JOB BURNOUT AND DEPRESSION: UNRAVELLING THE CONSTRUCTS' TEMPORAL RELATIONSHIP AND CONSIDERING THE ROLE OF PHYSICAL ACTIVITY

by

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Abstract

Job burnout and depression share key characteristics. In light of these similarities, it is not surprising that job burnout and depression are generally found to be correlated with one another (e.g., Maslach & Jackson, 1986). However, evidence regarding the burnout-depression association is limited in that most studies are cross-sectional in nature, and therefore the causality of the relationship is difficult to pinpoint (e.g., McKnight & Glass, 1995; Peterson, et al., 2008;). Moreover, little is known about factors that may influence the burnout-depression association, other than personal (e.g., gender) or organizational (e.g., supervisor support) factors. Drawing from Conservation of Resources (COR) theory (Hobfoll, 1989, 2001), the current study seeks to address these gaps in the literature by (1) unravelling the temporal relationship between job burnout and depression, and (2) examining whether the burnout-depression association may be contingent upon the degree to which employees engage in physical activity. On the basis of a full-panel three-wave longitudinal design, in a large sample (N=1632), our results indicate that depression is a stronger predictor of subsequent job burnout rather than the other way around. In addition, physical activity was found to buffer any positive relationship between job burnout and depression.

Keywords: Depression; Job burnout; Physical activity.

Introduction

Accumulated evidence show that job burnout and depression, two affective states, can be regarded as a major public health problem and a cause for concern for health care policy makers as well as for employers; for example, job burnout has been shown to predict individual (e.g., diabetes, cardiovascular diseases) and organizational (e.g., absenteeism, job turnover) consequences (Melamed, Shirom, Toker, Berliner, & Shapira, 2006; Schaufeli & Enzmann, 1998). The prevalence of job burnout among workers is considered high, although specific cutoffs are not used. Schaufeli and Enzmann (1998) estimated that about 4-7% of the Dutch working population suffer from severe job burnout. It has been suggested that the situation in the Netherlands is typical of most developed western countries (Landsbergis, 2003). Hallsten (2005), for example, found that among a representative sample of the Swedish employees, 7.4% were diagnosed as burned-out.

Likewise, employees' depression was found to be associated with reduced job performance (Adler, et al., 2006), with estimates as high as $44 billion cost per year in lost productive time (Stewart, Ricci, Chee, Hahn, & Morganstein, 2003). According to the World Health Organization, depression is the leading global cause of years of life lived with disability and the fourth leading cause of disability-adjusted life-years, a measure that takes premature mortality into account (WHO, 2001). Symptoms of depression and major depression are exceedingly common, reaching a lifetime prevalence of 6%-13% in the USA (Johnson, Weissman, & Klerman, 1992; Kessler, et al., 1994). The prevalence of a major depressive episode in Israel is somewhat lower (4.5%, The Israeli Central Statisitcs Bureau, 2006). Minor depressive disorders are also common, exceeding a lifetime prevalence of 23% (Johnson, et al., 1992).

Job burnout and depression are moderately correlated, sharing on average 26% of their variance (Schaufeli & Enzmann, 1998). Both affective states have been shown to have

similar work related antecedents (e.g., perceived control, social support), although not to the same extent (for review, see Schaufeli & Enzmann, 1998). In addition, both constructs have been shown to bear similar health related consequences, such as cardiovascular diseases (for a review see Suls & Bunde, 2005), sickness absence, and work disability (Bekker, Croon, & Bressers, 2005; Couser, 2008). Despite these similarities, as we explain in detail below, several Meta-analyses and literature reviews have concluded that the two constructs are conceptually and empirically distinct. The current study extends these findings by testing the longitudinal reciprocal relationship between depression and job burnout, as well as the moderating role of physical activity intensity on the depression-burnout relationship.

The conceptualization of job burnout

Job burnout, a unique affective response to stress, is a multidimensional construct consisting of three core components, namely emotional exhaustion, physical fatigue and cognitive weariness (Schaufeli & Buunk, 2003; Shirom, 2003). Job burnout develops as a result of prolonged exposure to stressors at one's workplace and therefore could be viewed as a major manifestation of stress consequences (Schwarzer & Greenglass, 1999). Theoretically, job burnout may be regarded as reflecting individuals' experiences of work-related stress, and thus may serve as a proxy variable that assesses the extent to which a person's energetic coping resources have been depleted following his or her exposure to chronic and possibly other forms of stress, primarily work related.

This approach to job burnout research is supported by theoretical insights offered by Hobfoll's Conservation of Resources (COR) theory (Hobfoll, 1989, 2001). According to COR theory, individuals who lack adequate and relevant resources are likely to experience cycles of resource losses, perceived threats of resource loss, or stress caused by failure to offset resource loss. Each of the above may lead to chronic depletion of emotional, cognitive, and physical resources, namely, to progressive job burnout (Hobfoll & Shirom, 2000). The

three components of job burnout (physical fatigue, emotional exhaustion, and cognitive weariness) are closely interrelated and can be gauged by a single job burnout score (Melamed, et al., 2006; Shirom & Melamed, 2006). The theoretical reason for focusing on the single job burnout score and not on the separate components is based on the premise that any change in each of these components reflects a change in the underlying latent construct of global job burnout (Shirom & Melamed, 2006). Corresponding definitions, with regard to the physical, emotional and mental components of job burnout, were offered by Pines and Aronson (1988, p.9), and Schaufeli and Peeters (2000). Maslach and her colleagues conceptualized job burnout somewhat differently, and referred to it as a constellation of emotional exhaustion, depersonalization, and diminished personal accomplishment (Maslach, Schaufeli, & Leiter, 2001).

Although the most widely used instrument to assess job burnout is the Maslach Burnout Inventory (MBI) in its different variations (Schaufeli & Enzmann, 1998), very few studies have related the MBI to any aspect of physical or mental health. Most of the studies exploring the association between job burnout and health have applied either the resource-based view to conceptualize job burnout, using the Shirom-Melamed Burnout Measure (SMBM, see: Melamed, et al., 2006; Shirom, 2003), or the measure of vital exhaustion (VE, see: Appels, Hoppener, & Mulder, 1987), a measure akin to job burnout that refers to a state characterized by excess fatigue, lack of energy, increased irritability, sleep disturbances, and feelings of demoralization. Our study focuses on a mental health-related outcome (depression) and a health-related moderator (physical activity). We therefore use the Shirom-Melamed burnout conceptualization and measure.

The construct of job burnout does not overlap with related affective dysfunctions such as depression and anxiety (cf. Brenninkmeyer, Van Yperen, & Buunk, 2001; Glass & McKnight, 1996; Leiter & Durup, 1994; McKnight & Glass, 1995). Nor does it overlap with

facets of the coping process such as psychological withdrawal, or with aspects of the self, such as self-efficacy (Shirom, 2003). Moreover, it is conceptually distinct from a temporary state of fatigue that passes after a resting period. When measured on several occasions in longitudinal studies, job burnout was found to have moderate to high correlations over time. The cross-time (diachronic) correlations were found to range from .50 to .60 even with a time interval extending up to eight years (Bakker, Shaufeli, Sixma, Bosveld, & Van Dierendonck, 2000; Burisch, 2002; Peiro, Gonzalez-Roma, Tordera, & Manas, 2001; Toppinen-Tanner, Kalimo, & Mutanen, 2002). These results suggest that job burnout is a stable and chronic phenomenon, regardless of sample makeup, cultural context, and length of time of the follow-up survey (For review, see Toon W. Taris, Blanc, Schaufeli, & Schreurs, 2005).

The conceptualization of depression

Depression is recognized as a multi-system disorder affecting both brain and body (Insel & Charney, 2003). Both the presence of major depression, as well as symptoms of depression, have been studied as predictors of morbidity and mortality (Suls & Bunde, 2005). Based on the Diagnostic and Statistical Manual of Mental Disorders, 4th edition (DSM-IV; American Psychiatric Association, 1994), major depressive episode represents at least five of the following criteria, lasting for a minimum of two weeks: depressed mood, markedly diminished interest or pleasure in activities, weight loss or gain, insomnia or hypersomnia, psychomotor retardation or agitation, fatigue, feelings of worthlessness or guilt, diminished ability to concentrate or think, and recurrent thoughts of death. Although the diagnosis of a major depressive episode involves in-depth interviews (Suls & Bunde, 2005, p. 292), it is possible to diagnose depressive symptoms, based on a self-reported questionnaire: the Patient Health Questionnaire (PHQ), which is a self-administered version of the Primary Care Evaluation of Mental Disorders (PRIME-MD) diagnostic instrument for common mental disorders (Kroenke, Spitzer, & Williams, 2001).

Depressive symptoms are triggered by the loss of something significant to the person, such as health, social status, or a close person. However, while expressing sadness in response to loss is normal, in people experiencing depressive symptoms, the period of sadness or lack of interest is abnormally intense, or abnormally long, and interferes with a variety of personal, interpersonal, and social activities. In congruence with COR theory, symptoms of depression can be regarded as a consequence of resource loss (salient or latent), and, like job burnout, exhibit a chronicity that resembles that of dispositions such as negative affectivity and trait anxiety (Suls & Bunde, 2005).

Similarities and differences in the conceptualization of job burnout and depression

All approaches toward conceptualizing job burnout include a component of felt fatigue or low levels of physical energy. These symptoms also appear as one of the criteria for the diagnosis of major depression (Aggen, Neale, & Kendler, 2005; Suls & Bunde, 2005), and in some depression symptomatology scales, such as the Beck Depression Inventory (Beck, Steer, & Carbin, 1988). Moreover, when depression is conceptualized as a trait it is often regarded as being a component of neuroticism, one of the Big Five personality factors (McCrae & John, 1992), and neuroticism has been shown to be closely associated ($r = .48$) with job burnout (as gauged by the emotional exhaustion scale of the MBI, see: Zellars & Perrewe, 2001; Zellars, Perrewe, & Hochwarter, 2000). These findings point to a certain degree of overlap between job burnout and depression and has led to the suggestion that these constructs are essentially interchangeable (Hemingway & Marmot, 1999). This notion is aggravated when measures of job burnout include other symptoms of depression, such as sleep disturbances or distress, vital exhaustion, or feeling sad or blue (Burnout Measure, see Pines, Aronson, & Kafry, 1981).

Notwithstanding the similarities between depression and job burnout, the two concepts differ in several respects. Compared with depressed individuals, individuals high in

job burnout: (1) make a more vital impression and are more able to enjoy things (although they often lack the energy for it); (2) rarely lose weight, show psychomotoric inhibition, or report thoughts about suicide; (3) have more realistic feeling of guilt, if they feel guilty; (4) tend to attribute their indecisiveness and inactivity to their fatigue rather than to their illness (as depressed individuals tend to do); (5) often have difficulty falling asleep, whereas in the case of depression one tends to wake up too early (Hoogduin, Schaap & Methorst, 1996). In addition, job burnout and depression are conceptually distinct in that job burnout is dependent on the quality of the social environment at work (Schaufeli & Enzmann, 1998), and focuses on experiences and feelings in one life domain (work) whereas depression is a global state that pervades virtually every aspect of an individual's environment.

Prior empirical work has largely supported the conceptual distinction between job burnout and depression, reporting moderate positive correlations between the two constructs. Based on 12 studies, Schaufeli and Enzmann (1998) found that the emotional exhaustion component of job burnout (gauged by the MBI) and depression share on average 26% of their variance. Schaufeli and Enzmann (1998) reported in their meta-analysis that the relationships between depression and the other MBI components, depersonalization and personal inefficacy, are much weaker, sharing 13% and 9% of their variance, respectively. Moreover, factor analysis of items measuring job burnout and depression (Leiter & Durup, 1994; Schaufeli & Enzmann, 1998) has generally found each construct to load on different factors, indicating that they tap different domains. This was recently further supported by three large scale studies, which found job burnout and depression to represent distinct factors (Ahola, et al., 2008; Nyklicek & Pop, 2005; Thomas, 2004).

Job burnout and depression: The nature of their relationship

A theoretical question is raised concerning the nature of the relationship between job burnout and depression. Drawing from COR theory, Hobfoll and Shirom (2000) proposed

that during the early stages of job burnout, when individuals are still trying to engage in active coping to prevent further losses of energetic resources and to replenish those lost, job burnout may co-occur with anxiety, whereas in the later stages of job burnout, when these active coping behaviors prove ineffective, job burnout may be accompanied by depressive symptoms. Therefore, depression can be viewed as a result of unsuccessful coping with job burnout. Furthermore, COR theory stresses the importance of loss spirals: when employees are exposed to chronic stressors, they experience resource loss (e.g., time, health, self esteem, sleep quality), and develop job related strain (e.g., job burnout). These employees are more susceptible to subsequent losses, as the resources they have already lost cannot buffer additional losses. These subsequent losses can include, among others, weight loss or gain, feelings of worthlessness, diminished ability to concentrate, and other symptoms of depression. Therefore, increases in job burnout can theoretically trigger subsequent depression overtime.

However, the association between job burnout and depression is not necessarily unilateral. As noted above, depression involves markedly diminished interest or pleasure in activities, diminished ability to concentrate or think, fatigue and agitation. As a consequence, depression may influence employees' perceived and objective workload and decision latitude, lower their productivity and performance, all of which were found to trigger job burnout (e.g., Barling & Macintyre, 1993; Pines, 2000). Thus, an increase in depressive symptoms can theoretically trigger subsequent job burnout overtime.

In light of accumulating evidence for a bi-directional relationship between job burnout and depression, a number of researchers have argued that the two constructs may be seen to influence each other in the manner of a ‘vicious cycle’ or a ‘downward spiral’, where job burnout increases depression, which, in turn, increases job burnout, which then again increases depression (e.g., Appley & Trumbull, 1986; Huibers, Leone, van Amelsvoort, Kant,

& Knottnerus, 2007; Skapinakis, Lewis, & Mavreas, 2004). However, despite the richness of this evidence, most of the studies that examined the association between job burnout and depression were cross-sectional in nature, as a result of which researchers were unable to empirically account for the sequential location of job burnout and depression in their model. In other words, the causality of the job burnout-depression relationship remains unsolved (For reviewes, and two recently published papers see McKnight & Glass, 1995; Peterson, et al., 2008; Schaufeli & Enzmann, 1998; Sonnenschein, Sorbi, van Doornen, Schaufeli, & Maas, 2007).

Only one study to date (Ahola & Hakanen, 2007), has examined the reciprocal relationship between job burnout and depression over time. This study among 2555 Finnish dentists found that baseline levels of depression predicted new cases of job burnout and vice versa: baseline levels of job burnout predicted new cases of depression over a 3-year follow-up. However, both job burnout and depression were dichotomized – a procedure with known limitations (Irwin & McClelland, 2003; MacCallum, Zhang, Preacher, & Rucker, 2002). Another study that was based on the same panel study of 2555 Finnish dentists, found a cross-lagged effect of baseline job burnout on future depressive symptoms, using continuous scores (Hakanen, Schaufeli, & Ahola, 2008). However, the authors did not consider the reciprocal longitudinal influence of depression on subsequent job burnout.

Based on the abovementioned arguments, we assume that there is a reciprocal longitudinal relationship between job burnout and depression, with the two construct likely to influence each other over time. We test our model while addressing the shortcomings of prior research by (a) using a three wave longitudinal design, which enables us to control for the time sequence of the influence of job burnout and depression, and (b) assessing both job burnout and depression as continuous variables. Formally we propose:

Hypotheses 1: An increase in job burnout over time (from Time 1 to Time 2) will predict a subsequent increase in depression (from Time 2 to Time 3).

Hypotheses 2: An increase in depression over time (from Time 1 to Time 2) will predict a subsequent increase in job burnout (from Time 2 to Time 3).

Job burnout and depression: Considering the role of physical activity

Another limitation of the extant literature on job burnout and depression is that efforts to identify variables that may moderate the burnout-depression relationship are limited to personal or organizational factors. For example, it was proposed that job burnout is more predictive of depression among females (e.g., Schaufeli, Maslach, & Marek, 1993), as well as individuals with certain personality dispositions (e.g., Iacovides, Fountoulakis, Moysidou, & Ierodiakonou, 1999) and those scoring low in social support (e.g., from peers and supervisors; Suls, 1982). In contrast, other, health behavior factors has rarely been considered. In particular, we know little about the role of physical activity as a possible moderator of the burnout-depression association. This is surprising given that physical activity has received much attention as a modifiable risk factor for both job burnout and depression (e.g., Gorter et al., 2000; Peterson et al. 2008). Accordingly, in the current study we propose that the intensity of an individual's physical activity is likely to attenuate the job burnout-depression relationship.

A leisure physical activity refers to a voluntary behavior, specifically a body movement that occurs from skeletal muscle contraction and results in increased energy expenditure. This includes activities such as walking, jogging or climbing stairs (Sallis & Owen, 1999). When measuring physical activity, researchers often refer to the notion of the intensity of physical activity (i.e., 'sport intensity'), which takes account of such indicators as the duration (number of years) and frequency (number of hours per week) of physical

activity within which the individual is involved (e.g., Mensink, Heerstrass, Neppelenbroek, Schuit, & Bellach, 1997).

Prior research (e.g., Hu et al., 2004; Lee & Paffenbarger, 2000) suggest that physical activity relates positively to such outcomes as quality of life and longevity, and inversely to such outcomes as chronic diseases (e.g., coronary heart disease, type 2 diabetes). With respect to stress, and in particular job burnout and depression, a number of studies suggest that individuals that engage in physical activities sustain decreased levels of job burnout (e.g., Mutrie & Faulkener, 2003; Kouvonen et al., 2005) as well as depression (e.g., Bernaards et al., 2006; Farmer, et al., 1988). For example, meta-analyses have estimated that depression scores decrease by between 0.3 and 1.3 of a standard deviation after physical training compared to a variety of control conditions (e.g., Craft & Landers, 1998). The physical activity-induced biological changes (e.g., increased body temperature, adrenaline infusion, and elevation of the plasma levels of endorphins) are suggested as the main mechanism underlying these benefits of physical activity. These biological changes were found to be associated with improvements in life quality through, among others, improved mood states, self-esteem, physical self-perceptions and body image, cognitive function and sleep (e.g., Salmon, 2001; Yeung, 1996), all of which were also found to be inversely related to job burnout and depression (e.g., Janssen, Schaufeli, & Houkes, 1999; Nowack, 1987). This captures the resilience to stress effect, or the ability to properly function under stressful conditions, that is associated with physical activity.

However, beyond any direct, negative effect of sport intensity on job burnout and depression, there are three reasons why sport intensity should attenuate the effect of job burnout on depression. First, physical activity may be viewed as a buffering mechanism, alleviating the strain and other negative aspects of work environments and life in general (e.g., Biddle & Mutrie, 2001). More specifically, from a COR perspective (Hobfoll, 1989),

physically active employees are more likely to re-direct or distract their attention away from any felt job burnout and towards more functional, health promoting responses. As a result, fewer resources are to be exhausted, and, indeed more resources (self-perception of control, mastery, self-efficacy; e.g., Salmon, 2001), are to be gained that may well serve to protect such employees from developing depression.

Second, the COR perspective (Hobfoll, 1989) may also suggest that physical activity may be viewed as a recovery mechanism, allowing employees to be temporarily relieved of job burnout in order to replenish the personal resources needed to once again face the demands of the job (Siltaloppi, Kinnunen, & Feldt, 2009; Sluiter, van der Beek, & Frings-Dresen, 1999). Studies on recovery processes suggest that for recovery to occur, employees must be psychologically detached from work – a state which involves not only being physically away from the workplace but also not being occupied by work-related duties (Etzion, Eden, & Lapidot, 1998; Sonnentag & Bayer, 2005). Detachment from work may occur during both relatively long off-job periods, such as vacations, and relatively brief respites at work such as time off for physical exercise. Yet very little research has been conducted on the latter, brief respites (Eden, 2001; Westman & Eden, 1997).

Finally, to the degree that employees are more physically active, they may interpret, frame or respond to job burnout differently. While, under conditions of low (less intensive) physical activity, job burnout may be framed as a more problematic mental state likely to lead to negative outcomes such as depression, under conditions of high (more intensive) physical activity, job burnout may be interpreted as less threatening for employee well-being. This should allow individuals to confidently and effectively handle job burnout without being overwhelmed by it or letting it evolve into depression.

At the same time, whereas depressed employees tend to exhibit diverse health-related symptoms, which, if not attended to, may also manifest in more specific contexts, such as job

burnout, it is plausible that physical activity may protect against the detrimental consequences of depression. First, the biological changes induced by physical activity (such as those described above), may be so powerful as to essentially mandate employee mental reaction, buffering any endemic effect of depression. Second, the enjoyment of physical activity, defined as "positive affective response to the sport experience that reflects generalized feeling such as pleasure, liking and fun" (Scanlan & Simons, 1992, p. 203-202), may have significant positive outcomes by facilitating continued involvement in activity and by promoting positive psychological health. Importantly, such psychological benefits of physical activity as challenge, intrinsic motivation, social interaction, and mindfulness, may serve to counter negative influences of depression (e.g., Wankel, 1993; Stephens, 1988).

Taking these considerations into account we propose:

Hypothesis 3a: The positive association between job burnout and depression is attenuated as a function of physical activity intensity.

Hypothesis 3b: The positive association between depression and job burnout is attenuated as a function of physical activity intensity.

Method

Design and Sample

Study participants (N=2214) were employed men and women, arriving every one or two years, to the Tel Aviv Sourasky Medical Centre, for routine health examinations that were sponsored by their employer as a subsidies fringe benefit. All participants arrived at Time 1 (T1), Time 2 (T2) and Time 3 (T3) between 2003 and 2009. The mean time lags from T1 to T2 were 19.9 months (SD=8.7) and from T2 to T3, 19.2 months (SD=8.3). At T1 all examinees arriving at the medical centre between 2003 and 2005 (N=7079) were invited to participate in the study; 92% agreed (N=6512). We systematically checked for non-response

bias between participants and non-participants at T1 and found that non-participants did not differ from participants on any of the socio-demographic or biomedical variables. As the medical examinations were sponsored by the employer, change of employment, fringe benefits or a health-care provider resulted in attrition of 65% that was unrelated to participation in the present study. However, employees that did not come back for a follow up at T2 or T3 were more likely to be male, to be older (near retirement age), and to have a self-reported chronic disease at T1. These possible sources of attrition bias were controlled for in the data analyses. The final number of employees that arrived at the medical centre for three examinations consisted of 2460 employees, of which 91% agreed to participate at T2 and 90% agreed to participate at T2 and T3, resulting in a sample of 2214 employees.

We excluded from the study 582 participants that at T1, T2 or T3 worked for less than 24 hours a week (N=149), were 67 years old or older (retirement age, N=37), engaged in professional or very intensive physical activity of more than 15 hour a week (N=20), or had missing data for one of the study's parameters (N=376). Thus, the final sample included in our analyses consisted of 1632 employees. 70% were men, the mean age at T1 was 46.6 (SD=8.7), study participants completed 16 years of education (SD=2.3) and worked for 49.7 hours a week at T3 when the criteria was measured (SD=9.9).

Participants were recruited individually by an interviewer while awaiting their turn for the medical examination. They have been promised and given a detailed feedback on their health behaviors and an additional blood test (High-sensitive C - reactive protein, an inflammatory biomarker). All participants completed the three study's questionnaires at T1, T2 and T3. Using a personal identification number assigned at T1 to each participant, the study's questionnaires were matched and entered into a computerized SQL-based database. The study protocol was approved by both the ethics committee of the medical centre and the ethics committee of the University. Each participant signed a written informed consent form

before entering the study, and confidentiality was assured by separating any identification source from the analysis.

Measures

Job burnout was assessed using the Shirom-Melamed Burnout Measure (SMBM). Respondents were asked to report the frequency of recently experienced energetic feelings at work. All items were scored on a 7-point frequency scale, ranging from 1 (almost never) to 7 (almost always). This measure is the combination of three subscales: physical fatigue (e.g., "I feel physically drained), cognitive weariness (e.g., "I have difficulty concentrating"), and emotional exhaustion (e.g., "I feel I am unable to be sensitive to the needs of co-workers"). Shirom (1989, 2003) provides more details concerning the format and validation studies that led to the construction of the job burnout measure. In the current study alpha = .92, .92 and .93, at T1, T2 and T3 respectively.

Depressive symptoms were assessed using the Personal Health Questionnaire (PHQ-9), the depression section of a patient oriented self-administered instrument derived from the PRIME-MD (Kroenke, et al., 2001). We listed nine potential symptoms of depression, in accordance with each of the nine DSM-IV criteria and asked participants to rate the frequency of experiencing each symptom during the past 2 weeks on a scale ranging from 0 (never) to 3 (almost always). The validity of this questionnaire as a diagnostic and severity measure for depressive disorders has been confirmed in past studies (Kroenke, et al., 2001). In the current study alpha=.78, .81, .82, at T1, T2 and T3, respectively.

Physical activity intensity was assessed at T1 and T2 based on participants' self reports of physical activity. Respondents were asked how many days per week, and how many minutes each time, they engage in strenuous physical activity (activity that increase their heart rate and make them sweat). The number of minutes was multiplied by the number of days to form weekly physical activity intensity.

Control Variables. To minimize the risk of attrition bias resulting from the significantly heightened rate of drop outs among males, older employees, and those self-reporting a chronic disease, we controlled for gender, age, and participants' self reports of having been diagnosed by a physician and for currently taking medications for one or more of the following diseases: cardiovascular disease, stroke, diabetes, cancer or mental distress. Participants were dichotomized into having ('1') or not having ('0') a chronic disease. This is also in line with a recent review suggesting that these medical problems could impact levels of depression (Clarke & Currie, 2009). In addition, we controlled for years of education (T1), based on a substantial body of evidence linking low education level (as a proxy of socio-economic status) with an increased risk for depression (Cole & Dendukuri, 2003). Similarly, we controlled for T3 number of work hours per week, based on prior studies linking extended work hours with job burnout (e.g., Gopal, Glasheen, Miyoshi, & Prochazka, 2005). Finally, we controlled for the time gap between T1 and T3, by calculating the delta (in months) between participants' first and third visit to the medical centre.

Analysis Technique

All criteria and predictors were systematically examined to detect outliers or non-normal distributions (i.e., skewness > 2.0 and kurtosis > 5.0); none was detected. To examine whether changes in job burnout and physical activity intensity from T1 to T2 predict changes in depression from T2 to T3, we ran a linear hierarchical regression (Using the SPSS 17.0 software). In the first step we entered the control variables and the T2 level of depression, as it enabled the measurement of change in depression from T2 to T3 (Twisk, 2003). In the second step the T1 and T2 levels of job burnout and physical activity intensity were entered. By including baseline levels of our predictors in the analyses, we avoided the well-known artifact of using change scores (Taris, 2000). To reduce the possibility of multicollinearity among the interaction term and its' component predictors, the T2 levels of job burnout and

sport intensity were centred prior to the regression runs (Aiken & West, 1992). In the last step, the interaction between T2 levels of physical activity intensity and job burnout was tested by entering the multiplication of the centred T2 level of physical activity intensity by the T2 level of job burnout. The same procedure was repeated in a second regression where the criterion was T3 job burnout and the predictors were depression and physical activity intensity.

Results

Means, standard deviations and correlations among the variables are displayed in Table 1. In order to ensure consistency between the bivariate and multivariate analyses, the statistics reported in this table are based on the list-wise deletion of observations with missing data on any of the control variables. T test analyses comparing the job burnout and depression levels among those dropped from the analyses (n=626) and those remaining (n=1632) indicated no significant differences ($p>0.10$). However, baseline levels of physical activity intensity among those dropped from the analyses compared to those remaining were slightly higher (mean=2.58, 2.30, respectively, $p<0.05$). As indicated in table 1, the bivariate results indicate a negative relationship between T1 and T2 levels of physical activity intensity and T1, T2 and T3 levels of both job burnout and depression ($r=-.10$ to $-.13$, $p<0.01$). In addition, T1, T2 and T3 of job burnout and depression were significantly associated with each other ($p<0.01$).

[Insert Table 1 about Here]

The results of our multivariate analysis testing Hypotheses 1 and 2 (which specified, respectively, that an increase in job burnout over time will predict a subsequent increase in depression, and an increase in depression over time will predict a subsequent increase in job burnout) are presented in Model 2 of Tables 2 and 3. The results support both hypotheses.

Specifically, Model 2 in Table 2 indicates that the T2 to T3 change in depression was positively predicted by the T1 to T2 change in job burnout (β=.07, p<.01). Similarly, Model 2 in Table 3 indicates that the T2 to T3 change in job burnout was positively predicted by the T1 to T2 change in depression (β=.08, p<.01). We also evaluated the difference in coefficient values between the two predictors (i.e., whether the effect of job burnout on subsequent depression differs in magnitude from the effect of depression on subsequent job burnout). The results of a t-test indicate that the slopes (unstandardized path coefficients) differed significantly from each other (t=-3.279, P<.01). This suggests that the effect of depression on subsequent job burnout is stronger than the effect of job burnout on subsequent depression.

[Insert Tables 2 and 3 about Here]

In order to test Hypotheses 3a and 3b (positing, respectively that the positive association between job burnout and depression is attenuated as a function of physical activity intensity and that the positive association between depression and job burnout is attenuated as a function of physical activity intensity), we first centered the individual predictors, and then multiplied these centered values to compute the interaction terms (Aiken & West, 1991). These terms were then incorporated into the main effect models noted above. The results provide support for both hypotheses. Regarding Hypothesis 3a, as Model 3 of Table 2 indicates, the generally positive association between job burnout and depression was found to be attenuated as a function of physical activity intensity (β=-.05, p<.01).

To further examine the effect of T2 sport intensity on the link between T2 job burnout and T3 depression, we graphically illustrated the interactions utilizing a procedure similar to the one recommended by Stone and Hollenbeck (1989). Specifically, we plotted three slopes of T2 physical activity intensity: one at one standard deviation below the mean, one at the mean, and one at one standard deviation above the mean. As evident from Figure 1, the higher the level of T2 physical activity intensity, the less pronounced the effects of T2 job

burnout on T3 depression. Simple slopes analyses, based on the method described by Preacher, Curran, & Bauer (2006), support this conclusion, suggesting that the slope (effect) of job burnout was significantly positive under conditions of low and medium levels of physical activity intensity (estimate=.04 and 03, respectively, both at p<.01), but insignificant in the case of high levels of physical activity intensity (estimate=.02, n.s).

[Insert Figure 1 about Here]

Also, in line with Hypothesis 3b, physical activity intensity was found to attenuate the association between T2 depression and T3 job burnout (β=-.04, p<.01). As evident from Figure 2, the higher the level of T2 physical activity intensity, the less pronounced the effects of T2 depression on T3 job burnout. Simple slopes analyses support this conclusion, suggesting that although the slope (effect) of job burnout was significantly positive under the three conditions of low, medium and high levels of physical activity intensity, stronger effect sizes were found among participants that engaged in low and medium levels of physical activity intensity (estimate=.25 and .21, respectively, both at p<.01) compared to those who engaged in high levels of physical activity (estimate=.16, p<.05).

[Insert Figure 2 about Here]

Exploratory analyses

We ran the analyses reported above again, controlling for the initial level of Body Mass Index (BMI), as there was change in BMI from T1 to T2. In addition we controlled for the T1 and T2 fitness levels as measured by an ergometric test. The inclusion of these variables had no statistically significant effect on our results, and they were eventually omitted from the analyses. As we explain below, this suggests that the underlying mechanism of the moderation effect of physical activity intensity is unlikely to be related to an increase in physical fitness or to a decrease in obesity.

Discussion and Implications

Drawing from COR theory (Hobfoll, 1989, 2001), the study presented above represents what we believe to be one of the first longitudinal examinations of the temporal relationship between job burnout and depression. In addition, the paper examined the degree to which physical activity moderates the development of job burnout and depression. With respect to the former issue, based on a full-panel three-wave longitudinal design, in a fairly large sample of healthy employees (i.e., not a clinical sample of individuals undergoing treatment for stress-related problems), our results indicate that job burnout and depression serve as important independent antecedents of each other. These findings further support the emphasis placed in recent years on studying the unique effects of discrete affective states on physical and mental health (e.g. Lazarus & Cohen, 2001; Ryff & Singer, 2003).

The dynamic interplay demonstrated between the two constructs (by means of the changes from T1 to T2 and to T3) provides an empirical support for the conceptual differentiation between the two contracts. Although depression and job burnout are highly correlated (sharing up to 29% of their variance in the present study), an increase in job burnout levels from T1 to T2 predicted an increase in depression levels from T2 to T3 and vice versa. These results may imply that deterioration in one domain (e.g., work-related) may trigger further deterioration in another domain (e.g. general affective state). This deterioration corresponds with the notion of 'vicious cycle' or a 'downward spiral', which other researchers proposed (e.g., Appley & Trumbull, 1986; Huibers, et al., 2007; Skapinakis et al., 2004 (Hobfoll, 2001)), yet has been rarely tested in a consistent fashion. To the degree that these two constructs are involved in a reciprocal relationship, the observed influence of one variable on the other is likely to intensify or accumulate into a chronic state, with the upshot being an ever widening range of physical and mental health-related problems (e.g., Menaghan, 1991; Vinokur, Pierce, & Buck, 1999).

At the same time, the effect of depression on the development of job burnout was deemed stronger than the other way around. Examining the nature of these constructs sheds light on this finding. Job burnout, a work-related affective state, may generalize to other areas in life through spillover mechanisms (Westman, 2001) and induce depression as well as other ailments (Melamed, et al., 2006). However, drawing on crossover literature (e.g., Westman, 2001), several factors (e.g., social support, personality traits or coping strategies) may moderate this process thus allowing the worker to leave work behind at the end of the day and prevent further deterioration. Depression, on the other hand, is not domain-specific and hence has a significantly bigger effect on various life domains. Depressed people tend to suffer from sleeping problems, weight loss or gain, behavior changes, cognitive impairments, agitation and depressed mood, all of which have a significant impact on life as a whole. Thus, depressed employees may find it hard to "leave" their depression behind during work days, while burnt out employees may find comfort at home.

All in all, these results suggest that, to help break the 'vicious circle', employers should aim their intervention efforts at both job burnout and depression, for example, by offering peer-based assistance programs for identifying and helping employees handle diverse stress-inducing issues. In terms of theoretical implications, the study help illuminate psychological influences of work-and non-work-related affective states by more systematically and explicitly bringing the larger, every-day life context into the micro-structure of work, and by recognizing the contagion of stress across multiple contexts. Whereas this notion has been primarily studied with respect to work-family balance (i.e., spillover, in which stresses experienced in the marital or parental domains lead to stresses in the work domain, and vice versa; e.g., Bolger, DeLongis, Kessler, & Wethington, 1989), and whereas prior research has established a link between a number of personal traits (e.g., negative affectivity) and work-related attitudes (e.g., Judge & Larsen, 2001), the results of the

current study move the field further by demonstrating how an individual's *general affective state* might manifest in specific domains, such as the workplace, and vice versa.

Turning to the interaction effects found in our study, these effects demonstrate how physical activity interacts with general and work-specific affective states to influence subsequent aggravation in job burnout and depression. In this respect, our study extends past research by uncovering moderators other than demographic or organizational variables. And whereas prior research has confirmed the direct association between physical activity and both job burnout and depression (e.g., Gorter et al., 2000; Peterson et al., 2008), in the current study we focused on the buffering effect of physical activity. Based on the premises of COR theory, engaging in physical activity can be seen as proactive coping that is manifested by investing present resources (e.g., time, energy) in order to prevent additional resource loss (job burnout, depression) and to gain new resources (e.g., health, self appraisal). Thus, from a resource gain perspective, engaging in physical activity may trigger several underlying mechanisms that can prevent burnt-out employees from developing future depression, or depressed employees from developing future job burnout. These mechanisms can be physiological (e.g., involve adrenaline infusion or, serotonin secretion, enhancing stamina), psychological (e.g. improved self esteem & well being) or cognitive (e.g., when I engage in physical activity I unwind, relax, stay focused). Although we cannot specify the underlying mechanisms of this effect, based on the explanatory analyses reported above we believe it is safe to say that it was not the change in fitness or body mass (weight) that accounted for the effect.

In any case, the association appears sufficiently strong to warrant serious consideration by those using physical activity as a treatment for such maladies as job burnout and depression. More specifically, in designing intervention programs, employers should acknowledge the benefits of physical activity, not only in decreasing job demands and

depression, but also in attenuating the effect of the former on the latter as well as the other way around, thus offering an important means by which to prevent these stresses from ever increasing.

Limitations and Suggestions for Future Research

Our study should be considered in light of its limitations, which also offer suggestion for future research. First, the study's sample of subjects undergoing periodical health examinations may not be representative of the general population. Most participants were highly educated employees who exhibited generally good health behavior patterns: they smoked little and exercised at least twice a week. They may, therefore, have been more resilient to the effects of job burnout on depression and vice versa. Their physical health may, at least to some extent, restrict the variance of job burnout and depression scores. Any such attenuation of the variance would serve to only reduce the size and significance level of the associations observed, thus suggesting that, if anything, our findings err on the conservative. This also suggests that our findings should be replicated in more diverse samples.

Second, the study is based on self reported affective states and physical activity and is therefore subjected to a common method bias. However, there are several reasons why our results are unlikely to be subject to such a bias. First, we followed recommendations by Podsakoff, MacKenzie, Lee, and Podsakoff (2003) to use temporal and psychological separations in our survey. We created temporal separations by (1) including the items measuring the key concepts non-consecutively, thereby increasing the likelihood that employees respond to each set of key items without recalling their responses to prior sets of key items, and (2) asking about *general* depressive symptoms and *work-related* burnout, forcing respondents to think of different contexts. Second, interaction effects are unlikely to be subject to common-method bias, as respondents are unlikely to consciously theorize

moderated relationships when they fill out a survey (Brockner, Siegel, Tyler, & Martin, 1997; Kotabe, Martin, & Domoto, 2003), especially when they do not know the exact goal of the survey, as in our case. Third, following Kotabe et al. (2003), we performed a principal-components factor analysis on all Likert-type questionnaire items used to construct our perceptual measures. This analysis did not yield one overarching factor, but three separate ones, suggesting the absence of common method bias (Harman, 1967).

A third limitation relates to the difficulty of measuring psychosocial variables such as job burnout and depression in large samples. Scales used in epidemiological research are usually short, easy to administer and score, and emphasize population means and deviations from these means rather than the diagnosis of the individual. Still, the job burnout and depression scales used in the current study have demonstrated high reliability and construct validity. In addition, the PHQ-9, which was used to measure depression, can be used as a criteria-based diagnosis of depressive disorders, and also as a reliable and valid measure of depression severity (Kroenke, et al., 2001).

Finally, future research should not be restricted to negative affective states only, and should include positive affective states as well. There is substantial support for the position that negative and positive affects, while modestly correlated, do not represent bipolar opposites on the same continuum and that they should be measured and analyzed as relatively independent constructs (e.g., Diener, 2003; Judge & Larsen, 2001; Russell, 2003; Watson, Wiese, Vaidya, & Tellegen, 1999; Yik, Russell, & Feldman Barrett, 1999).

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Table 1: Mans, standard deviations and correlations (Pearson) on the measured variables (n=1632)

	Mean	S.D	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Gender, 0=Men, 1=Women	.30	.46													
2. Age	46.6	8.7	.017												
3. Education years	16	2.3	-.108**	.092**											
4. Weekly work hours, T3	49.7	9.88	-.297**	-.071**	.115**										
5. Illness, T1 or T2 or T3	.09	.29	.062*	.199**	-.002	-.042									
6. Time gap, months, T1:T3	19.4	8.40	.115**	-.096**	-.075**	.012	.041								
7. Job burnout, T1	2.13	.82	.162**	-.111**	-.063*	-.068**	.048	.042							
8. Job burnout, T2	1.98	.78	.151**	-.105**	-.023	-.025	.047	.064*	.697**						
9. Job burnout, T3	1.93	.77	.161**	-.095**	-.053*	-.028	.040	.048	.668**	.740**					
10. Depression, T1	1.23	.31	.226**	.004	-.088**	-.081**	.130**	.021	.513**	.456**	.453**				
11. Depression, T2	1.22	.27	.200**	-.010	-.071**	-.044	.127**	.037	.421**	.527**	.489**	.604**			
12. Depression, T3	1.22	.28	.191**	-.015	-.090**	-.068**	.136**	.041	.405**	.437**	.539**	.563**	.603**		
13. PA intensity, T1	2.31	2.33	-.107**	.063*	.036	-.005	-.007	-.081**	-.101**	-.112**	-.110**	-.104**	-.132**	-.132**	
14. PA intensity, T2	2.20	2.15	-.104**	.071**	.040	.031	-.004	-.068**	-.113**	-.112**	-.115**	-.133**	-.134**	-.122**	.658**

Note: PA = Physical activity, * p<.05, ** p<.01

Table 2: Linear Regression testing the Influence of T2 job burnout on T3 depression and the moderating effect of T2 sport intensity (n=1632)

Model / Variable	(1) Control Model			(2) Main Effect Model			(3) Moderation Model		
	B	S.E	Beta	B	S.E	Beta	B	S.E	Beta
Depression, T2	.60	.02	**.58****	.50	.02	**.48****	.50	.02	**.48***
Gender, 0=Men, 1=Women	.04	.01	**.06****	.03	.01	**.05***	.03	.01	.01
Age	.00	.00	-.02	.00	.00	.00	.00	.00	.02
Education years	.00	.00	-.04	.00	.00	-.04	.00	.00	-.04
Weekly work hours, T3	.00	.00	-.02	.00	.00	-.01	.00	.00	.01
Self reported illness at T1 or T2 or T3	.06	.02	**.06****	.06	.02	**.06****	.06	.02	**.06****
Time gap, months, T1:T3	.00	.00	.01	.00	.00	.00	.00	.00	.00
Job burnout, T1				.05	.01	**.13****	.05	.01	**.13****
Job burnout, T2				.03	.01	**.07****	.03	.01	**.07***
PA intensity, T1				.00	.00	-.04	.00	.00	-.03
PA intensity, T2				.00	.00	.00	.00	.00	-.01
Job burnout T2 * Sport intensity T2							.00	.00	**-.05****
Model Summary	♦R^2 =.371**			♦R^2 =.399 ΔR^2 =.029** (Relative to Model 1)			♦R^2=.402 ΔR^2 =.003** (Relative to Model 2)		

Note: PA = Physical activity, *p<.05, **p<.01

Table 3: Linear Regression testing the Influence of T2 depression on T3 job burnout and the moderating effect of T2 sport intensity (n=1632)

Model / Variable	(1) Control Model			(2) Main Effect Model			(3) Moderation Model		
	B	S.E	Beta	B	S.E	Beta	B	S.E	Beta
Job burnout, T2	.73	.02	**.73****	.65	.02	**.65****	.64	.02	**.64****
Gender, 0=Men, 1=Women	.09	.03	**.05****	.05	.03	.03	.04	.03	.02
Age	.00	.00	-.02	.00	.00	-.02	.00	.00	-.02
Education years	-.01	.00	-.03	.00	.00	-.01	.00	.00	-.02
Weekly work hours, T3	.00	.00	.01	.00	.00	.01	.00	.00	.01
Self reported illness at T1 or T2 or T3	.02	.05	.01	-.02	.05	-.01	-.02	.05	-.01
Time gap, months, T1:T3	.00	.00	-.01	.00	.00	.00	.00	.00	.00
Depression, T1				.26	.05	**.10****	.26	.05	**.10****
Depression, T2				.23	.06	**.08****	.22	.06	**.07****
PA intensity, T1				.00	.01	-.01	.00	.01	-.01
PA intensity, T2				.00	.01	-.01	-.00	.01	-.01
Depression T2 * Sport intensity T2							.02	.01	**-.04****
Model Summary	♦R^2 =.55**			♦R^2 =.57 ΔR^2 =.019** (Relative to Model 1)			♦R^2=.57 ΔR^2 =.001** (Relative to Model 2)		

Note: PA = Physical activity, *p<.05, **p<.01

Figure 1: The association between T3 depression and T2 job burnout as a function of T2 sport intensity: Curves for three different levels of the moderator (–1 SD, Mean and +1 SD of sport intensity)

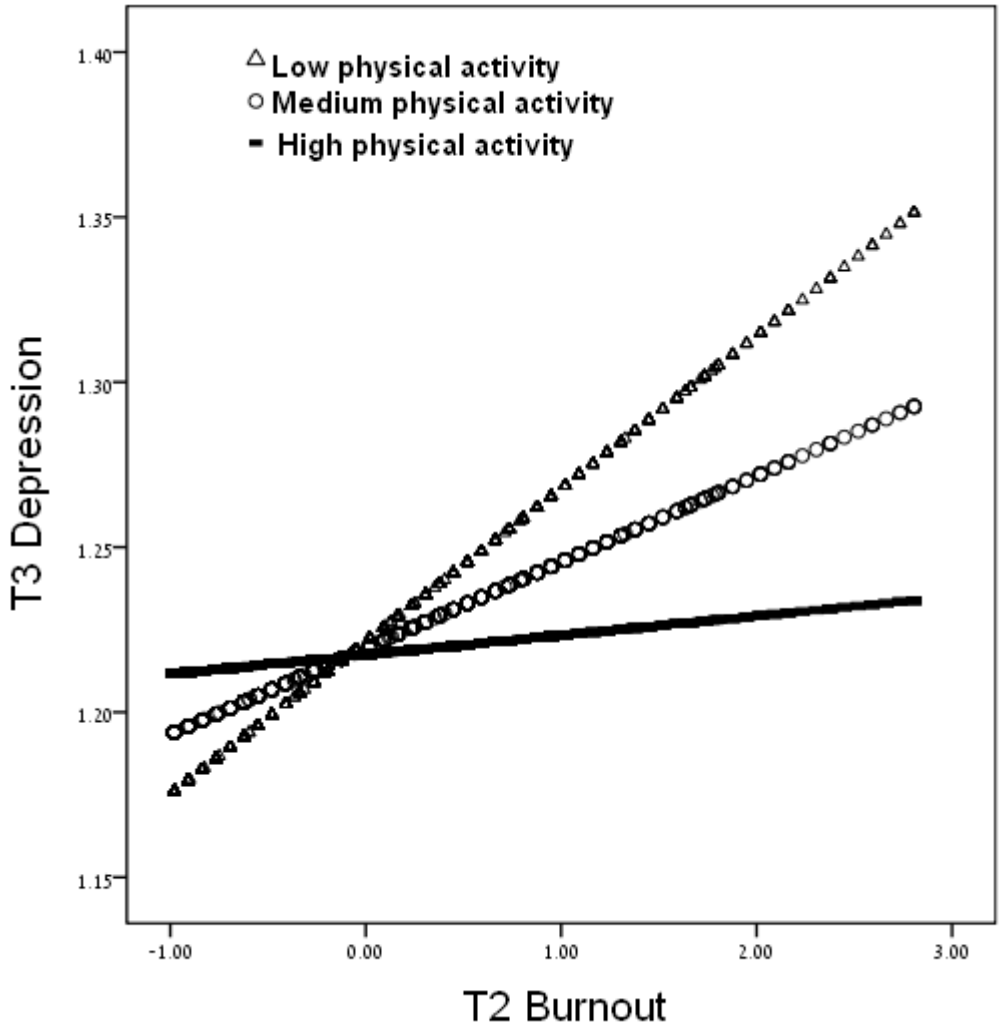

Figure 2: The association between T3 job burnout and T2 depression as a function of T2 sport intensity: Curves for three different levels of the moderator (–1 SD, Mean and +1 SD of sport intensity)