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MEASURING POSITIVE AND NEGATIVE OCCUPATIONAL STATES AT WORK: A STRUCTURAL AND DIFFERENTIAL ITEM FUNCTIONING ANALYSIS

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This article reports on the structural validation of the Positive and Negative Occupational States Inventory, which measures positive and negative states at work. The first aim was to check for the impact of item wording. The second aim was to check for interactions between items and gender or age. More than 31,000 data collected in 63 Belgian and French companies were used. Results of structural equation show that meaning better represents the tool structure than wording, at least for the negative occupational state. Results of differential item functioning analyses show that gender and age have no impact on workers' answers. It is concluded that future studies should check for the impact of initial NOSI and POSI levels. Future studies should also examine reciprocal relationships between working conditions on the one hand and NOSI and POSI on the other.

Keywords: wellbeing at work, validation, structural equation modelling, differential item functioning

With the development of positive psychology, occupational psychologists have been interested not only in workers negative reactions to work situations (stress or health problems for example), but also in positive ones, such as work motivation or engagement. As an illustration, the Job Demands-

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Resources (JDR) model (Bakker & Demerouti, 2007; Schaufeli & Bakker, 2004) considers positive and negative work experiences (work engagement and burnout) as distinct reactions occurring in distinct work situations. On the one hand, high job demands combined with a lack of job resources would facilitate the development of burnout and negative outcomes such as health problems. On the other hand, the presence of job resources would be associated with job engagement and positive outcomes such as a low intention to leave the organization. According to the JDR model, such positive and negative work reactions have distinct antecedents and consequences, and therefore they must be measured with different items (Schaufeli, Salanova, Gonzalez-Roma & Bakker, 2002). The aim of our study is to complete the validation process of the Positive and Negative Occupational States Inventory (PNOSI), a new tool measuring positive and negative workers' reactions to their working environment. We will first check for the impact of item wording on factorial structure. We will then check for gender and age impact on workers' answers.

The Positive and Negative Occupational States Inventory

Between 1999 and 2003, our research unit collaborated within a research program investigating the "Flexihealth" concept (Vandenberghe, De Keyser, Vlerick & D'hoore, 2004), at the end of which the PNOSI was elaborated (Hansez, Grisard & De Keyser, 2004). This inventory was designed to measure both positive and negative states at work with separate items. De Keyser and Hansez (1996) and Hansez (2008) define occupational stress as the response of workers facing demands that they feel they have to manage but for which they doubt that necessary resources are available. We consider this type of response as negative occupational state (NOSI). On the contrary, we define positive occupational state (POSI) as the response of workers facing demands that they feel they have to manage and for which they perceive necessary resources are available.

The idea that different types of stressors lead to different experiences at work is developed by Podsakoff, LePine and LePine (2007), who distinguish between hindrance and challenge stressors. Hindrance stressors are obstacles or constraints to workers personal growth and work-related accomplishment. Challenge stressors promote workers personal development and achievement. Both are related to job strain, but hindrance stressors elicit negative affective and behavioural responses, whereas challenge stressors are also associated to positive affective and behavioural responses. More specifically, in their meta-analysis, the authors have found that hindrance stressors are positively related to job strain and withdrawal behaviours such as absenteeism or intended and actual turnover. Hindrance stressors are also negatively related to job satisfaction and organizational commitment. Challenge stressors were also positively related to job strain, but they were positively associated with job satisfaction and organizational commitment, and negatively associated with intended and actual turnover.

The PNOSI has been of large use for diagnostic purposes in French-speaking countries (especially Belgium and France), collecting more than 30,000 data from diverse occupational fields such as veterinary practice, farming, informatics, printing, pharmaceutics, and the energy, public or health care sectors (Bertrand, Peters, Perée & Hansez, 2010; Hansez, Bracci & Bertrand, 2007; Hansez & Chmiel, 2010; Hansez, Schins & Rollin, 2008). A recent study of Barbier, Peters & Hansez (2009) has confirmed the two-factor structure of the PNOSI. The tool is composed of one factor measuring NOSI and another factor measuring POSI. This structure has been replicated on several samples coming from diverse Belgian and French companies active in different areas. The study of Barbier et al. (2009) has also shown that NOSI is distinct from burnout. According to Demerouti, Bakker, Nachreiner and Ebbinghaus (2002), "whereas short-term effects of strain develop as an immediate reaction to specific work conditions… , burnout will develop only after repeated, prolonged, and unsuccessful confrontation with such conditions" (p.426). According to the study of Barbier et al. (2009), NOSI can be considered as an intermediate state occurring before burnout. The second scale, POSI, seems to be conceptually equivalent to engagement. Engagement at work is defined as a persistent, positive and satisfying state of mind linked to work (Schaufeli et al., 2002). It can be considered as an "assumption of 'optimal functioning' at work in terms of well-being" (Hallberg & Schaufeli, 2006, p.120). According to the study of Barbier et al. (2009), POSI can be considered as an alternative measurement for engagement.

Even if PNOSI's structure has been validated and replicated, it suffers from one main criticism relating to item wording. More specifically, all NOSI items are negatively worded whereas all POSI items are positively worded. According to Anastasi (1988), one-side worded scales are not as psychometrically valid as scales including both positively and negatively worded items. Such scales can lead to response bias and thus biased solutions in which positively and negatively worded items are likely to load on separate factors (Doty & Glick, 1998). In consequence, it might be that this two-dimensional structure is an artifact reflecting item wording rather than "true" content. The first aim of our study is to address this shortcoming. In that order, we created new items. Half of them were positively worded and supposed to measure NOSI, whereas the remaining half were negatively worded and supposed to measure POSI. In doing so, each subscale comprises items that are positively and negatively worded. We expected the PNOSI two-factor structure to reflect the "true" item content rather than item wording. More specifically, we expect that:

Hypothesis 1: Items will load more strongly on factors defined based on content (NOSI/POSI) than on factors defined based on wording (positive/negative).

The second aim of our study is to check whether gender and age interact with POSI and NOSI items. According to Hungi (2005), an important part of a tool evaluation lies in checking for bias towards some subgroups of the population to which the test is administered. It is expected that individuals having the same level of a trait or ability will show the same probability of choosing a similar answer, irrespective of the particular subgroups to which they belong. When individuals of different groups share the same level on a given construct but have different probabilities of endorsing one item measuring that construct, then the item is said to show differential item functioning (DIF)(Mitchelson, Wicher, LeBreton & Craig, 2009).

It is well known that some subgroups of workers are at risks in terms of stress. It is notably the case for women (De Keyser & Hansez, 2002). De Smet et al. (2005) investigated gender differences in stress at work at a European level. They show that men perceive less psychological demands and more job control than women. Moreover, job stress and reported stress symptoms are more prevalent among women than among men. In Belgium, according to the third Belstress study (Kittel, Godin, Clays & De Baker, 2008), Belgian working women aged between 30 and 55 showed higher levels of strain than working men of the same age. Another variable that should be taken into account is age. Some studies report that stress is more frequently reported by older than by younger workers (Griffiths, 1999; Poelmans, Compernolle, De Neve, Buelens & Rombouts, 1999), whereas others argue that age, and the associated experience, might act as a buffer against work stressors, with coping being more efficient as workers get older (Jex, 1998). Randall (2007) also found burnout to be negatively correlated with age. Thus, theoretical and empirical facts do not establish clear relations between stress and age. In one of their study, Bertrand et al. (2010) summarize that older workers do not experience more difficulties at work than younger workers, excepted in situations where they lack resources to satisfy demands they encounter. This kind of situation clearly corresponds to our definition of NOSI. Concerning POSI, Schaufeli and Salanova (2007) report that men show slightly better engagement than women, but the difference is very weak and hardly bears any practical meaning. They also report studies showing that engagement is positively correlated with age and tends to get higher as workers get older. However, this correlation hardly goes beyond .15 and might be interpreted in terms of "healthy worker effect". Engagement and POSI being very close concepts, we can suppose relations between POSI on the one hand and gender and age on the other will parallel relations between engagement and gender and age.

Results of previous empirical studies suggest that workers would exhibit different levels of NOSI, but not of POSI, according to their gender and age. Our question then is whether this difference reflects a "true" difference in levels or whether it is linked to a differential functioning of some items among gender and age groups. Based on what we developed, we hypothesize that gender and age would interact with NOSI items but not with POSI items. More specifically, we formulate:

Hypothesis 2a: Gender will interact with NOSI items.
Hypothesis 2b: Gender will not interact with POSI items.
Hypothesis 3a: Age will interact with NOSI items.
Hypothesis 3b: Age will not interact with POSI items.

Method

Sample

Sample 1 was composed of data collected in 2010 in a French company active in the production sector ($N = 827$). It was used to check for the impact of item wording on PNOSI structure. It counted 644 men (77.87%) and 181 women (21.89%). Gender information was not provided for 2 cases (0.24%). Concerning age, 39 workers were younger than 25 (4.72%), 272 were aged between 25 and 35 (32.89%), 194 were aged between 36 and 45 (23.46%), 250 were aged between 46 and 55 (30.23%) and 71 were older than 55 (8.59%). Age information was not provided for 1 case (0.12%). Missing data in PNOSI items were replaced with item median.

Sample 2 was composed of data collected in 62 Belgian and French companies between 2003 and 2008 ($N = 31{,}185$). It was used to check for the impact of gender and age on workers' responses. Men and women were equally represented ($n = 15{,}606$, 50.04% and $n = 15{,}391$, 49.35%, respectively). Gender information was not provided for 188 cases (.60%) Concerning age, 1,851 workers were younger than 25 (5.94%); 7,008 were aged between 25 and 35 (22.47%); 8,827 were between 36 and 45 (28.31%); 8,135 were between 46 and 55 (26.09%) and 2,355 were older than 55 (9.65%). Age information was not provided for 3,009 cases (9.65%).

Measure

The *PNOSI* was administered in both samples as part of a larger questionnaire. It consists of 17 first singular pronoun formulated items (Barbier et al., 2009). Eight are formulated to tap positive work reactions, what we call Positive Occupational State or POSI (e.g. "I am very active at work"). The nine remaining items are formulated to tap negative work reactions, what we call Negative Occupational State or NOSI (e.g. "I feel demoralized by my work"). Workers are asked to indicate how they felt at work the last seven days, so the tool addresses short term reactions. Answers are made on four-point Likert scales (1 = never or rarely; 2 = from time to time; 3 = regularly; 4 = nearly always or always). In order to check for the impact of item wording on the tool structure, eight additional items were created. They were selected from a first version of the PNOSI. This first version counted 34 items, 15 of them had been deleted after factor analyses (for more details on PNOSI development, see Barbier et al., 2009). Among those 15 items, we selected the four highest loadings on NOSI factor, and rephrased them in a positive way. Similarly, we selected the four highest loadings on POSI factor and rephrased them in a negative way. Thus, among the eight new items, four are positively worded and supposed to measure NOSI ("I feel I have a lot of resources to face my workday", "I am able to structure my thoughts at work", "I have peaceful relationships with my colleagues" and "I feel relaxed at work"). The four remaining are negatively worded and supposed to measure POSI ("I don't feel able to cope with challenges at work", "I have difficulties to concentrate at work", "I lack enthusiasm at work" and "I have difficulties to start my workday"). In this way, and contrary to the previous version, each subscale contains both positively and negatively worded items. The new items were only administered in sample1. NOSI positive items are reverse-coded, whereas POSI negative items are reverse-coded.

Questionnaires were sent in French. Means, standard deviations and Cronbach α in sample 1 and sample 2 are provided in table 1.

Table 1

Means, Standard Deviations and Cronbach α

	Sample 1			Sample 2		
	Mean	**SD**	**α**	**Mean**	**SD**	**α**
NOSI	1.93	.47	.86	1.74	.54	.86
POSI	2.92	.49	.85	2.77	.58	.84

Analyses

A structural equation modeling (SEM) analysis was conducted to check for the impact of item wording on PNOSI structure. This kind of analysis compares the covariance matrix obtained from the data with a covariance matrix implied by a theoretical model. It gives an evaluation of how well the theoretical model fits the original data: the less discrepancy between the two matrices, the best the fit.

SEM analysis was performed using Lisrel 8.80 (Jöreskog & Sörbom, 2006). We defined one single model in which each item was allowed to load on two of four different latent factors. Latent factors were defined either based on meaning (NOSI, POSI) or based on wording (negative, positive). All NOSI and POSI items loaded respectively on latent NOSI and POSI factors, irrespective of their wording. Moreover, all positive and negative items also loaded respectively on positive and negative latent factors, irrespective of their meaning. In other words, negatively worded NOSI items loaded on NOSI and also on negative latent factors. Positively worded NOSI items loaded on NOSI and also on positive latent factors. Positively worded POSI items loaded on POSI and also on positive latent factors. Negatively worded POSI items loaded on POSI and also on negative latent factors. All the relations were tested in the same model. The fit of this model was assessed and standardized loadings were compared. According to our hypothesis 1, item loadings on latent factors defined based on meaning (NOSI, POSI) should be consistently higher than item loadings on latent factors based on wording (negative, positive).

Several indices were used to assess model fit. The first was χ^2 testing perfect fit between data and model. However, given that the value of χ^2 is influenced by sample size, it has to be completed by other fit indices. We used the Standardized Root Mean Square Residual (SRMR), the Normed Fit Index (NFI), the Non-Normed Fit Index (NNFI) and the Comparative Fit Index (CFI). For SRMR, values smaller than .10 indicate good fit (Kline, 2005). For NFI, NNFI and CFI, values higher than .90 indicate good fit (Hoyle, 1995).

Differential item functioning analyses with POSI and NOSI items were performed using logistic regression analyses. According to Zumbo (1999), logistic regression statistically models the probability of responding correctly to an item depending to group membership (in this paper: gender and age) and to a criterion variable (in this paper: NOSI or POSI scores). Compared to other techniques, such as those based on Item Response Theory, logistic regression is easier to implement (Swaminathan & Rogers, 1990). One can also distinguish between uniform and nonuniform DIF (Swaminathan & Rogers, 1990; Teresi & Fleishman, 2007). In case of nonuniform DIF, ability or trait level interacts with group membership, so that differences in probabilities of succeeding to a particular item between the groups vary according to trait level. Concretely, the nonuniform DIF consists of comparing the slopes of the two Item Characteristic Curves. In case of uniform DIF, the slopes of the two Item Characteristic Curves do not statistically differ. In this study, the presence of uniform DIF on sample 2 data was tested by using the logistic regression as described by Zumbo (1999). First, item scores were recoded as to become a binomial variable. Scores1 and 2 were coded 1, indicating the item is not often experienced while scores 3 and 4 indicating the item is very often experienced. In a first regression step, we introduced the mean NOSI/POSI score as an independent variable. Gender was introduced in a second regression step as a second independent variable. Item score was used as a dependent variable. The same procedure was replicated for all NOSI and POSI items, as well as for age groups. An item is said to show DIF if χ^2 at step two has a p value equal or inferior to 0.01. Besides χ^2, one also has to examine the effect size (R^2) between step one and step two. As stated by Zumbo (1999), "*two points are noteworthy at this juncture. First, as per usual in statistical hypothesis testing, the test statistic should be accompanied by some measure of the magnitude of the effect. This is necessary because small sample sizes can hide interesting statistical effects whereas large sample sizes can point to statistically significant findings where the effect is quite small and meaningless" (p.26)*.In large samples as ours, it is important to examine the effect size because despite being statistically significant, results might be of low practical usefulness and meaning.

As a criterion, Zumbo proposes to compute the difference in the R^2 between the logistic regression with and without modeling the DIF. If the difference in R^2 is equal or superior to 0.13, then the DIF will be considered as substantial (Zumbo, 1999).

Results

SEM analyses

Our model did show good fit to the data. The χ^2 was significant, which can be due to high sample size, $\chi^2(244) = 2555.94, p < .01$. However, all other indices were satisfactory (SRMR = .06, NFI = .93, NNFI = .92 and CFI = .94). Item loadings are provided in table 2. Results are clear for NOSI: item loadings are consistently higher on latent factor NOSI than on latent factors defined based on wording. However, results are mitigated for POSI items: half of the items load more strongly on the POSI latent factor, whereas for the other half loadings are either ambiguous or higher on the wording latent factor. Our hypothesis 1 is confirmed only for NOSI subscale (see Table 2).

DIF analyses

With regards to NOSI items, results of logistic regression analyses show that all χ^2 values are highly significant (all $p < .01$). However, examining R^2 indicates that all effects are very low (all $\Delta R^2 <= .01$). In other words, it is very likely that significant χ^2 are mainly due to our high sample size but have no practical meaning.

Table 2
Item Loadings in Sample1 (N = 827)

	Meaning		Wording	
	NOSI	**POSI**	**Negative**	**Positive**
Nosi01	.52	/	.12	/
Nosi02	.53	/	.31	/
Nosi03	.65	/	.37	/
Nosi04	.78	/	.02 (n.s.)	/
Nosi05	.67	/	-.07 (n.s.)	/
Nosi06	.77	/	-.33	/
Nosi07	.69	/	.13	/
Nosi08	.72	/	-.12 (n.s.)	/
Nosi09	.73	/	.04 (n.s.)	/
Nosi10R	.47	/	/	-.74
Nosi11R	.37	/	/	-.46
Nosi12R	.45	/	/	-.09 (n.s.)
Nosi13R	.72	/	/	.05 (n.s.)
Posi01	/	.28	/	.45
Posi02	/	.11 (n.s.)	/	.61
Posi03	/	.22	/	.66
Posi04	/	.61	/	.24
Posi05	/	.71	/	.19
Posi06	/	.67	/	.27
Posi07	/	.54	/	.32
Posi08	/	.37	/	.29
Posi09R	/	.48	-.29	/
Posi10R	/	.52	-.48	/
Posi11R	/	.85	-.15	/
Posi12R	/	.78	-.20	/

Note. R = the item was reversed before scoring. / = the relation was not tested so the parameter was not estimated. n.s. = the relation is not significant.Items Nosi01 – Nosi09 are negatively worded. Items Nosi10 – Nosi13 are positively worded. Items Posi01 – Posi08 are positively worded. Items Posi09 – Posi12 are negatively worded.

Results are similar for logistic regressions performed on POSI items. Again, all χ^2 values are highly significant (all $p < .01$) but all effects are very low (all $\Delta R^2 <= .01$). In other words, it is very likely that significant χ^2 are mainly due to our high sample size but that have no practical meaning. Table 3 provides χ^2 and ΔR^2 values for NOSI and POSI items (see Table 3, p. 12).

Table 3

χ^2 and ΔR^2 for NOSI and POSI items

	Gender	Age		
	χ^2	ΔR^2	χ^2	ΔR^2
Nosi01	6499.36**	.00	5941.96**	.00
Nosi02	9214.36**	.00	8290.50**	.00
Nosi03	16172.63**	.00	14441.58**	.00
Nosi04	13935.45**	.00	12462.40**	.00
Nosi05	2527.79**	.00	2346.81**	.00
Nosi06	8048.56**	.00	7244.02**	.01
Nosi07	13862.72**	.00	12616.23**	.00
Nosi08	7630.68**	.00	6881.62**	.00
Nosi09	10829.58**	.00	9482.41**	.01
Posi01	3608.97**	.00	3367.41**	.00
Posi02	6879.58**	.00	6330.57**	.00
Posi03	10846.62**	.00	9641.62**	.00
Posi04	17825.01**	.00	16083.65**	.00
Posi05	12621.45**	.00	11356.26**	.00
Posi06	20529.11**	.00	18543.53**	.00
Posi07	16244.68**	.01	14347.45**	.00
Posi08	11424.51**	.00	10204.70**	.00

Note. ** = $p<.01$.

Discussion

The Positive and Negative Occupational States Inventory, or PNOSI, is a new tool developed to measure negative as well as positive occupational states. It has been of large use for diagnosis purposes in diverse occupational fields (Bertrand et al., 2010; Hansez et al., 2007; Hansez & Chmiel, 2010; Hansez et al., 2008) and its two-dimensional structure has been validated and replicated (Barbier et al., 2009). The first aim of our study was to check if item wording has an impact on PNOSI structure. Results show that the structure of NOSI subscale reflects item content rather than item wording. However, results are less clear concerning the POSI subscale. In other words, we cannot conclude that this subscale is free of wording bias. Note that the results do not indicate that this subscale is totally biased with item wording. We simply were not able to clearly identify one solution as being better than the other. Thus the POSI subscale cannot be completely invalidated anyway.

The second aim of our study was to check for differences in workers' answers to NOSI and POSI items according to gender and age. We expected NOSI items to interact with gender, whereas there would be no interaction with POSI items. As already mentioned, all DIF appear to be statistically significant. However, the magnitudes of the effect are so small that we can consider there is no variation in workers answers to NOSI and POSI items according to gender. This indicates that NOSI as well as POSI scales are not prone to gender bias. We also expected an age-related bias with NOSI items, but not POSI items. Again, our results show there is no variation in workers answers to NOSI and POSI items according to age. Even if our results are partly contrary to our hypotheses, they tend to indicate that the PNOSI can be considered as a valid and non-biased tool for use with workers, irrespective of their gender and age. Hungi (2005, p.155) proposed three reasons for item bias: "the content of the item requires some experience that is possessed by one of the groups but not by the others; the item format is favourable or unfavourable to a given group; or the content of the item is offensive to a given group to the extent of affecting the performance of the group on the test". Clearly, this is not the case in our tool.

Limits and perspectives

In our sense, this study combines several advantages. First, it relies on a very large database collected in several companies active in diverse sectors in both private and public areas. It covers a large panel of working contexts and realities, which ensures results generalizability. Second, it takes into account one main limit of the PNOSI, namely the confounding role of item wording. Structural equation modeling confirmed that the factorial structure reflects item content rather than wording, at least with respect to the NOSI subscale.

In the introductory section we assumed NOSI being an intermediate state occurring between unbalanced working conditions and burnout. Future research should test this hypothesis using longitudinal design. Reciprocal relations between working conditions and NOSI/POSI should also be examined. According to the JDR model, it is the level of job resources relative to job demands that lead to negative or positive work experiences (Bakker & Demerouti, 2007; Schaufeli & Bakker, 2004). It might also be that a high level of NOSI or POSI would lead to higher (perceived) job demands or job resources, respectively. Bakker & Demerouti (2007) provide two explanations. First, workers with a high NOSI level might be biased with "negative glasses" through which working reality is distorted: the importance of job demands is highlighted, whereas the availability of job resources is denied. Thus, the way workers perceive their work environment would influence working conditions by creating a negative or a positive working climate. Second, workers behaviour can lead to additional demands, engaging in a kind of vicious circle. For example, high NOSI workers might badly deal with workload, leading to additional time pressure. Similarly, high POSI workers might actively search for colleagues support, leading to goal accomplishment and positive feedback.

Conclusion

The aim of this study was to complete the validation process of the PNOSI. We first checked for the impact of item wording on the tool structure and showed the factorial solution reflects true item content rather than item wording, at least for one of the two subscales. We then checked for the impact of gender on workers answers and showed it was null. We finally checked for the impact of age on workers answers and showedit was null as well. Additional studies dealing with temporal process leading from working conditions to burnout, and with reciprocal relations between working conditions and NOSI or POSI, are necessary in order to achieve the PNOSI validation process.

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References

Anastasi, A. (1988). *Psychological testing* (6th ed). New York: Macmillan.

Bakker, A.B., & Demerouti, E. (2007). The Job Demands-Resources model: State of the art. *Journal of Managerial Psychology, 22*(3), 309-328.

Barbier, M., Peters, S., & Hansez, I. (2009). Measuring Positive and Negative Occupational States (PNOSI): Structural confirmation of a new Belgian tool. *PsychologicaBelgica, 49*(4), 227-247.

Bertrand, F., Peters, S., Perée, F., & Hansez, I. (2010). Facteurs d'insatisfaction incitant au départ et intention de quitter le travail: Analyse comparative des groupes d'âge. *Le Travail Humain, 73(1), 215-239.*

De Keyser, V., & Hansez, I. (1996). Vers une perspective transactionnelle du stress au travail: Pistes d'évaluation méthodologique. *Cahiers de Médecine du Travail, 33*(3), 133-144.

De Keyser, V., & Hansez, I. (2002). Les transformations du travail et leur impact en termes de stress professionnel. In M. Neboit & M. Vezina, *Santé au travail et santé psychique* (pp. 28-34). Toulouse, France: Octarès. Collection Travail et Activité Humaine.

Demerouti, E., Bakker, A.B., Nachreiner, F., & Ebbinghaus, M. (2002). From mental strain to burnout.*European Journal of Work and Organizational Psychology, 11*(4), 423-441.

De Smet, P, Sans, S, Dramaix, M, Boulenguez, C, de Backer, G, Ferrario, M, Cesana, G, Houtman, I, Isacsson, SO, Kittel, F, Ostergren, PO, Peres, I, Pelfrene, E, Romon, M, Rosengren, A, Wilhelmsen, L, Kornitzer, M. (2005). Gender and regional differences in perceived work stress across Europe. *European Journal of Public Health, 15*(5), 536-545.

Doty, D.H., & Glick, W.H. (1998). Common methods bias: Does common methods variance really bias results? *Organizational Research Methods, 1*, 374-406.

Griffiths, A. (1999). Work design and management: The older worker. *Experimental Aging Research, 25,* 411-420.

Hallberg, U.E., & Schaufeli, W.B. (2006). "Same same" but different? Can work engagement be discriminated from job involvement and organizational commitment? *European Psychologist, 11*(2), 119-127.

Hansez, I. (2008). The Working Conditions and Control Questionnaire (WOCCQ): Towards a structural model of psychological stress. *European Review of Applied Psychology, 58*, 253-262.

Hansez, I., Bracci, E., & Bertrand, F. (2007). Solutions face au départ précoce des travailleurs: Etude de cas. *Psychologie du Travail et des Organisations, 13(2)*, 5-22.

Hansez, I., & Chmiel, N. (2010). The Job Demands-Resources model and management commitment to safety applied to safe behaviour outcomes. *Journal of OccupationalHealthPsychology, 15*(3), 267-278.

Hansez, I., Grisard, A., & De Keyser, V. (2004). *Changements organisationnels, stress des employés, et satisfaction des clients: émergence du concept de Flexihealth.* Programme d'appui scientifique à la protection des travailleurs en matière de santé, contribution au rapport de recherche final du 29/02 (PS/12/29 – 1999/2003). Liège, Belgique: Université de Liège.

Hansez, I., Schins, F., & Rollin, F. (2008).Occupational stress, work-home interference and burnout among Belgian veterinary practitioners.*Irish Veterinary Journal, 61*(4), 233-241.

Hoyle, R.H. (1995). The structural equation modeling approach: Basic concepts and fundamental issues. In R.H. Hoyl (Ed.), *Structural equation modeling, concepts, issues, and applications* (pp. 1-15). Thousand Oaks, CA: Sage.

Hungi, N. (2005). Employing the Rasch model to detect biased items. In S. Alagumalai, D.D. Curtis & N. Hungi (eds.), *Applied Rasch measurement: A book of exemplars* (pp. 139-157). Dordrecht, The Netherlands: Springer.

Jex, S.M. (1998). *Stress and Job Performance: Theory, Research, and Implications for Managerial Practice*. Thousand Oaks, CA: Sage.

Jöreskog, K., & Sörbrom, D. (2006). LISREL for Windows [computer software]. Lincolnwood, IL: Scientific Software International, Inc.

Kittel, F., Godin, I., Clays, E., & De Backer, G. (2008).*Rapport de recherche Belstress III. Recherche des déterminants de l'absentéisme pour cause de maladies chez les hommes et chez les femmes*. Service Public Fédéral Emploi, Travail et Concertation Sociale et Fonds Social Européen: Bruxelles, Belgium. Retrieved on December 8, 2011, from http://www.emploi.belgique.be/WorkArea/showcontent.aspx?id=13646

Kline, R. (2005). *Principles and practice of structural equation modelling* (2nd ed.). New York: Guilford Press.

Mitchelson, J.K., Wicher, E.W., LeBreton, J.M., & Craig, S.B. (2009). Gender and ethnicity differences on the Abridged Big Five Circumplex (AB5C) of personality traits: A differential item functioning analysis. *Educational and Psychological Measurement, 69*(4), 613-635.

Podsakoff, N.P., LePine, J.A., & LePine, M.A. (2007). Differential challenge stressor – hindrance stressor relationships with job attitudes, turnover intentions, turnover, and withdrawal behavior: A meta-analysis. *Journal of Applied Psychology, 92*(2), 438-454.

Poelmans, S., Compernolle, T., De Neve, H., Buelens, M., & Rombouts, J. (1999). Belgium: A pharmaceutical company. In M. Kompier & C. Cooper (Eds.), *Preventing Stress,Improving Productivity: European case studies in the workplace* (pp. 121-148). London: Routledge.

Radloff, L.S. (1977). The CES-D scale: A self-report depression scale for research in the general population. *Applied Psychological Measurement, 1*, 384-401.

Randall, K. (2007). Examining the relationship between burnout and age among Anglican clergy in England and Wales.*Mental Health, Religion & Culture, 10*(1), 39-46.

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*(3), 293-315.

Schaufeli, W. B., & Salanova, M. (2007). Work engagement. An emerging psychological concept and its implication for organizations. In S. W. Gilliland, D. D. Steiner & D. P. Skarlicki (Eds.), *Research in social issues on management: Managing social and ethical issues in organizations* (Vol. 5, pp. 135-177). Greenwich, CT: Information Age Publishers.

Schaufeli, W.B., Salanova, M., Gonzalez-Roma, V., & Bakker, A.B. (2002). The measurement of engagement and burnout: A two sample confirmatory factor analytic approach. *Journal of Happiness Studies, 3*(1), 71-92.

Swaminathan, H., & Rogers, H.J. (1990).Detecting differential item functioning using logistic regression procedures.*Journal of Educational Measurement, 27*(4), 361-370.

Teresi, J.A., & Fleishman, J.A. (2007).Differential item functioning and health assessment.*Quality of Life Research, 16*, 33-42.

Vandenberghe, C., De Keyser, V., Vlerick, P., & D'hoore, W. (2004). *Organizational changes, employee stress, and customer satisfaction: Emergence of the Flexi-health concept*. Brussels, Belgium: Belgian Science Policy. Retrieved on December8, 2011, from http://www.belspo.be/belspo/organisation/Publ/pub_ostc/PS/rPS14_en.pdf

Zumbo, B.D. (1999). A handbook on theory and methods of Differential Item Functioning (DIF). Logistic regression modeling as a unitary framework for binary andLikert-type (ordinal) item scores. Ottawa, ON: Directorate of Human Resources Research and Evaluation, Department of National Defense.

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