for publication in *Psychometrika*.
- MUTHÉN, L. K., & MUTHÉN, B. O. (1998–2010) *Mplus user's guide*. (6th ed.) Los Angeles: Muthén & Muthén.
- NEWSOM, J. (2012) *Practical approaches to dealing with nonnormal and categorical variables*. Retrieved April 8, 2012 from [http://www.upa.pdx.edu/IOA/newsom/semclass/ho\\_estimate2.pdf](http://www.upa.pdx.edu/IOA/newsom/semclass/ho_estimate2.pdf).
- NIEMAND, Y. (2008) A model of work-related well-being in the chemical industry. Unpublished master's dissertation, North-West University, Potchefstroom, South Africa.
- NUNNALLY, J. C., & BERNSTEIN, I. H. (1994) *Psychometric theory*. (3rd ed.) New York: McGraw-Hill.
- PREACHER, K. J., & KELLEY, K. (2011) Effect sizes measures for mediation models: quantitative strategies for communicating indirect effects. *Psychological Methods*, 16, 93-115.
- R DEVELOPMENT CORE TEAM. (2010) *R: a language and environment for statistical computing*. Vienna, Austria: Author.
- ROTHMANN, S. (2002) Burnout and engagement: a fortigenic perspective. Inaugural lecture presented at the North-West University, Potchefstroom.
- ROTHMANN, S., JR. (2011) *Kappa-squared: mediation effect size*. Retrieved August 11, 2011, from <http://stats.myresearchsurvey.com/kappasquared/>.
- ROTHMANN, S., & JORGENSEN, L. (2007) A model of work-related well-being for police members in the North West Province. *Acta Criminologica*, 20, 73-84.
- ROTHMANN, S., MOSTERT, K., & STRYDOM, M. (2006) A psychometric evaluation of the job demands-resources scale in South Africa. *South African Journal of Industrial Psychology*, 32, 76-86.
- ROTHMANN, S., & ROTHMANN, J. C. (2007) *The South African Employee Health and Wellness Survey (SAEHWS): user manual*. (4th ed.) Potchefstroom, South Africa: Afriforte.
- RUCKER, D. D., PREACHER, K. J., TORMALA, Z. L., & PETTY, R. E. (2011) Mediation analysis in social psychology: current practices and new recommendations. *Social and Personality Psychology Compass*, 5/6, 359-371.
- 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 Behaviour*, 25, 293-315.
- SCHAUFELI, W. B., & ENZMANN, D. (1998) *The burnout companion to study and practice: a critical analysis*. London: Taylor & Francis.
- SCHAUFELI, W. B., & TARIS, T. W. (2005) The conceptualization and measurement of burnout: common ground and worlds apart. *Work & Stress*, 19, 256-262.
- SHAUGHNESSY, J. J., ZECHMEISTER, E. B., & ZECHMEISTER, J. S. (2003) *Research methods in psychology*. (6th ed.) New York: McGraw-Hill.
- SHROUT, P. E., & BOLGER, N. (2002) Mediation in experimental and nonexperimental studies: new procedures and recommendations. *Psychological Methods*, 7, 422-445.
- SIEGRIST, J. (1996) Adverse health effects of high effort-low reward conditions at work. *Journal of Occupational Health Psychology*, 1, 27-43.

- SMOLKOWSKI, K. (2007) *Correlated Errors in CFA and SEM Models*. Retrieved July 13, 2011, from [http://www.ori.org/~keiths/Files/Tips/Stats\\_SEMErrorCorrs.html](http://www.ori.org/~keiths/Files/Tips/Stats_SEMErrorCorrs.html).
- VAN SCHALKWYK, L., ELS, C., & ROTHMANN, S., JR. (2011) The moderating role of perceived organisational support in the relationship between workplace bullying and turnover intention across sectors in South Africa. *South Africa Journal of Human Resource Management*, 9, 1-13.
- VAN VEGCHEL, N., DE JONGE, J., BOSMA, H., & SCHAUFELI, W. B. (2005) Reviewing the effort-reward imbalance model: drawing up the balance of 45 empirical studies. *Social Science and Medicine*, 60, 1117-1131.
- VAN WYK, A. (2008) Work wellness, absenteeism and productivity in a call centre in the insurance industry. Unpublished master's thesis, North-West University, Potchefstroom, South Africa.
- WILLIAMS, J., & MACINNON, D. P. (2008) Resampling and distribution of the product methods for testing indirect effects in complex models. *Structural Equation Modeling*, 15, 23-51.
- WRIGHT, T. A., & HOBFOLL, S. E. (2004) Commitment, psychological well-being and job performance: an examination of conservation of resources (COR) theory and job burnout. *Journal of Business and Management*, 9, 389-406.
- XANTHOPOULOU, D., BAKKER, A. B., DOLLARD, M. F., DEMEROUTI, E., SCHAUFELI, W. B., TARIS, T. W., & SCHREURS, P. J. G. (2007) When do job demands particularly predict burnout? The moderating role of job resources. *Journal of Managerial Psychology*, 22, 766-786.

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