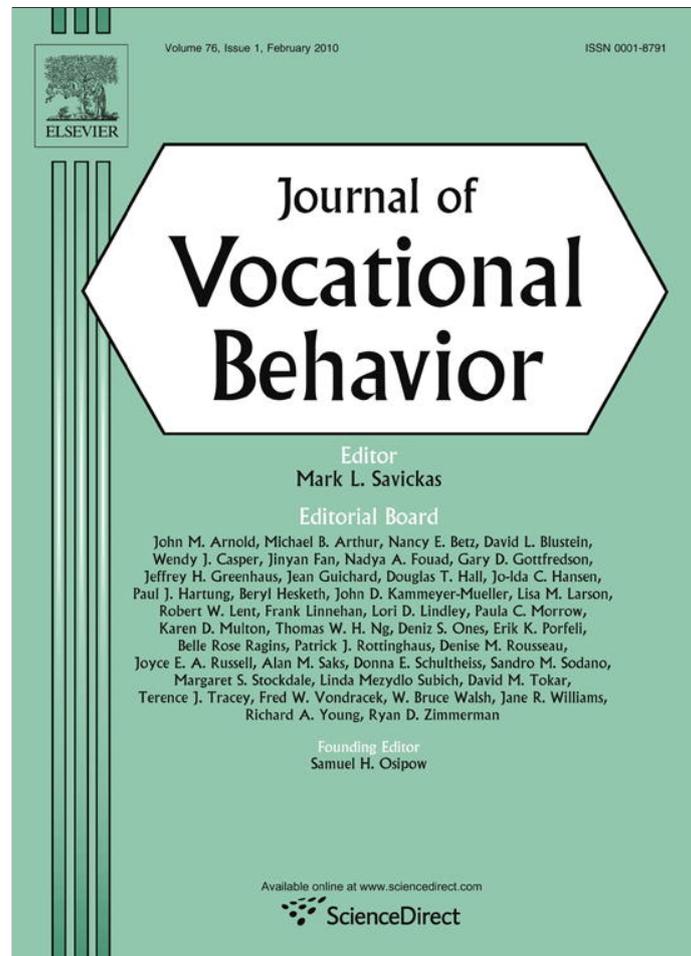


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Self-determination as a moderator of demands and control: Implications for employee strain and engagement

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ABSTRACT

Does job control act as a stress-buffer when employees' type and level of work self-determination is taken into account? It was anticipated that job control would only be stress-buffering for employees high in self-determined and low in non-self-determined work motivation. In contrast, job control would be stress-exacerbating for employees who were low in self-determined and high in non-self-determined work motivation. Employees of a health insurance organization ($N = 123$) completed a survey on perceptions of role overload, job control, work self-determination, and a range of strain and engagement indicators. Results revealed that, when individuals high in self-determination perceived high job control, they experienced greater engagement (in the form of dedication to their work). In addition, when individuals high in non-self-determination perceived high job demands, they experienced more health complaints. A significant 3-way interaction demonstrated that, for individuals low in non-self-determination, high job control had the anticipated stress-buffering effect on engagement (in the form of absorption in their work). In addition, low job control was stress-exacerbating. However, contrary to expectations, for those high in non-self-determination, high job control was just as useful as low job control as a stress-buffer. The practical applications of these findings to the organizational context are discussed.

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1. Introduction

Occupational stress literature focuses on identifying moderators or “buffers” of job demands that enable individuals and organizations to alleviate the negative effects of specific stressors on the experience of strain. One of the earliest and most influential models of occupational stress, Karasek's (1979) job demands-control model (D-CM), proposes that high levels of perceived job control acts as a stress-buffer, alleviating the negative effects of job demands on strain. Within the D-CM, job demand is conceptualized as role overload (e.g., high time pressure and workload) which occurs when an individual feels pressured by difficult deadlines, excessive workloads, and a general inability to fulfill organizational expectations in the time available (Peterson, Smith, Akande, & Aystaran, 1995). Job control, originally conceptualized as decision-making latitude, has been reformulated in later years to reflect a broader construct of behavioral control, encapsulating control over tasks, methods, scheduling, pacing, and the physical workspace (see Ganster, 1989; Jackson, Wall, Martin, & Davids, 1993; Karasek & Theorell, 1990). Recent theoretical reviews on the D-CM suggest these work characteristics are still relevant to today's globalized and post-tayloristic workforce (Hvid, Lund, & Pejtersen, 2008; Johnson, 2008).

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Research on the D-CM has traditionally focused on the negative implications of jobs with high demand and low control on a range of variables tapping psychological strain (i.e., depression, anxiety, mental health, burnout, and job dissatisfaction, see van der Doef & Maes, 1999) and physical health (see van der Doef & Maes, 1998). However, positive psychology has brought about a shift in emphasis, moving from human weaknesses to human strengths (Seligman & Csikszentmihayi, 2000). In light of this, more recent research investigating the effects of demand and control has sought to examine the learning outcomes of active jobs (i.e., jobs with high demands yet high control), for example, the work by de Jonge, Dollard, Dormann, Le Blanc, and Houtman (2000), de Jonge, van Breukelen, Landerweerd, and Nijhuis (1999) examining motivation and job challenge, and the work by Bakker, Schaufeli, Leiter, and Taris (2008), Schaufeli and Bakker (2004) as well as Mauno, Kinnunen, and Ruokolainen (2007) examining engagement. In these studies, engagement is defined as a “positive, fulfilling, work-related state of mind that is characterized by vigor, dedication, and absorption” (p. 295) and is not simply the positive antipode of burnout (Schaufeli & Bakker, 2004). Together, these findings suggest that active jobs are experienced as more challenging and have positive implications for motivation and engagement (i.e., provide support for the active learning outcomes of the D-CM).

Self-determination theory (SDT) is a well-established theory of motivation that considers both the type and intensity of motivation (Deci & Ryan, 1985; Gagné & Deci, 2005). In fact, Meyer and Gagné (2008) have noted the applicability of SDT to engagement, contending that engagement, as an outcome, should be embedded within motivation theory and that SDT is well-suited for this. More specifically, self-determination provides a distinct multidimensional conceptualization of motivation (i.e., self-determined versus non-self-determined forms) which has implications for differential effects on employee outcomes (i.e., work engagement). Thus, the primary goal of this study is to establish the role of types of work motivation (i.e., self-determined and non-self-determined forms) as moderator variables within the D-CM, more specifically, assessing the utility of job control as a stress-buffer at different levels and types of work motivation. A secondary goal is to further extend the central propositions of the D-CM to learning and motivation outcomes (i.e., work engagement).

1.1. The demands-control model

As discussed by van der Doef and Maes (1998, 1999), two propositions of the D-CM have received considerable research attention. First, is the *strain hypothesis* which posits that the combination of high job demands and low job control has the most detrimental implications for employee well-being. Second, is the *stress-buffering hypothesis* which maintains that, under conditions of high job demands, the presence of high job control can have a stress-alleviating effect on strain. Furthermore, this combination of high demands and high control can potentially engender favorable learning outcomes (i.e., enhanced motivation and performance). This motivational aspect of the D-CM is referred to as the active learning axis (Karasek, 1979; Karasek & Theorell, 1990). Although there is considerable support for the proposed main effects of demand and control on strain outcomes, there is inconsistent support for the model's interactive effects, despite decades of research and use of varied and sophisticated methodologies (de Lange, Taris, Kompier, Houtman, & Bongers, 2003; Jones & Fletcher, 1996; Terry & Jimmieson, 1999; van der Doef & Maes 1998; van der Doef & Maes 1999). In fact, in their review, de Lange et al. (2003) concluded that many of the findings from longitudinal research mirrored that of cross-sectional research, indicating that methodology may not be a valid explanation for inconsistency of the interactive effects of demand and control.

An alternative explanation for the inconsistency of interactive effects is the presence of conjunctive moderators, such as individual difference variables related to personal control (Terry & Jimmieson, 1999). These individual difference variables include desire for control (Parker, Jimmieson, & Amiot, in press), self-efficacy (Jimmieson, 2000; Meier, Semmer, Elferting, & Jacobshagen, 2008), locus of control (Daniels & Guppy, 1994; Meier et al., 2008; Parkes, 1991), Type A personality (Day & Jreige, 2002), and a proactive personality (Parker & Sprigg, 1999). Taken together, these findings suggest that the proposed stress-buffering effects of job control may only be evident for individuals who are high in attributes related to personal control or self-directedness. Moreover, when these attributes or abilities are lacking, the presence of high job control may in fact be stress-exacerbating. Theoretically, individuals who have the desire, need, or ability to utilize high job control opportunities would thrive under such conditions, whereas for those who do not possess such qualities, the presence of high job control would potentially be stress-exacerbating, as the absence of rules, procedures, and structure would increase role ambiguity and responsibility for outcomes (see Burger, 1989).

Personal control is not always desirable; there are specific instances when control can actually have a negative impact on the performance of, or engagement in, an activity (Burger, 1989). These include (1) when predictability of an outcome is uncertain, (2) when there is high visibility, and (3) when responsibility for outcomes is attributable. Ostensibly, when job control is high (i.e., employees are given the freedom to plan, organize, and complete their work as they see fit), there is less certainty about what the results of one's efforts will be. In addition, there is more visibility and responsibility for outcomes. In this way, self-determination (Deci, 1975), as an individual difference variable, has theoretical relevance to the D-CM. When someone is sourcing their motivation from external sources such as job security, rewards, and recognition (i.e., a non-self-determined work motivation), these undesirable aspects of job control may be more salient, or might make job control seem like a barrier or hindrance to getting work done. Conversely, when someone is oriented towards a self-determined work motivation, the freedom that high job control affords might be seen in a more positive light; as it enables choice and also alignment of one's work activities with inner goals and values (i.e., preferred ways of doing things).

1.2. Self-determination theory and occupational stress

Essentially, self-determination occurs when a person feels a sense of choice, autonomy, and purpose over their behaviors (Deci & Ryan, 2000). Being self-determined involves having the capacity to choose rather than to let reinforcement contingencies or any other internal or external pressures be the determinants of one's actions or behaviors (Deci & Ryan, 1985). Self-determined individuals may be more equipped to deal with an increased workload and may be more willing or able to utilize control opportunities available in the environment as an antidote to stressors. In contrast, individuals who are non-self-determined may find increased job control stress-exacerbating, perhaps due to an orientation toward external contingencies and a general lack of experience in being autonomous and in utilizing personal control. Generally, prior research findings demonstrate that adopting a more global self-determined, as opposed to non-self-determined, motivational orientation is related to an array of positive life outcomes, including physical and psychological well-being (Deci & Ryan, 1985; Kasser & Ryan, 1993, 1996; Ryan & Deci, 2000). Moreover, adopting a more global non-self-determined, as opposed to self-determined, motivational orientation is positively associated with defensive reactions to stress and self-handicapping (Knee & Zuckerman, 1998).

This orientation towards self-determined or non-self-determined drivers of behavior is believed to lie along a continuum of self-regulation (Gagné & Deci, 2005). This continuum represents the degree to which motivation comes from within the person (i.e., involves pleasure, volition, importance of the behavior, goals, and coherence with one's values) or externally (i.e., punishment and reward contingencies, pressure from self/others, and feelings of guilt). An autonomous orientation is proposed to underlie self-determined forms of regulation, whereas a controlled orientation is proposed to underlie regulatory mechanisms that are extrinsically derived (or non-self-determined in nature). Although positioned theoretically at opposite ends of a continuum, there is some agreement within the literature that these types of motivation are not necessarily negative antipodes (Amiot, Gaudreau, & Blanchard, 2004; Gagné & Deci, 2005; Ryan & Connell, 1989). In fact, a moderate positive correlation between the two types of motivation is commonly found (Amiot et al., 2004; Vansteenkiste, Lens, De Witte, De Witte, & Deci, 2004; Vansteenkiste, Lens, De Witte, & Feather, 2005; Vansteenkiste et al., 2007). This might be attributable to the nature of the constructs; the absence of self-determined motivation is not equivalent to a non-self-determined orientation. Moreover, it is likely that, in many contexts and perhaps more so in the context of work, individuals will engage in behavior for a variety of reasons, which can be a combination of self-determined and non-self-determined sources simultaneously.

In support of this, research investigating the construct as two uni-polar scales has found differential effects for self-determined and non-self-determined motivational styles (see Amiot et al., 2004; Vansteenkiste et al., 2005). For example, from the education setting, research has demonstrated that a more self-determined (or autonomous) study motivation predicted more adaptive learning attitudes, academic success, and personal well-being; however, in contrast to this, a more non-self-determined (or controlled motivation) was associated with higher drop-out rates, maladaptive learning attitudes, and reduced well-being (Vansteenkiste et al., 2005). From the sports setting, research has demonstrated that a more self-determined motivational style is associated with more task-oriented coping during sports competition, which then increased subsequent goal attainment and positive affect (Amiot et al., 2004). In contrast, a non-self-determined motivational style is associated with disengaged coping during sports competition, which resulted in less goal attainment and negative affect (Amiot et al., 2004).

In a recent theoretical paper, Gagné and Deci (2005) outlined the applicability of SDT to organizational research, specifically in terms of workplace motivation, job attitudes (see also Vansteenkiste et al., 2007) and job performance. Despite this, very little research has been conducted examining the role of SDT within the occupational stress domain. However, SDT researchers have focused on the role of the autonomous versus controlling (i.e., restrictive) environments in other domains as precursors to development of particular motivational styles, or as moderators of self-determined behavior. For example, O'Connor and Vallerand (1994) showed, in a study of nursing home residents, that those with self-determined motivational styles were better adjusted when living in homes that provided opportunities for freedom and choice (i.e., high control or autonomy supportive). In contrast, residents with less self-determined motivational styles (not necessarily non-self-determined styles) were better adjusted when living in high constraint environments (i.e., low control or controlling). More recently, using a prospective design, Philippe and Vallerand (2008) showed that nursing home environments that objectively supported their residents' autonomy facilitated psychological adjustment (i.e., enhanced life satisfaction and self-esteem, and reduced depression), and these effects were particularly pronounced among residents who were highly self-determined. These findings indicate that the climate you live in influences your perceptions of autonomy as well as your ability to draw on self-determined forms of motivation, and that these factors then have important effects for future psychological adjustment. These findings also highlight the potentially important role for self-determination within the work context, an environment in which available control varies considerably and in which individuals spend the vast majority of their day-to-day lives.

To date, only one published study has specifically examined self-determination as a moderator variable of the D-CM. Fernet, Guay, and Senecal (2004), in a study of university professors, showed that job control (i.e., measured as decision-making latitude or discretion) reduced the detrimental effects of high job demands (i.e., a composite of overload, ambiguity, conflict, and pressure for research outcomes) in predicting emotional exhaustion and depersonalization, though, only for employees who were self-determined. In addition, employees who were more self-determined experienced greater personal

accomplishment when they reported working in active jobs (i.e., jobs high in demand and control). Although this is a promising finding, there were limitations in this research and further investigation is warranted. First, self-determination was operationalized as a bi-polar construct (i.e., a relative autonomy index) rather than as two uni-polar constructs (i.e., self-determination and non-self-determination). Operationalization as a two uni-polar constructs would enable the contrast or comparison of different types of motivation. Second, the assessment of strain was limited to dimensions of burnout. As indicated by Fernet et al., there is value in extending these findings to other dimensions of strain and to positive work outcomes (i.e., engagement).

1.3. The present study

Thus, the purpose of the present study was to examine the moderating impact of self-determination on job demands and job control in an organizational setting. As previously discussed, the main advantage of examining motivation within the SDT perspective is the ability to explore various types of motivation rather than focusing solely on intensity. As such, two types of motivation were examined as moderator variables; a self-determined work motivation and a non-self-determined work motivation. A variety of outcomes were assessed to tap employee strain (i.e., health complaints and anxiety/depression) and engagement (i.e., vigor, dedication, and absorption). Two 3-way interactions are proposed; the first is related to how individuals high and low in self-determined work motivation will react to various combinations of job demand and control and the second is related to how individuals high and low in non-self-determined work motivation will react to these conditions.

1.3.1. Self-determined work motivation

Theoretically, individuals high in self-determined work motivation (i.e., internally driven and goal orientated) would be more willing and able to utilize control opportunities in the workplace. Conversely, lower perceptions of control would be stress-exacerbating for these individuals as they would believe they are restricted from exerting control in pursuit of their goals. In contrast, for those with low self-determined work motivation it is anticipated low control perceptions would be stress-buffering, as an environment where control is perceived as low (i.e., there is little visibility and responsibility for outcomes) would be less threatening. Alternatively, high control would be threatening to these individuals as an absence of the desire or ability to utilize control opportunities would make high control seem threatening. Thus, the following hypotheses were proposed:

Hypothesis 1a: Higher perceptions of job control will be stress-buffering (i.e., the negative implications of role overload will reduce when combined with high job control) when employees have higher self-determined work motivation.

Hypothesis 1b: Lower perceptions of job control will be stress-exacerbating (i.e., the negative implications of job demands will increase when combined with low job control) when employees have higher self-determined work motivation.

Hypothesis 1c: Lower perceptions of job control will be stress-buffering when employees have lower self-determined work motivation.

Hypothesis 1d: Higher perceptions of job control will be stress-exacerbating when employees have lower self-determined work motivation.

1.3.2. Non-self-determined work motivation

As noted earlier, it is important to consider that the absence of self-determined work motivation is not equivalent to the present of a non-self-determined work motivation. As such, a series of hypotheses were formulated for this motivational style also. For those high in non-self-determined work motivation (i.e., a reliance on external sources of regulation for behavior such as pay and recognition), an environment in which control is perceived as low would be more desirable as autonomy may interfere with the attainment of extrinsically orientated goals (e.g., rewards). For those with higher non-self-determined work motivation, having to determine and organize how to complete work may be more stressful under high demands. In contrast, the absence of non-self-determined work motivation would mean that high control perceptions would not be threatening. Similarly, the absence of non-self-determined work motivation would mean that lower control perceptions might be stress-exacerbating, as this desire for procedures and instruction would be lacking.

Hypothesis 2a: Lower perceptions of job control will be stress-buffering when employees have higher non-self-determined work motivation.

Hypothesis 2b: Higher perceptions of job control will be stress-exacerbating when employees have higher non-self-determined work motivation.

Hypothesis 2c: Higher perceptions of job control will be stress-buffering when employees have lower non-self-determined work motivation.

Hypothesis 2d: Lower perceptions of job control will be stress-exacerbating when employees have lower non-self-determined work motivation.

2. Method

2.1. Design and procedure

Questionnaires were distributed by department supervisors to their employees within the workplace. The first page of this questionnaire explained that participation was voluntary and that responses would remain completely confidential. To help maintain anonymity, questionnaires were returned directly to the researcher. The response rate was 41%.

2.2. Participants

Participants were 123 clerical and administrative workers from a medium-sized health insurance organization. Participants were aged 17–60 years ($M = 33.97$, $sd = 11.34$), with two participants not reporting their age. Approximately 80% of the sample was female, which was comparable to the gender distribution of the organization's workforce. Approximately 74% of respondents were full-time workers and 47% had completed some form of education beyond high-school. On average, participants had been in their current position for approximately 2.50 years ($sd = 4.20$). The organization comprised five departments; the majority of participants were working in the National Claims Department (34%) and the Memberships Department (28%). Of the remainder, 21% were from Customer Care, 12% Products and Services, and 5% were from Communications and Retentions. This pattern of department membership was representative of the population from which the sample was drawn.

2.3. Measures

Job demand was measured using the original Caplan, Cobb, French, Harrison, and Pinneau (1980) 4-item measure of role overload. The measure had a Cronbach (1951) alpha of $\alpha = .75$. An example item is "How often does your job require you to work very hard?" Items were measured on a 5-point scale, ranging from (1) rarely to (5) very often. An exploratory factor analysis (EFA) on this scale revealed a 1-factor model explaining 59.65% of variance.

Job control was measured using items adapted from the Dwyer and Ganster (1991) job control measure. In line with the Jackson et al. (1993) conceptualization of job control, items were selected to tap employees perceived control over tasks, methods, policies, procedures, and their general felt autonomy. These five items had an internal consistency of $\alpha = .86$. An example item is "How much control do you have over how you do your daily work?" Items were measured on a 5-point scale, ranging from (1) very little to (5) very much. An EFA on this measure revealed a 1-factor model explaining 64.16% of variance.

The shortened 18-item Work Extrinsic and Intrinsic Motivation (WEIM) measure from Blais, Brière, Lachance, Riddle, and et Vallerand (1993) was utilized to measure participants' self-regulatory mechanisms towards work (i.e., reasons for doing work). This is a contextual measure of work motivation. Examination of the relationships among the self-regulatory mechanisms has shown they can be used individually to predict outcomes, or they can be combined algebraically to form a relative autonomy index (see Grolnick & Ryan, 1987; Tremblay, Blanchard, Taylor, & Pelletier, in press). The self-regulatory mechanisms also can be computed to form two broad composites of work motivation: *self-determined work motivation* and *non-self-determined work motivation* (see Amiot et al., 2004; Koestner, Bernieri, & Zuckerman, 1992; O'Connor and Vallerand, 1994; Tremblay et al., in press). Prior research has established the factorial stability of the WEIM; each self-regulatory mechanism represents a separate factor. The three non-self-determined regulatory mechanisms load onto a higher-order latent construct representing non-self-determined work motivation, and the three self-determined self-regulatory mechanisms load onto a higher-order latent construct representing self-determined work motivation (Tremblay et al., in press). Encouraging the WEIM also has been demonstrated to be resistant to issues of social desirability (Blais et al., 1993).

When completing the WEIM measure, participants were asked to indicate the extent to which each item corresponds to the reasons why they are presently involved in their work. An example self-determined work motivation item is "Because this is the type of work I have chosen to attain certain important objectives" and an example non-self-determined work motivation item is "Because this type of work provides me with security". Recorded on a 7-point scale, response options ranged from (1) does not correspond at all to (7) corresponds exactly. In the present study, the computational method adopted by Amiot et al. was utilized to compute the two measures of broad work motivation. Internal consistency for the self-determined work motivation measure was $\alpha = .88$ and for the non-self-determined work motivation $\alpha = .68$. These internal consistencies are similar to the scale reliabilities reported in prior research examining these two types of work motivation separately (see Amiot et al., 2004; Tremblay et al., in press).

Two indicators of strain were utilized in the present study. *Health complaints* were measured on a shortened 7-item scale (adapted from Caplan et al., 1980) with internal consistency of $\alpha = .81$. Participants were asked if they experienced any of the following during the last month on the job. An example item is "You were bothered by your heart beating faster than usual?" Response options were (1) never, (2) once or twice, and (3) three or more times. An EFA on this measure revealed a 1-factor model explaining 47.53% of variance. An established subscale of The General Health Questionnaire (GHQ-12) was used to assess participants' feelings of anxiety/depression (Gao et al., 2004; Goldberg, 1972). The other two factors that underlie employees' general health and well-being are social dysfunction and loss of confidence. For the purposes of the present study the anxiety/depression subscale was selected as it is believed to be a valid indication of employees' psychological distress.

The anxiety/depression measure comprised four items with internal consistency of $\alpha = .71$. For each item, participants were asked to report on their well-being over the past few weeks. An example item is “*Been feeling unhappy and depressed*”. Response options were (1) *much less than usual*, (2) *same as usual*, (3) *more than usual*, and (4) *much more than usual*. An EFA on this measure revealed a 1-factor model explaining 54.36% of variance.

Participants’ work engagement was measured with the Schaufeli, Salanova, Gonzalez-Roma, and Bakker (2002b) Utrecht Work Engagement Scale (UWES). This is a 17-item scale which forms three sub-dimensions of engagement. These subscales include *Vigor* comprised of six items with $\alpha = .83$ (e.g., “*At work I feel bursting with energy*”), *Dedication* comprised of five items with $\alpha = .89$ (e.g., “*I find the work that I do full of meaning and purpose*”), and *Absorption* comprised of six items with $\alpha = .83$ (e.g., “*Time flies when I am working*”). Items were measured on a 7-point scale, ranging from (1) *not at all true* to (7) *very true*. Previous psychometric studies have established the dimensionality and construct validity of these sub scales of engagement (see Schaufeli et al. 2002b). The factorial structure also has been shown to replicate across a range of occupational groups and also generalize to other cultures (Schaufeli, Martinez, Pinto, & Bakker 2002a). In addition, the UWES has been shown to be distinct from burnout (see Schaufeli et al. 2002a; Schaufeli et al. 2002b) and other related work constructs, such as job involvement (Hallberg & Schaufeli, 2006).

Individuals’ level of *trait negative affectivity* is often considered a potential confound in research examining work stressors and strain (see Bagozzi & Yi, 1990; Glick, Jenkins, & Gupta, 1986). This is because negative affectivity may influence measures of work stress and employee strain outcomes, thus inflating the correlations between these variables. Thus, the construct of negative affectivity was assessed using the 11-item version of the Multidimensional Personality Index (Agho, Price, & Mueller, 1992). An example item is “*I often find myself worrying about something.*” Measured on a 5-point scale, response options ranged from (1) *no, this is very unlike me* to (5) *yes, this is very much like me*. Internal consistency for the measure was $\alpha = .86$.

A 3-item measure tapping the *use of prior education and training* also was included to be used as a marker variable in Common Method Variance (CMV) analyses (see Lindell & Whitney, 2001). This measure had an internal consistency of $\alpha = .81$. An example item is “*Do you use the knowledge, skills, and abilities from your previous training?*” Items were measured using a 5-point scale, with response options ranging from (1) *hardly any* to (5) *very often*.

3. Results

3.1. Preliminary analyses

Table 1 displays the descriptive statistics and zero-order correlations among all variables. Role overload and job control were not correlated ($r = -.05$), indicating independence of these two aspects of employees’ perceived work environment. Interestingly, the use of non-self-determined work motivation to regulate behavior was positively related to higher perceptions of role overload ($r = .42$), whereas the use of self-determined work motivation to regulate behavior was positively related to higher perceptions of job control ($r = .44$). The employee strain variables (i.e., health complaints and anxiety/depression) and engagement variables (i.e., vigor, dedication, and absorption) were only moderately inter-correlated with each other, supporting the treatment of these variables as distinct constructs.

Given the cross-sectional research design, the extent of CMV was assessed using the marker variable technique proposed by Lindell and Whitney (2001). This technique employs a measure that is theoretically unrelated to at least one other variable in the model in order to adjust the correlations among the substantive variables. Three items designed to assess the extent to which employees were, in general, able to utilize prior education and training on the job were utilized as the marker variable. This scale was found to be unrelated to several of the principal constructs in the model. Next, the smallest of the

Table 1
Descriptive statistics and zero-order correlations.

Variables	M	sd	1	2	3	4	5	6	7	8	9	10	11
1. Age	33.97	11.34	—										
2. Gender ^a	0.61	0.80	.22*	—									
3. Trait negative affectivity	2.90	0.80	.31**	-.06	—								
4. Role overload	3.85	0.74	.12	.09	.27**	—							
5. Job control	2.70	0.88	.00	.07	-.18**	-.05	—						
6. Self-determined	21.57 ^b	7.45	.18*	.09	-.09	.11	.44**	—					
7. Non-self-determined	19.49 ^b	4.66	.14	-.04	.09	.42*	.06	.48**	—				
8. Health complaints	1.56	0.47	-.04	.18*	.41**	.18	-.10	-.17	.04	—			
9. Anxiety/depression	2.11	0.58	-.08	-.04	.18*	.28**	-.10	-.07	.34**	.44**	—		
10. Vigor	4.23	1.11	.21*	-.05	-.30**	.17	.24**	.48**	.27**	-.17	-.25**	—	
11. Dedication	3.89	1.41	.20*	.09	-.14	.16	.47**	.66**	.25**	-.09	-.13	.62**	—
12. Absorption	3.61	1.22	.08	.11	-.00	.22*	.36**	.55**	.38**	-.05	.04	.56**	.66**

^a Gender was coded as -1 = male, 1 = female.

^b These variables were the product of a weighted computation.

* $p < .05$. Two-tailed.

** $p < .01$. Two-tailed.

correlations between the marker variable and the substantive variables was chosen to be used as the estimate of CMV; in this case, the correlation between the marker variable and the measure of non-self-determined work motivation ($r_s = .07$). CMV-adjusted correlations were then calculated for the 25 significant correlations (out of 45 possible correlations among the measured variables) using the formula for a partial correlation ($r_{Y_i^*M}$) provided by Lindell and Whitney, followed by the use of $t_{\alpha/2, N-3} = (r_{Y_i^*M}) / [(1 - r_{Y_i^*M}^2) / (N-3)]^{0.5}$ to establish significance. Results revealed that all but three of the original significant correlations remained significant after controlling for CMV. The correlations that failed to remain significant included the association between role overload and absorption ($r = .22$), trait negative affectivity and anxiety/depression ($r = .18$), trait negative affectivity and job control ($r = -.18$). Thus, CMV was not considered to be a threat to interpretations of the analyses that follow.

3.2. Data analysis overview

To test the proposed effects of role overload, job control, and work self-determination on employee strain and engagement, a series of hierarchical moderated regressions were used. Control variables (i.e., age, gender, and trait negative affectivity) were entered at Step 1. At Step 2, the main effects of role overload and job control were tested. At Step 3, the 2-way interaction of role overload and job control was entered. At Step 4, work self-determination was entered.¹ At Step 5, 2-way interactions involving self-determination were entered (i.e., role overload \times self-determination and job control \times work self-determination), and at Step 6, the 3-way interaction among role overload, job control and self-determination was entered. This order was selected such that any variance explained by the main effect of self-determination and interactions involving self-determination was above and beyond what was explained by the main propositions of the D-CM. We believed this was a more conservative test of our central hypotheses.² All variables were mean-centered prior to computing the interaction terms (see Aiken & West, 1991). Table 2 outlines the results from the hierarchical moderated regressions for each outcome variable using self-determined work motivation as the conjunctive moderator, and Table 3 outlines these results with non-self-determined work motivation as the conjunctive moderator. Finally, Canonical Correlation Analyses were conducted to investigate the overarching relationships between the predictor variables and criterion variables. This was a post hoc analysis to establish a better understanding of what the most important associations among the two sets of variables were.

3.3. Moderated regression analyses

3.3.1. Control variables

As can be seen in Table 2, age was a significant positive predictor of vigor, $\beta = .20$, $t(1, 118) = 2.20$, $p = .03$, $sr^2 = .04$, such that older employees reported themselves as being more vigorous at work. There were several significant main effects of trait negative affectivity on the employee outcome variables; justifying the inclusion of this variable as a statistical control.³

3.3.2. Main effects of demand and control

Role overload had a positive main effect on participants' ratings of anxiety/depression, $\beta = .25$, $t(1, 117) = 2.63$, $p = .01$, $sr^2 = .06$. Role overload did not have negative repercussions for employee engagement. In fact, the reverse effect was found for each of the subscales of engagement, as role overload was positively related to vigor, $\beta = .25$, $t(1, 118) = 2.88$, $p = .005$, $sr^2 = .06$, dedication, $\beta = .19$, $t(1, 118) = 2.25$, $p = .026$, $sr^2 = .03$, and absorption, $\beta = .23$, $t(1, 118) = 2.63$, $p = .01$, $sr^2 = .05$. These results are displayed in Table 2.

Job control had significant positive main effects on vigor, $\beta = .25$, $t(1, 118) = 2.94$, $p = .004$, $sr^2 = .06$, dedication, $\beta = .46$, $t(1, 118) = 5.62$, $p < .001$, $sr^2 = .20$, and absorption, $\beta = .36$, $t(1, 118) = 4.21$, $p < .001$, $sr^2 = .13$. This suggests that perceptions of high job control could have an energizing effect for employees, increasing their work engagement.

3.3.3. Demand \times control interactions

Although not hypothesized, three significant 2-way interactions of demand and control emerged. The 2-way interaction of demand and control was evident for the three subscales of engagement; vigor, $\beta = .25$, $t(1, 118) = 3.02$, $p = .003$, $sr^2 = .06$, dedication, $\beta = .28$, $t(1, 118) = 3.51$, $p = .001$, $sr^2 = .07$, and absorption, $\beta = .20$, $t(1, 118) = 2.33$, $p = .022$, $sr^2 = .04$. These interactions followed the same pattern across all three subscales of engagement. Across all three interactions, role overload had a positive main effect on engagement when employees perceived they also had high job control. There was no effect of role overload on engagement when employees perceived they had low job control.

3.3.4. Main effects of self-determination and non-self-determination

Several main effects of self-determination emerged on the dependent variables, including positive main effects of self-determined work motivation on vigor, $\beta = .38$, $t(1, 118) = 4.40$, $p < .001$, $sr^2 = .11$, dedication, $\beta = .50$, $t(1, 118) = 6.76$, $p <$

¹ One set of analyses involved the self-determined work motivation composite and a separate set of analyses involved the non-self-determined work motivation composite.

² The effects reported do not change when variables are entered simultaneously, or when the traditional Aiken and West (1991) approach is adopted.

³ Despite the significant relationships among trait negative affectivity and the principal variables in the analyses, entry or removal of this control variable does not change the nature or significance of any results reported.

Table 2

Hierarchical moderated regressions with self-determined work motivation as the conjunctive moderator ($N = 123$).

	Health complaints β	Anxiety/ depression β	Engagement vigor β	Engagement dedication β	Engagement absorption β
Step 1: Control variables					
Age	-.03	-.03	.20*	.17	.05
Gender	.07	-.10	-.00	.09	.10
Trait negative affectivity	.39**	.22*	-.28*	-.14	-.03
R^2	.17**	.05	.12*	.06*	.02
Step 2: Main effects demand and control					
Role overload	.07	.25*	.25*	.19*	.23*
Job control	-.04	-.04	.20*	.46**	.36**
R^2 ch.	.01	.06*	.10*	.23**	.18**
Step 3: Two-way interaction demand \times control					
Role overload \times job control	-.16	-.12	.25*	.28*	.20*
R^2 ch.	.02	.01	.06*	.07*	.04*
Step 4: Self-determination					
Self-determined work motivation	-.15	-.03	.38**	.50**	.45**
R^2 ch.	.02	.00	.11**	.19**	.15**
Step 5: Two-way interactions of self-determination					
Role overload \times self-determined work motivation	.02	-.02	.03	.04	.03
Job control \times self-determined work motivation	.06	-.04	.08	.16*	.04
R^2 ch.	.00	.00	.01	.02	.00
Step 6: Three-way interaction					
Role overload \times job control \times self-determined work motivation	.07	-.02	-.03	.02	-.09
R^2 ch.	.00	.00	.00	.00	.01

* $p < .05$.

** $p < .01$.

.001, $sr^2 = .19$, and absorption, $\beta .45$, $t(1, 118) = 5.16$, $p < .001$, $sr^2 = .15$. No main effects of self-determined work motivation emerged on strain outcomes.

Non-self-determined work motivation was positively associated with anxiety/depression, $\beta = .32$, $t(1, 117) = 3.33$, $p = .001$, $sr^2 = .08$. Interestingly, a positive main effect of non-self-determined work motivation on vigor was evident $\beta = .19$, $t(1, 118) = 2.14$, $p = .034$, $sr^2 = .03$, and non-self-determined work motivation was significantly positively associated with absorption, $\beta = .31$, $t(1, 118) = 3.46$, $p = .001$, $sr^2 = .08$. Although the effect sizes of the main effects of non-self-determined

Table 3

Hierarchical moderated regressions with non-self-determined work motivation as the conjunctive moderator ($N = 123$).

	Health complaints β	Anxiety/ depression β	Engagement vigor β	Engagement dedication β	Engagement absorption β
~Steps 1–3 are displayed in Table 2					
Step 4: Self-determination					
Non-self-determined work motivation	.01	.32*	.19*	.13	.31*
R^2 ch.	.00	.08*	.03*	.01	.08*
Step 5: Two-way interactions of self-determination					
Role overload \times non-self-determined work motivation	.25*	.16	-.07	-.03	.09
Job control \times non-self-determined work motivation	.11	-.08	.03	.09	-.04
R^2 ch.	.05*	.03	.01	.01	.01
Step 6: Three-way interaction					
Role overload \times job control \times non-self-determined work motivation	-.02	-.13	-.17	-.12	-.28*
R^2 ch.	.00	.01	.02	.01	.05*

* $p < .05$.

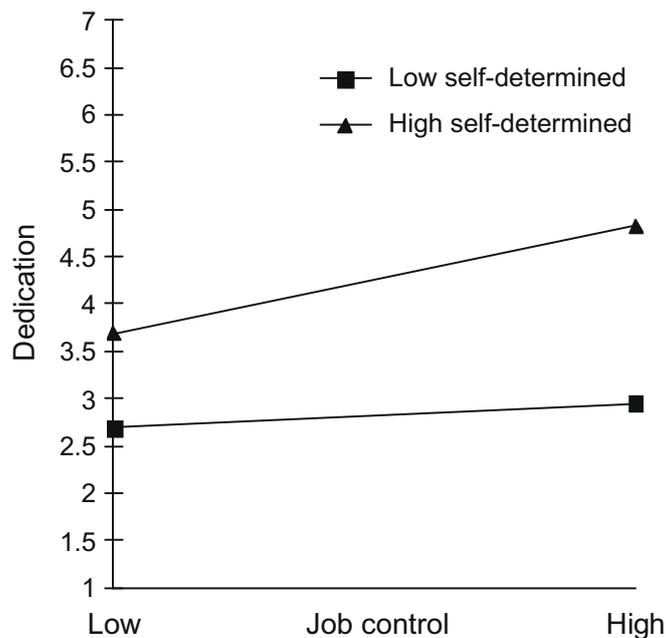


Fig. 1. Two-way interaction of job control and self-determined work motivation on dedication.

work motivation are not as strong as those of self-determined work motivation on employee engagement, the effects do seem to indicate there may be some potential for positive implications of non-self-determined work motivation on some forms of employee engagement (i.e., vigor and absorption).

3.3.5. Two-way interactions involving self-determination

As seen in Table 2, a significant 2-way interaction of job control and self-determined work motivation on dedication was revealed, $\beta = .16$, $t(1, 118) = 2.31$, $p = .023$, $sr^2 = .02$. Fig. 1 displays this interaction. Simple slopes analysis revealed that the positive effect of job control on dedication was more marked for employees who were more self-determined, $\beta = .65$ ($p < .001$), than for those employees who were less self-determined, $\beta = .15$ ($p = .19$, *ns*).

As seen in Table 3, a significant 2-way interaction of role overload and non-self-determined work motivation on health complaints also was revealed, $\beta = .25$, $t(1, 117) = 2.71$, $p = .008$, $sr^2 = .05$. Fig. 2 displays the interaction. Simple slope analysis revealed that the positive main effect of role overload on health complaints was significant for employees who were more non-self-determined, $\beta = .14$ ($p = .035$). However, for employees who were less non-self-determined, there was a negative main effect of role overload on health complaints, $\beta = -.14$ ($p = .03$).

3.3.6. Three-way interactions

In support of Hypotheses 2a through 2d, a 3-way interaction of role overload, job control, and non-self-determined work motivation on absorption emerged, $\beta = -.28$, $t(1, 118) = -2.80$, $p = .006$, $sr^2 = .05$ (see Table 3). This interaction is displayed in Fig. 3a (at high non-self-determined work motivation) and Fig. 3b (at low non-self-determined work motivation). For employees high in non-self-determined work motivation, simple slope analysis revealed (in support of Hypothesis 2a) a positive main effect of role overload on absorption when employees perceived low job control, $\beta = .82$ ($p = .019$). Although there was no stress-exacerbating effect of high job control (Hypothesis 2b), it is interesting to note that high job control did not increase absorption for individuals high in non-self-determined work motivation, $\beta = .17$ ($p = .55$, *ns*). For individuals low in non-self-determined work motivation, simple slope analysis revealed (in support of Hypothesis 2c) a positive main effect of role overload on absorption when job control perceptions were high, $\beta = .75$ ($p = .025$). This indicates that high job control may be more appealing to these individuals (i.e., when faced with high demands, high job control increased absorption). Again, although there was no stress-exacerbating effect of low job control (Hypothesis 2d), as would be expected, low job control did not increase absorption for these individuals, $\beta = -.25$ ($p = .21$, *ns*).

3.4. Canonical correlation analysis

Because the proposed interactive effects of demand, control, and work motivation only emerged on a few of the employee strain and engagement indicators, canonical correlation analyses were conducted as post hoc descriptive analyses of the main interrelations among the data. Canonical correlation analyses were performed using SPSS CANCELL. The predictor variables set included employees' perceptions of role overload, available job control, and work motivation (i.e., self-determined or non-self-determined). The criterion variables set included two indicators of employee strain (i.e., health complaints and

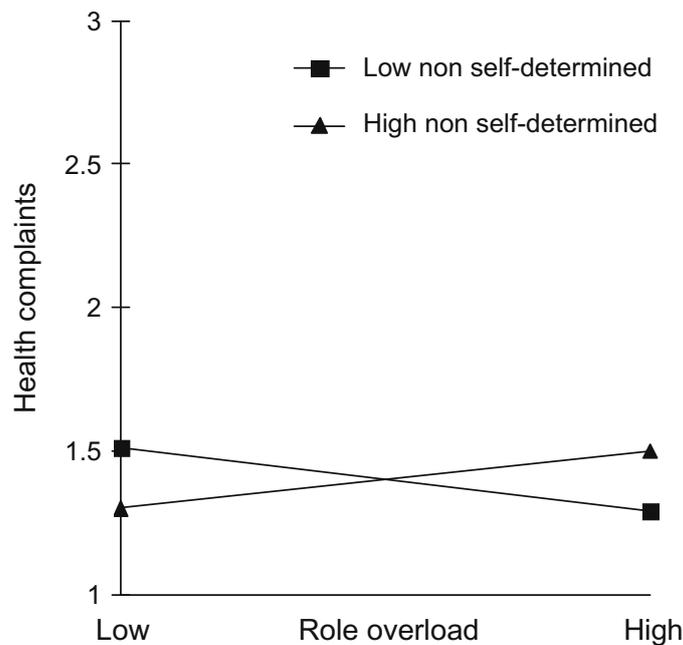


Fig. 2. Two-way interaction of role overload and non-self-determined work motivation on health complaints.

anxiety/depression) and three indicators of employee engagement (i.e., vigor, dedication, and absorption). A separate canonical correlation analysis was performed for each type of work motivation. This was performed so that differential effects of the two types of work motivation could more easily be observed (i.e., without their positive association confounding the analyses).⁴

3.4.1. Canonical correlational analysis: self-determined work motivation

The first canonical correlation was .72 (53% overlapping variance); the second was .34 (12% overlapping variance). The third was essentially zero. The model was significant with all canonical correlations included, $\chi^2(15) = 101.50, p < .001$, and with the first canonical correlation removed, $\chi^2(8) = 16.61, p < .001$. Subsequent χ^2 tests were not statistically significant. Therefore, the first two canonical variate pairs (CVP) accounted for the significant relationship between the two sets of variables. Total percent of variance and redundancy analysis indicated that the first CVPs were strongly related and the second CVPs were only weakly associated. As interpretation of the second CVP was questionable an interpretation of the first CVP is provided (see Tabachnick & Fidell, 2007; Thompson, 1984). With a cut-off criterion of .3 (Tabachnick & Fidell, 2007) for canonical loadings, the first CVP indicated that higher self-determined work motivation (.79) and higher perceptions of job control (.31) were associated with higher scores on dedication (.76). This pattern of results is indicative of the interactive effect between self-determined work motivation and job control on dedication found in moderated regression analysis in the previous section.

3.4.2. Canonical correlational analysis: non-self-determined work motivation

The first canonical correlation was .62 (38% overlapping variance) and the second was .40 (16% overlapping variance). The remaining canonical correlation was .19 (4% overlapping variance). The model was significant with all canonical correlations included, $\chi^2(15) = 79.55, p < .001$, and with the first canonical correlation removed, $\chi^2(8) = 24.08, p = .002$. Subsequent χ^2 tests were not statistically significant. Therefore, the first two CVPs accounted for the significant relationship between the two sets of variables. Total variance and redundancy analysis indicated that interpretation of the second CVP was questionable (see Tabachnick & Fidell, 2007; Thompson, 1984). As such, interpretation of the first CVP is provided below.

With a cut-off criterion of .3 (Tabachnick & Fidell, 2007), low role overload (−.32), low job control (−.53) and low non-self-determined work motivation (−.68), which could be described as low non-self-determined employees working within Passive Jobs (see Karasek, 1979), was associated with lower anxiety/depression (−.60) and lower engagement in the form of dedication (−.42) and absorption (−.36). This is indicative of a potential 3-way interactive effect between the work characteristics variables (i.e., role overload and job control) and non-self-determined work motivation in the explanation of anxiety/depression, dedication, and absorption. More generally, it also could represent a general model of amotivation. However, the more rigorous and conservative tests in moderated regression (see Stone-Romero & Liakhovitski, 2002)

⁴ It should be noted that the significant CVP emerging within the self-determined work motivation canonical correlation analysis is the same CVP which emerges when self-determined and non-self-determined work motivation are included in the predictor variable set simultaneously. This indicates that this latent construct explains the most variance across the two sets of variables when all variables are included in the model.

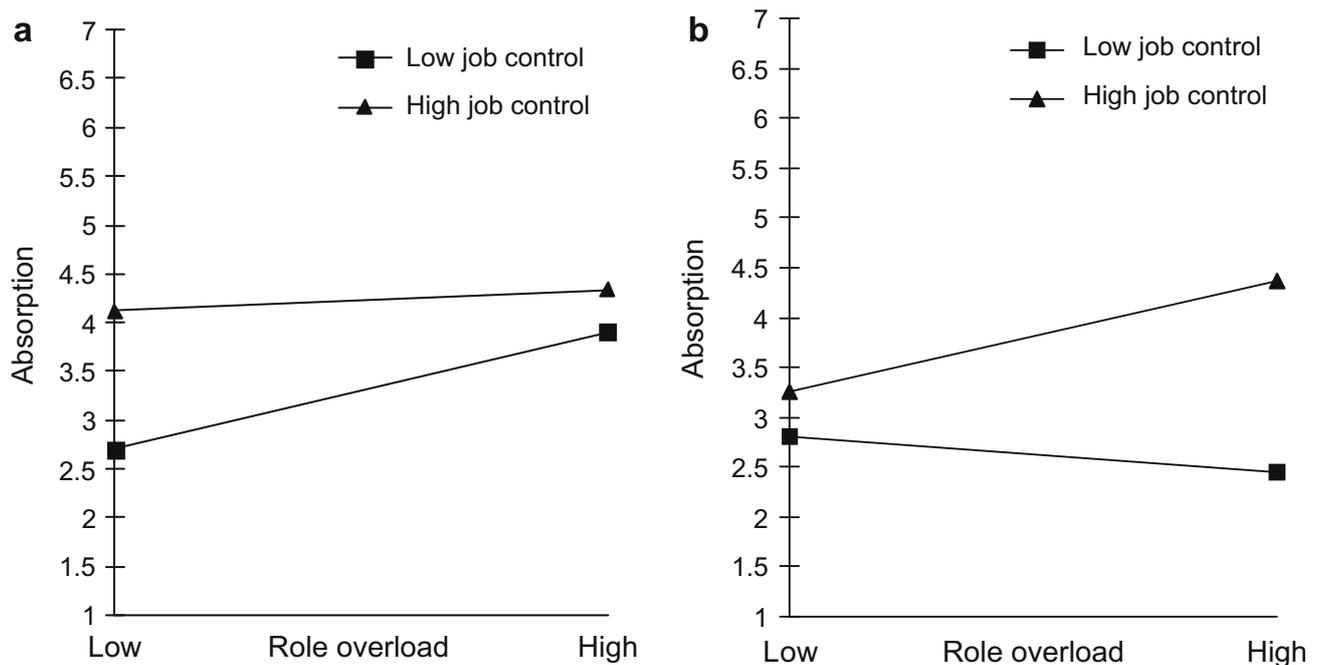


Fig. 3. (a) Three-way interaction of role overload, job control, and non-self-determined work motivation on absorption at high non-self-determined work motivation. (b) Three-way interaction of role overload, job control, and non-self-determined work motivation on absorption at low non-self-determined work motivation.

revealed this 3-way interactive effect was only evident for absorption. Moreover, simple slope analysis across demand revealed interesting and divergent stress-buffering effects of job control on absorption for those employees high and low in non-self-determined work motivation.

Overall, canonical correlation analysis provided additional support for some of the main and interactive effects emerging in moderated regression. The CVPs are representative of the 2-way interaction of self-determined work motivation and job control on dedication, and the 3-way interaction of role overload, job control, and non-self-determined work motivation on absorption. In fact, the canonical correlation analyses imply that these effects, when using a variance maximizing procedure, are the most important inter-relationships across the two sets of variables. The fact that a CVP explaining the 2-way interaction of role overload and non-self-determined work motivation on health complaints did not emerge does not imply that this effect is spurious. It simply suggests it is not as important as other effects in explaining variance when the outcomes are treated as a set.

4. Discussion

4.1. Propositions of the D-CM

Several of the main propositions of Karasek's (1979) D-CM were supported. Specifically, increased job demand (i.e., role overload) was associated with higher levels of anxiety/depression, whereas increased job control was associated with higher work engagement. This pattern of findings is in line with the findings of Mauno et al. (2007) and Schaufeli and Bakker (2004) who showed that job demands (including role overload) act as draining forces, whereas job control serves to energize and motivate employees. Interestingly, job control was not negatively associated with health complaints or anxiety/depression. In relation to health complaints, this might not be surprising given that recent epidemiological research using a prospective design has demonstrated that employees' experience of low job control might not manifest itself on health status for many years; that is to say, the impact is longer-term (Smith, Frank, Mustard, & Bondy, 2008).

Job demand, as operationalized by role overload, was positively associated with all three subscales of engagement. This positive association between job demands and engagement can be explained in several ways. First, job demands can be conceptualized as either a challenge stressor or a hindrance stressor (LePine, Podsakoff, & LePine 2005). Perhaps, when work pressures are very high, they no longer provide challenge, but act as a hindrance, and this is when we may observe a negative impact of job demand on employee engagement (i.e., disengagement from one's work). A second explanation for the positive main effect of job demand on engagement involves the underlying processes at work. In line with Lazarus and Folkman's (1984) perspective on the stressor-strain process, the extent to which job demand will be viewed as a challenge or a hindrance will depend on (1) the controllability of the stressor (i.e., available job control), and (2) individual differences (e.g., self-determined or non-self-determined work motivation) that influence perceptions of the stressor and behavioral responses (i.e., coping strategies).

The three 2-way interactions of demand and control which emerged on the subscales of engagement partially support the first explanation (i.e., that the negative implications of job demands will depend on available job control). In this way, there was support for the active learning axis of the D-CM found on all three subscales of engagement (i.e., vigor, dedication, and absorption). Engagement increased with job demand when job control was high. Yet, employees' level of engagement remained the same, as job demands increased, when job control was low. This supports the proposition that the combination of high demands with high control (i.e., an active job) is motivating and has positive repercussions for employee engagement (Karasek, 1979; Karasek & Theorell, 1990). Overall, these findings indicate that available job control did act to limit the potentially detrimental effect of job demand on employee engagement.

4.2. Findings involving self-determination

There were differential main effects of self-determined versus non-self-determined work motivation on employee strain and engagement, justifying the examination of these two types of motivation separately. Self-determined work motivation had positive implications for employee engagement (i.e., vigor, dedication, and absorption). However, a self-determined work motivation did not act as a protective factor for employee strain (i.e., did not reduce health complaints and anxiety/depression). This could potentially be due to the use of a contextual measure of self-determination (i.e., self-determination towards work). The influence of work self-determination may not extend to general health and well-being outcomes (Vallerand, 1997), whereas global self-determination or self-determined behavior towards other contexts outside the workplace might potentially influence such general health and well-being outcomes, as seen in the O'Connor and Vallerand (1994) and Philippe and Vallerand (2008) nursing home studies. Moreover, recent research has more strongly linked high self-determined work motivation with increased involvement and citizenship behaviors, whereas non-self-determined work motivation was not associated with these job attitudes (Tremblay et al., *in press*).

In contrast, non-self-determined work motivation had negative implications for employee strain (i.e., increased anxiety/depression). However, non-self-determined work motivation also had positive implications for two of the subscales of engagement (i.e., vigor and absorption, but not dedication). Examination of the effect sizes indicates that there may be a more important role for self-determined work motivation as it explained 11% of the variance in vigor, 19% in dedication, and 15% in absorption, whereas non-self-determined work motivation explained only 3% of the variance in vigor and 8% of the variance in absorption. It is important to note that these effects represent additional variance explained after the impact of demand, control, and their interaction had been taken into account. This is in line with the findings of Brunborg (2008) who examined core self-evaluations and also found that dispositional variables related to personal control, self-awareness, and internalization (i.e., core self-evaluations) explained additional variance after controlling for the main and interactive effects of demand and control. In fact, in his study with Norwegian employees, none of the interactive effects of demand, control, and core-self-evaluations were significant. Dissimilar to Brunborg's findings, and in line with a Person–Environment Fit (P–E Fit) perspective on strain (Terborg, 1981), in the present study, there were interactive effects of self-determination, demand, and control.

P–E Fit theory maintains that interactions between individual and environmental characteristics are fundamental to explaining strain and productive workplace behaviors (Terborg, 1981), suggesting, when examining the stressor-strain process, it is important to consider both person and contextual factors, and their impact on resulting outcomes. The interactive effects found with self-determination, demand, and control provides some support for the P–E Fit perspective on strain. First, the combination of self-determined work motivation and high job control (i.e., a P–E match) had positive implications for dedication towards one's work. This is interesting as Mauno et al. (2007) demonstrated that the positive association between job control and the dedication subscale of engagement was the only relationship to remain significant over time and also after accounting for baseline effects. The role of individual differences (i.e., such as work motivation) might be involved in sustaining this effect. Second, the combination of non-self-determined work motivation and job demand (i.e., a potential P–E mismatch) had negative implications for health complaints, whereas the absence of this type of work motivation had positive implications for employees' health complaints, even when they perceived high job demands.

Third, it was shown that when non-self-determined employees perceived high job demands, low job control was just as useful as high job control for enhancing absorption (i.e., being happily engrossed in one's work). However, for individuals who did not draw on this type of work motivation (i.e., who were low in non-self-determined work motivation), only high job control had the hypothesized stress-buffering effect on levels of absorption (i.e., an energizing and motivating effect). This is an interesting finding as some researchers would suggest that the engagement sub scale of absorption represents *flow*, a construct believed to be best explained by a need for autonomy and intrinsic motivation (Fullagar & Mills, 2008). However, one necessary aspect of *flow* could potentially be the absence of non-self-determined motivation rather than the presence of self-determined forms. As observed in the present study, those low in a non-self-determined work motivation did experience enhanced absorption in their work when in active conditions and decreased absorption in high-strain conditions (supporting the propositions of Karasek's (1979) D-CM). For those high in non-self-determined work motivation, it seems the story is more complex. Perhaps one avenue for future research is to examine the impact of various types of extrinsic motivators in the workplace when employees are working in active or high-strain jobs. This would help establish whether the stress-buffering effect of control for these individuals depends on the way their non-self-determined work motivation has been primed.

Given that there is little direct association between non-self-determined work motivation and dedication, it is not surprising this type of work motivation did not moderate the impact of the employees' perceived work environment (i.e., the interaction of demand and control) on dedication. Moreover, given the 2-way interaction of control and self-determined work motivation, and the prior research linking self-determined work motivation to involvement and citizenship behaviors (see Tremblay et al., *in press*), it seems self-determined work motivation may be more important in explaining dedication to one's work (i.e., especially when job control is high). One potential reason why interactive effects of work characteristics (i.e., demand and control) and self-determination did not emerge on the subscale of vigor is because this subscale of engagement more directly taps an emotional reaction to one's engagement in work (i.e., these effects may be more dynamic). Indeed, vigor is the engagement subscale that is most negatively correlated with the emotional exhaustion dimension of burnout (Schaufeli & Bakker, 2004). Another reason P–E Fit interactions on vigor may not have emerged in the present study could be related to the sample of clerical and administrative workers. Across occupational groups, levels of vigor have been shown to be lowest amongst lower-status employees (Schaufeli, Bakker, & Salanova, 2006).

Overall, the findings of the present study lend support to the findings of Fernet et al. (2004), which is the only other study to examine self-determination in the context of the D-CM. Interestingly, in the Fernet et al. paper, the stress-exacerbating effects of a mismatch between control and self-determination were not found. One explanation for this difference may relate to the measure of job demands utilized in the Fernet et al. paper. This was a composite of four role stressors. One of the main conclusions to come out of the Örtqvist and Wincent (2006) Meta-analysis of consequences of role stress was that the individual role stressors have differential effects on a variety of outcomes, and that researchers should look at each facet individually. Another explanation may be the use of a self-determination index, which represents relative autonomy and treats self-determination as a bi-polar construct. In the present study, we confirmed the importance of examining different types of work motivation (i.e., self-determined and non-self-determined). However, overall the findings reported by Fernet et al. and the present study offer converging evidence for the importance of self-determination as a moderator variable within the D-CM.

The positive correlation between self-determined and non-self-determined motivation ($r = .48$) found in the present study is important to consider. This relationship is not surprising given that the self-regulatory mechanisms that underlie these constructs are said to lie along a continuum of controlled versus autonomous self-regulation, where each regulatory mechanism is more strongly positively correlated to the mechanism positioned closest to it along the continuum (Grolnick & Ryan, 1987). Many past studies also have found positive moderate associations between self-determined and non-self-determined motivation, ranging from $r = .23$ to $r = .32$ (Tremblay et al., *in press*; Vansteenkiste et al., 2004; Vansteenkiste et al., 2005; Vansteenkiste et al., 2007). On one hand, we might expect a negative correlation between the self-determined and non-self-determined motivation variables. However, work motivation is a particular type of contextual motivation that may in fact behave differently. This might be because work motivation is quite fundamental to livelihood and security. Moreover, extrinsic motivators (i.e., pay and rewards) in a workplace may be more salient to employees, as compared to extrinsic motivators in other contexts. Thus, the positive association between self-determined and non-self-determined work motivation is likely to be more prominent because employees can be more easily motivated by both self-determined and non-self-determined reasons (simultaneously). Moreover, the strength of the association is likely to differ across occupational groups depending on existing reward structures. In summary, as a differential pattern of results emerged for non-self-determined work motivation, as compared to self-determined work motivation, we would argue it is useful to maintain this distinction in future research.

It also is important to consider why other research examining person variables as potential moderators of demand and control (i.e., core self-evaluations) have not found P–E interactive effects (see Brunborg, 2008). One potential explanation for the dissimilarity of this finding and that of Brunborg is that when the unique variability of individual traits (i.e., self-efficacy, locus of control, and self-esteem) are ignored by examining a more global underlying construct (i.e., core self-evaluations) we are unable to observe the interactive effects of person and environment matches and mismatches. That is to say, we need to be very specific about the aspects of the individual being triggered by their work environment. This perspective is in line with the proposals of Piasentin and Chapman (2006) who suggested that future research examining P–E Fit interactions should use very specific individual difference variables that have relevance to the subjective environment being examined. In addition, it is consistent with the findings of trait activation research, which posit that specific environmental characteristics trigger the tendencies associated with specific traits (see Tett & Burnett, 2003).

4.3. Practical implications

Prior SDT research has noted the role of extrinsic motivators in the work environment as potential inhibitors of employees' autonomy and self-directedness (Vansteenkiste et al., 2007). This of course has implications for work outputs as well as employee well-being. However, what about the impact of non-self-determined work motivation within a stress and coping perspective? Given the present findings, it seems that individuals who draw on self-determined forms of work motivation may generally be more engaged (in terms of vigor, dedication and absorption). Moreover, as there were no 3-way interactions with work characteristics these employees may be more resilient. Potentially self-determined employees retain some level of 'hardiness' towards the detrimental effects of high-strain jobs. These individuals also could be more likely to come to perceive (or create) some degree of autonomy despite their objective work environment. In contrast, for individuals who draw on non-self-determined motivation, it seems there are potentially negative implications for anxiety/depression

generally, and for their health when under high demands. Moreover, when in active positions (i.e., jobs high in demand and high in control), it seems that low job control can be just as useful as high job control as a stress-buffer. Ostensibly, when under conditions of high demand, these individuals may prefer more instruction, rules, or procedures, and less autonomy (i.e., which can be associated with increased ambiguity and responsibility for outcomes). Whereas for those who are less non-self-determined, control is not a hindrance, it is more like a positive challenge. More generally, these results indicate that the implications of a mismatch between job control and self-determination may only be of real importance when employees (1) perceive high levels of demand and (2) when employees are utilizing non-self-determined work motivation.

With these results in mind, how can we increase employee engagement? One method would be to use different incentive programs in active and high-strain positions. It seems we should be wary of the use of extrinsic motivators when employees are working under high levels of demand. For jobs with high demands, it may be more appropriate to influence or prime the use of more self-determined (i.e., internally driven) self-regulation, rather than non-self-determined (i.e., externally driven) self-regulation. Perhaps reinforcing or making salient aspects of the work that relate to (1) learning and mastery, (2) the alignment of work tasks with employees goals and values, and (3) the enjoyable or pleasurable nature of the work. Another application could be the use of self-awareness training, where employees explore the implications of their work contextual motivation under different working conditions (i.e., different combinations of demand and control). One aspect or focus of this training could be the development of more internalized self-regulation at work (i.e., self-determined work motivation), which, in general, has positive implications for employee engagement (and a range of other job attitudes and outcomes, see Vansteenkiste et al., 2007).

4.4. Limitations and future research directions

Some of the main criticisms of prior research testing the D-CM include (1) the homogeneity of samples used (i.e., participants are recruited from one organization or occupational group which is thought to constrain variability in exposure to job demands and job control) and (2) the use of cross-sectional designs (i.e., absence of a causal explanation for findings and presence of CMV over or under-estimating relationships among variables). Interestingly, de Lange et al. (2003) have noted that the overall pattern of findings from studies using homogeneous samples were very similar to studies using heterogeneous samples. This is potentially due to the provision of enough true individual and within-occupation variation in job characteristics, indicating researchers do not need to source heterogeneous samples to provide enough exposure contrast. However, it does need to be acknowledged that the homogeneous sample and cross-sectional methodology utilized in the present research may have produced some unique effects.

First, the sample was comprised of clerical and administrative employees. These employees are somewhat low in status (i.e., career opportunities). In a sample with professional employees, with higher status, interactive effects with demand, control, and self-determined work motivation may have appeared (as was the case using university professors in the Fernet et al. 2004 study). In fact, in a recent Meta-analysis of the role stressor research, it was demonstrated that the negative impact of job demands on performance measures was more pronounced for managers relative to non-managerial employees (Gilboa, Shirom, Fried, & Cooper, 2008). It would be worthwhile to extend the findings of the present study (i.e., using two or more types of self-determination) with employees occupying higher status jobs.

Second, although it has been demonstrated that CMV may inflate relationships between variables, it actually obscures the presence of interactions because correlated errors serve to reduce the magnitude of true interaction effects (see Evans, 1985; McClelland & Judd, 1993). As such, CMV cannot account for the interactions observed in the current study. Moreover, CMV analyses revealed very little impact of CMV bias. The main concern related to the use of cross-sectional survey data is the restriction on a causal explanation for the impact of demand, control, and self-determination on strain and engagement. As such, tentativeness should be employed in drawing conclusions regarding the potential impact changes to the work environment would actually have on employee strain and engagement. Further research using experimental field studies or longitudinal methodologies utilizing different sources of data (i.e., objective data) is warranted.

5. Concluding remarks

The major contribution of this research is the finding that individuals' type and level of work motivation explained additional variance in employee strain and engagement above and beyond that of their subjective work environment (i.e., job demands and job control). More importantly, employees work motivation moderated the impact of demand and control on employee strain and engagement. Self-determined employees who perceived high job control experienced greater dedication to their work. In addition, the negative implications of role overload on health complaints were present for those with a non-self-determined work motivation; however, low non-self-determined work motivation did not have this negative implication for employees. For those with a high non-self-determined work motivation both high and low job control acted as an energizing force (or stress-buffer) increasing absorption in one's work, whereas for those low in this type of work motivation, only high job control acted in this way. SDT is an appealing framework when exploring individual differences (i.e., why people engage in certain behaviors) within a stress and coping perspective as the theory allows exploration of both the intensity (i.e., high or low) and type of motivation (i.e., self-determined or non-self-determined) utilized. At a practical level, this information could be more useful in making recommendations that guide occupational stress management interventions and the development of workplace reward structures more generally.

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