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Overwhelmed by Emotional Job Demands in High Vigor Days! Its Detrimental Effects
on Daily Recovery from Work Among Health-care Workers

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Abstract

The objective of this study is twofold: first, to analyze whether the daily level of energy in terms of vigor at work could explain the way in which workers psychologically detach from their work, relax, practice challenging activities, and have the feeling of having control over their leisure time when arriving home. Second, to check if the daily emotional job demands could hinder that relationship, reversing the positive effect of vigor in recovery. For this purpose, a multilevel study with a diary methodology was designed. In total, 94 nurses from various hospital and primary care centres in Madrid and Basque Country (Spain) participated in this study. They completed daily questionnaires twice a day (in the afternoon after work and at night before going to bed) for five consecutive workdays from Monday to Friday ($N = 94 \times 5 = 470$). The results revealed that on days that vigor at work was high, nurses experienced more psychological detachment, relaxation, feelings of mastery, and time control at home. Moreover, on days that emotional job demands were high, vigor was more negatively related to psychological detachment and time control at home. Additionally, vigor was more positively related to all recovery experiences at home in days that emotional demands were low. Therefore, daily vigor can act as an energy resource that helps the worker to recover. However, this effect can occur in situations in which stressors are not present in high intensity. These results have clear practical implications for both health organizations and workers.

Keywords: vigor at work, emotional job demands, antecedents of recovery, health-care workers, diary study

Overwhelmed by Emotional Job Demands in High Vigor Days! Its Detrimental Effects on Daily Recovery from Work Among Health-care Workers

Work-related stress is one of the most common psychosocial risks in organizations in the twenty-first century, and its incidence is increasing. The intensification of work that characterizes the current labor market is one of the main reasons for this increase (Kubicek & Korunka, 2017). This fact was also included in the last European Working Conditions Survey (Eurofound, 2017), which considered that the work intensity index—including aspects related to working at high speed and under time pressure, and experiencing high emotional demands—had increased in recent years. Specifically, workers in the health sector (e.g., nurses and physicians) were exposed to the highest levels of work intensity. In fact, during the socio-economic crisis generated by the COVID-19 pandemic, this phenomenon has been more than evident.

The intensification of work and its reflection in the presence of greater job demands has a negative impact on physical health, psychological well-being, and aspects such as work-family balance (Macky & Boxall, 2008). Therefore, workers need to recover from the efforts they make in the workplace, and thus be able to maintain their levels of health and well-being at optimum levels (Meijman & Mulder, 1998; Sonnentag & Fritz, 2007).

Recovery from work

Recovery can be conceptualized as a process during which individual functional systems that have been called upon during a stressful experience return to their pre-stressor levels (Meijman & Mulder, 1998), and it can take place both within the organization (e.g., through micro-breaks) and outside (e.g., leisure activities after the workday) (Demerouti, Bakker, Geurts, & Taris, 2009). Sonnentag & Fritz (2007) identified four different recovery experiences that would act as psychological mechanisms underlying the different activities that workers can deploy to recover, namely: psychological detachment,

relaxation, mastery experiences, and control during leisure time. *Psychological detachment* from work implies the ability to gain mental distance from one's job. In people's everyday experience, psychological detachment is often experienced as switching off. *Relaxation* refers to processes characterized by a state of low sympathetic activation and increased positive affect, that can occur both at a physical level (e.g., by reducing one's physical activity) and at a mental level (e.g., engaging in a kind or purposeful relaxation exercise such as meditation). *Mastery experiences* refer to off-job activities that distract from work by providing challenging experiences, learning opportunities, or broadening one's horizon in other domains. Finally, *control* refers to self-determination during off-job time (e.g., deciding about when and how to get involved into a specific activity).

When workers have the opportunity to recover after a day's work, they can recharge their energy reserves and start the next day with more energy (Parker, Sonnentag, Jimmieson, & Newton, 2019). In addition, the four recovery experiences described have been related to less fatigue, emotional exhaustion, fewer complaints about health, fewer sleep problems, and higher levels of well-being (Siltaloppi, Kinnunen, & Feldt, 2009; Sonnentag & Fritz, 2007; Wendsche & Lohmann-haislah, 2017).

In the study field of recovery, most studies have focused on exploring the consequences of recovery; however, less attention has been paid to the study of the factors that promote or inhibit this on a short-term basis (Chawla, MacGowan, Gabriel, & Podsakoff, 2020; Demerouti et al., 2009; Sonnentag, Arbeus, Mahn & Fritz, 2014; Parker et al., 2019). Scientific literature has shown that demands (e.g., workload or time pressure) and job resources (e.g., coworker support or job control) are related to recovery from work (Bennett, Bakker, & Field, 2018; Kinnunen & Feldt, 2013; Wendsche & Lohmann-haislah, 2017). Nevertheless, a recent meta-analysis carried out by Steed,

Swider, Keem, and Liu (2019) draws attention to the reduced attention paid in the scientific literature to personal resources in the recovery process compared to the study of job resources or job demands. Accordingly, the role of personal resources is not as clear as the job-related variables in explaining the recovery process of workers. In addition, the authors of this meta-analysis point out that it is necessary to study in greater depth the interaction between job demands and specific resources, and to incorporate the study of moderating variables to explore under what conditions the recovery processes could be experienced. Furthermore, in the scientific literature, there are few studies that analyze the relationship between experiences, attitudes and behaviors related to work and recovery experiences (Michel, Turgut, Hoppe, & Sonntag, 2016; Rodríguez-Muñoz, Sanz-Vergel, Antino, Demerouti, & Bakker, 2018; Sonnentag et al., 2014). Taking into account all of the above, in this study we will focus on the experience of work-related vigor as an energy resource of the worker, which could act as a precursor of the recovery process (Hobfoll, 2002). Specifically, vigor is characterized by high levels of energy and mental resilience while working, the willingness to invest effort in one's work, and persistence even in the face of difficulties (Schaufeli, Salanova, González-Romá, & Bakker, 2002).

Hence, the objective of this study is twofold: first, to analyze whether the daily level of energy in terms of vigor at work could explain the way in which workers psychologically detach from their work, relax, practice challenging activities, and have the feeling of having control over their leisure time when arriving home; second, to check if the daily emotional job demands could hinder that relationship, reversing the positive effect of vigor in those recovery experiences. To achieve these aims, we will analyze our hypothesis with a sample of professionals who are exposed to high levels of emotional job demands, as is the case of nursing professionals. Understanding the process through

which health workers recover is relevant because they are highly vocational professions, where professionals deal daily with high emotional job demands (e.g., understand patients' pain, communicate emotional news to relatives, or handle negative emotions such as frustration). As Sonnentag (2018) noted "seeing one's work as a calling might reduce a worker's need for recovery – and at the same time might make it difficult to actually achieve recovery" (p.13).

Daily energetic resources as antecedents of recovery from work

One of the most direct consequences of the lack of recovery of work is the loss of energy (Siltaloppi et al., 2009; Virtanen, de Bloom, & Kinnunen, 2019). However, could the opposite relationship occur? That is, can the energy that is deployed during the workday positively affect the recovery that workers experience after they arrive home? This approach implies placing energy as the antecedent of recovery, and not just as a consequence of it (Sonnentag, Mojza, Demerouti, & Bakker, 2012; Sonnentag et al., 2014).

Vigor is considered to be a dimension of a larger construct called work engagement, and it usually experienced in work environments that have abundant job resources (Bakker & Demerouti, 2008; Schaufeli et al., 2002). At the same time, experiencing vigor and work engagement has been related to greater performance, creativity, positive emotions, and health (Bakker & Demerouti, 2008; Bradley, 2010; Steele et al., 2012). However, very little is known about the effects of experiencing vigor on worker's recovery on a daily basis (Sonnentag et al., 2012). In the diary study carried out by Sonnentag et al. (2012), they found that engagement levels were related to higher levels of recovery at the end of the day. The authors explain that this may happen because the workers, when they are engaged, do not need to mobilize extra resources to do the job well and achieve their goals. Consequently, the resources would be maintained for the

rest of the day without increasing exhaustion, thus encouraging the workers to start recovery activities when work is finished. However, Sonnentag et al. (2012) did not explore which specific component of work engagement had more weight in the association between engagement and recovery. For example, it has been proven that high levels of vigor when leaving work predict a greater probability of getting involved in physical activity (Niermann, Herrmann, van Haaren, van Kann, & Woll, 2016). Conversely, those workers who experience greater exhaustion would also be those who recover less because they are mentally occupied with stressful aspects related with their work, especially in those days when work demands are higher (Sonnentag et al., 2014). As can be seen in the results of these studies, workers' energy can play a relevant role in the recovery process and be a personal resource that is a precursor to recovery experiences. For this reason, the specific role of this dimension of engagement, namely vigor, has been thoroughly explored in this research article.

The relationship between vigor at work and the experiences of recovery at home can be explained from the *Conservation of Resources Theory* (COR-theory, Hobfoll, 2002). The main principle of this theory is that people are motivated to reach, maintain, and accumulate those things and resources that they value (e.g., objects, personal characteristics, mental and physical energy, social support, etc.). A second principle of this theory is that people invest in obtaining resources to protect themselves from possible future losses, to recover from those losses and therefore to obtain more resources. Moreover, the COR-theory establishes that people with greater resources are less vulnerable to their loss and are more capable of resource gain (*gain spirals*) (Hobfoll, 2011).

In accordance with the principles of COR-theory, we hypothesize a positive relationship between vigor and recovery experiences, explaining the fact that vigor is a

personal resource of the worker that can initiate a positive spiral of gain of more resources, in and out of work (Hobfoll, 2002; Shirom, 2007; ten Brummelhuis & Bakker 2012a). That is, in terms of the COR-Theory, workers will seek to maintain their energy resources at optimal levels and therefore will be involved and committed to specific recovery experiences to maintain those energy levels (Steed et al., 2020). Therefore, those who show more energy will do better, generating positive spirals of well-being. Specifically, the experience of vigor is positive for the workers (Shirom, 2007), and it makes them feel that they have enough energy and strength to face their daily tasks and job demands, even the most challenging ones, which can allow them to disconnect psychologically from work, not continue ruminating when the day is over, and relax—thus, gaining more energy and well-being (Clauss, Hoppe, Schachler, & O’Shea, 2020; Sonnentag et al., 2012). As Clauss et al., (2020) has noted “a spillover from positive work experiences to positive experiences at home may also facilitate the enjoyment of off-job time and reduce negative and brooding thoughts about work” (p.12). In addition, the energy experienced in one role can reduce or facilitate performance in another role, thus generating conflict or energy-based work-life facilitation (Greenhaus, Allen, & Spector, 2006). In this way, showing vigor during the workday could be an indication of the energy resources available to workers that will allow them to participate in leisure activities when they get home, or involve in activities that will enable them to learn new skills. Thus, the experience of vigor could be associated with the participation of workers in experiences involving mastery activities (e.g., physical activity), that allow them to obtain additional energy and well-being when they have finished their workday, compared to workers who end the day exhausted (Clauss et al., 2020; Michel et al., 2016; Niermann et al., 2016). Finally, vigor is also experienced when work resources are available and there is a feeling that things are going well at work, which could facilitate the experience of control of

leisure time outside of work (Kinnunen & Feldt, 2013). As Steed et al. recently (2019) point out, personal resources (e.g., vigor levels) are likely to provide more opportunities for mastery and learning, as well as increase perceived control over one's time. In addition, personal resources can also result in greater confidence in the ability to balance work and life, decreasing a person's reluctance to participate in recovery activities.

Therefore, and taking into account all of the above, the following hypotheses were formulated:

*H*₁. Daily vigor at work will be significant and positively related to (1a) psychological detachment; (1b) relaxation at night; (1c) mastery; and (1d) time control at night at home, so the workers who experience high levels of vigor at work will have higher scores in these domains.

The dark side of vigor on recovery in demanding workdays

The scientific literature has shown that job demands are related to recovery from work (Bennett et al., 2018; Kinnunen & Feldt, 2013; Steed et al., 2019). Specifically, exposure to high job demands can increase the risk that workers ruminate about their work after the working day is over, which means that they will have difficulties in psychological detachment from work and for relaxation, due to the prolonged activation and negative affect related to work (Kinnunen, Feldt, Siltalo, & Sonnentag, 2011). Furthermore, because work demands deplete workers' mental and physical resources (van Woerkom, Bakker & Nishii, 2016), they cannot have enough energy left for mastery experiences; namely, to tackle new challenges or learn new things during free time. Similarly, high job demands could increase the feeling of being out of control during non-work time, such as decreasing leisure time or by being cognitively busy with work issues (Kinnunen et al., 2011).

The negative effect of job demands on daily recovery can be especially significant in the case of the emotional job demands that health professionals must face (Steed et al., 2019). Emotional job demands in this profession may require professionals to be attentive and perceive the emotions of patients and family members, put themselves in their place (empathize with them), satisfy their emotional needs, and handle situations of high emotional intensity (Moreno-Jiménez, Gálvez Herrer, Rodríguez-Carvajal & Garrosa, 2010). In a recent study carried out by Xanthopoulou et al. (2018), it was discovered that *emotional labor* during the workdays was associated with a greater need for recovery at the end of work because this type of work depleted energy resources, affecting the relaxation levels that were experienced outside of it.

Daily emotional job demands may be negatively related to daily experiences of psychological detachment and relaxation, due to the fact that, in those days when workers are exposed to greater emotional demands, they may be more physiologically activated, ruminate more, and remain fused with the emotional content of the activities carried out in their work after finishing it (Sonnentag et al., 2014; Sonnentag & Fritz, 2015; Steed et al., 2019; Vandevala et al., 2017). In the same way, having the mind occupied with thoughts of high emotional content, the chances of initiating other activities that generate challenge (i.e., mastery experiences), or maintaining control over their free time (i.e., time control), will be lower because these demands consume energy resources and cause fatigue (Barnes & Van Dyne, 2009). Therefore, and taking into account all of the above, the following hypotheses were formulated:

*H*₂. Daily emotional demands at work will be significant and negatively related to (2a) psychological detachment (2b) relaxation; (2c) mastery; and (2d) time control at night at home, so the workers who experience high levels of emotional demands at work will have lower scores in these domains.

Along the same lines, it is important to keep in mind that the presence of high emotional job demands at work on days when workers show high levels of vigor could specially affect the recovery of the workers at home due to an extra depletion of their energy resources (Sonnentag et al., 2014; Sonnentag & Fritz, 2015). As we explained earlier, vigor at work will not withdraw energy from other domains, however, human energy is limited (Greenhaus & Beutell, 1985), and the sum of vigor with high emotional job demands could end up depleting workers' energy resources and blocking their ability to recover after work. In this way, this interaction could hinder the worker from engaging in “mastery experiences” (e.g. playing a sport or taking a language or a dance class) at the end of the workday, thus decreasing their sense of “time control” outside of work. In addition, the presence of high levels of vigor in days of high emotional job demands could make workers ruminate even more about the emotional content of their work, and remain more psychophysiologicaly activated and, therefore, have a diminished experience of psychological detachment and relaxation, which depletes their energy and mental resources. From the COR-theory, this fact is perfectly consistent with its theoretical principle because as this theory postulates people in the absence of stressors strive to obtain more resources (which would account for our first four hypotheses). However, if those stressors are present, then they may not fight because it is exhausting. In addition, if many cognitive, emotional and energetic resources are invested in a domain, stress can end up wearing out the worker (Hobfoll, 2002). Based on all these arguments, four additional hypotheses were stated:

H₃. Daily vigor at work will be more positively associated with (3a) psychological detachment; (3b) relaxation; (3c) mastery; (3d) and time control at home at night on those days in which nurses deal with lower levels of emotional job demands, as opposed to those days with higher job demands.

Figure 1 shows the research model that guides our hypotheses.

This study contributes to the literature in a number of ways. Firstly, we add to the very limited number of daily studies examining the positive impact of positive psychological experiences at work (i.e., workers' vigor) on recovery at home on a daily level. Since most studies have focused on demands and job resources, some researchers have called for a broadening of knowledge about other possible antecedents of workers' recovery, such as the variables related to workers well-being and personal resources (Rodríguez-Muñoz et al., 2018; Sonnentag, 2018a; Steed et al., 2019). We also contribute to the studies on vigor at work, not only considering it as a consequence of the recovery experiences, but also as an antecedent of these experiences (Sonnentag, 2018a; Sonnentag et al., 2012; Steed et al., 2019). In this sense, some researchers have called for studies to discover how workers who show high levels of work engagement recover from job stress (van Wijhe, Peeters, Schaufeli, & Ouweneel, 2013). Second, this study contributes to the study of specific moderating variables in the recovery process (Steed et al., 2019), exploring the moderating role that emotional job demands may have in the relationship between vigor and recovery experiences (Virtanen et al., 2019; Xanthopoulou et al., 2018). Moreover, we analyze our hypothesis using a diary study, which constitutes one of the best designs to collect the dynamics involved in the recovery processes (Demerouti et al. 2009) because it allows the study of the antecedents and moderating factors in short intervals of time. Currently, new insights suggest the relevance of analyzing daily fluctuations in predictor variables to predict recovery experiences (Chawla et al., 2020). Finally, this study contributes by analyzing the four recovery experiences proposed by Sonnentag & Fritz, since most studies focus only on the experience of psychological detachment or relaxation (Parker et al., 2019; Sonnentag et al., 2008). In this sense, we consider that it is important to deepen into the antecedents of the mastery and control

experiences because they have also previously been associated in the literature with restoration of physical and mental resources of the workers (Bennett et al., 2018).

Insert Figure 1 here

Method

Sample and Procedure

Nurses from various hospital and primary care centres in Madrid and the Basque Country (Spain) participated in this study. The survey was conducted between 2015 and 2018. Participants were mainly recruited using a snowball technique through the researchers' social networks. In addition, the Primary Care Management of Madrid and the Department of Occupational Risks of a large capacity hospital in Madrid participated in this study. Both showed interest in collaborating in this study, offering to their workers the possibility to participate.

The surveys were directly delivered to the supervisors of the work units that showed interest in participating. These supervisors then informed their workers about the possibility of taking part in this study. Those nurses who wanted to participate voluntarily received a package that included: a letter describing the objectives of the study, and the general and daily questionnaires. First, they had to fill in the general questionnaire and then they had to complete daily questionnaires (paper-and-pencil surveys) twice a day (in the afternoon after work and at night before going to bed) for five consecutive workdays from Monday to Friday. Previous diary studies in the organizational field stated five consecutive working days as a strong measure to assess the phenomenological work experience and to assure a good sample size (Ohly, Sonnentag, Niessen, & Zapf, 2010; Pindek, Arvan, & Spector, 2019), being standard weekly shifts among health professionals in Spain of five business days as well.

Once the surveys were completed, they were delivered in sealed envelopes to the supervisors, who sent them to the researchers, or posted directly to them. Participants were asked to complete the questionnaires during the week that they worked in the morning shift. To reduce the common-method variance (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003), the scales of the diary study were not administered at the same time. More specifically, the scales of emotional job demands and vigor at work were administered after leaving work in the afternoon, and the scale of recovery experiences was administered before going to bed (although this scale includes the experiences of recovery experienced in the afternoon). During the study, researchers regularly contacted the participants and supervisors to sustain their participation. Participants were also recommended to use alarms on their mobile phones to serve as a warning and reminder that they had to complete the questionnaires at different times of the day. The Ethics Committee of the university (name masked for peer review) approved the study protocol and all participants gave informed consent. To guarantee confidentiality, responses were matched using anonymous codes, such that the data were anonymized.

Of the 142 diary surveys that were distributed, 94 diary surveys were returned (response rate = 66%; 86 women, five men and three missing values). This is a considerable sample for a diary study with good statistical power ($N = 94 * 5 \text{ days} = 470$ observations). The hospital nurses (42.6%) belonged to diverse care services (e.g., intensive care unit, surgical unit, and emergencies). Mean age was 45.14 years ($SD = 11.85$; range from 23-65 years). Most employees worked 36.97 hours per week ($SD = 6.31$) and the average years of tenure in their work centres was 10.63 years ($SD = 9.89$). 83% had a couple and an average of 1.45 children ($SD = 1.04$; range from 0-4).

Measures

General and daily vigor at work. Vigor was measured with the vigor subscale from the Utrecht Work Engagement Scale (UWES; Schaufeli et al., 2002), which was validated by Schaufeli et al., (2002). The items from this scale were simultaneously formulated in Spanish and English in the original version. Subsequently, a bilingual psychologist checked the semantic and syntactic equivalence of both versions. We used the Spanish version. This six-item scale measures the levels of energy and mental resilience while working, the willingness to invest effort in one's work, the ability to not be easily fatigued, and persistence in the face of difficulties (i.e., During the task, I felt full of energy). The scale was scored on a seven-point Likert scale (0 = *never*, 6 = *most of the time*). Daily vigor at work was measured with the same scale modified so that the items referred to the present moment. An example item is: "At this moment, I feel strong and vigorous with regard to my job". This questionnaire has an adequate reliability (internal consistency) and construct validity (Schaufeli et al., 2002). In this study, Cronbach's alpha for the general measure was $\alpha = .86$, and it ranged between .88 and .91 for the daily measure.

General and daily emotional demands. Emotional demands were measured with the subscale "Emotional Requirements Derived from Task" from the Emotional Labour Questionnaire (TREMO, Moreno-Jimenez, Gálvez-Herrer, & Garrosa, 2004). Emotional requirements derived from the task are related to the emotional load, the valence and the variety of the task, as well as their relation with the characteristics of the job (i.e. "In my work, being aware of emotions is important"). The measure contains five items, which the participants endorse on a four-point Likert scale, ranging from 1 = "*rarely*" to 4 = "*constantly*". For the daily measure, the items were adjusted so that they referred to the preceding working day, (i.e. "Today, to do my work properly, I had to know how to empathize with patient's needs"). This questionnaire has an acceptable reliability (internal consistency) and construct validity (Moreno-Jimenez et al., 2004). In this study,

Cronbach's alpha for the general measure was $\alpha = .84$, and it ranged between .83 and .88 for the daily measure.

General and daily recovery experiences. Recovery experiences were measured with the Recovery Questionnaire developed by Sonnentag & Fritz (2007) in their Spanish adaptation (Sanz-Vergel, Sebastian, Rodriguez-Muñoz, Garrosa, & Moreno-Jiménez, 2010). The translation of this scale from English to Spanish followed the Reverse Translation Method. This questionnaire evaluates through 12 items and the following four recovery experiences (three items for each subscale): psychological detachment, relaxation, mastery and time control. For daily measure, the items were adjusted so that they referred to the preceding afternoon (i.e., “Today, after work, I have been able to “disconnect” for psychological detachment; “Today, after work, I have been able to take my time to rest” for relaxation; “Today, after work, I have been able to perform other activities that pose a challenge for me” for mastery; and “Today, after work, I have been able to decide for myself how to spend my free time” for time control). The scale was scored on a five-point Likert scale (1 = *completely disagree*, 5 = *completely agree*). This questionnaire has an adequate reliability (internal consistency), construct validity and concurrent validity (Sanz-Vergel et al., 2010). In this study, Cronbach's alphas for the general measure was $\alpha = .92$ (psychological detachment), .86 (relaxation), .88 (mastery), and .94 (time control), and they ranged between .83 and .94 for daily measures.

Table 1 shows the reliability indices (Cronbach's alpha) of all the general scales and daily measurements.

Statistical analysis

Data was analyzed using MLwiN 2.28 software. We used multilevel analysis, given the hierarchical structure of our data (Nezlek, 2012). Day-level variables (Level 1: i.e., daily vigor at work and daily emotional demands at work in the afternoon, after work, and the

four daily recovery experiences at home at night) were centred at the respective person mean, whereas person-level variables (Level 2: i.e., gender, age, number of children, time and the general measure of the four recovery experiences) at the grand mean. Following Ohly et al., (2010), we centred predictor variables at the person level around the grand mean, and predictor variables at the day level around the respective person mean. Interpretations of our results based on stable differences between persons can be ruled out because we used person-level variables as control variables before entering day-level variables in subsequent models of analysis (Nezlek 2012). Moreover, to control for possible accumulation effects in the dependent variable over the course of the five working days, we also included the variable “time” in the analyses.

Results

Descriptive and Preliminary Analysis

Table 1 shows the means, standard deviations, intra-class correlations, reliability of day-level and general measures, and bivariate correlations among all the study variables. Before testing our hypotheses, we examined whether our variables vary within persons using the intra-class correlation. The intra-class correlation measures are calculated through the ratio between the Level-2 variance component and the sum of the Level-2 and Level-1 components. As we can see in Table 1, these findings suggest that a substantial portion of the variance in our outcome variables can be attributed to within-person variation across the 5 days, which supports the usage of multilevel analysis (Fisher and To 2012).

Insert Table 1 here

Hypothesis Testing

We calculated four multilevel models for each outcome variable. In Model 1, we entered the control variables (i.e., gender, age, number of children, time, and the outcome general

measure). In Models 2 and 3, we entered the main effects of daily predictor; namely, the experience of vigor at work in the afternoon and emotional job demands, respectively. In Model 4, we entered the interaction between the daily experience of vigor at work and the presence of emotional job demands. We tested the improvement of each model over the previous one by computing the differences of their log likelihood statistic $-2*\log$ and submitted this difference to a χ^2 -test.

Insert Table 2 here

The results of our multilevel analyzes testing Hypotheses 1a, 1b, 1c and 1d are presented in Tables 2, 3, 4 and 5 (in Model 2). The results supported Hypothesis 1a ($B = .15$, $SE = .06$, $t = 2.43$, $p < .05$), Hypothesis 1b ($B = .24$, $SE = .06$, $t = 3.80$, $p < .001$), Hypothesis 1c ($B = .36$, $SE = .05$, $t = 6.20$, $p < .001$), and Hypothesis 1d ($B = .25$, $SE = .06$, $t = 4.00$, $p < .001$). Thus, on days that vigor at work was high, nurses experienced more psychological detachment, relaxation, mastery and time control at home at night. In addition, it should be noted that two of the sociodemographic variables used as controls in our analyses were significant in explaining the variance of "Time control", specifically age ($B = .02$, $SE = .00$, $t = 2.87$, $p < .01$) and number of children ($B = -.21$, $SE = .09$, $t = 2.15$, $p < .05$).

The results of our multilevel analyzes testing Hypotheses 2a, 2b, 2c and 2d are presented in Tables 2, 3, 4 and 5 (in Model 3). The result did not support any of these hypotheses ($B = .06$, $SE = .08$, $t = 0.81$, $p > .05$; for psychological detachment; $B = .16$, $SE = .08$, $t = 2.07$, $p < .05$; for relaxation; $B = .09$, $SE = .07$, $t = 1.29$, $p > .05$; for mastery; and $B = .31$, $SE = .07$, $t = 4.11$, $p < .001$; for time control). As we can see, while there were statistically significant relationships between the daily emotional job demands and the recovery experiences of relaxation and time control, these relationships were not in

the hypothesized sense. Specifically, the results showed that on days that emotional job demands were high, nurses experienced more relaxation and time control at home at night.

Insert Table 3 here
Insert Table 4 here
Insert Table 5 here

To test Hypotheses 3a to 3d, the interaction terms were incorporated into the last model (Model 4 in the tables). For the significant moderating effect, we conducted simple slope tests to examine the pattern of the interaction (Preacher, Curran & Bauer, 2006).

Interaction effects for psychological detachment experience at home at night

In the case of psychological detachment, we can see in Table 2 that Model 4 added the interaction terms and increased the model fit (difference of $-2 \times \log = 21.816$, $df = 1$, $p < .001$). There was a significant interaction effect between emotional job demands and vigor at work with the experience of psychological detachment at home at night ($B = -0.387$, $SE = .08$, $t = -4.71$, $p < .001$). Simple slope tests showed that vigor at work was more positively related to psychological detachment at home in days that emotional job demands were low ($\gamma = 0.452$, $SE = 0.083$, $z = 5.40$, $p < .001$), while they were more negatively related on days that emotional job demands were high ($\gamma = -0.322$, $SE = 0.104$, $z = -3.07$, $p < .01$). These results are in line with Hypothesis 3a (see Figure 2).

Insert Figure 2 here

Interaction effects for relaxation experience at home at night

In the prediction on relaxation, we can see in Table 3 that Model 4 added the interaction terms and increased the model fit (difference of $-2 \times \log = 15.546$, $df = 1$, $p < .001$). There was a significant interaction effect between emotional job demands and vigor at work with experiencing relaxation at home at night ($B = -0.329$, $SE = .08$, $t = -4.01$, $p < .001$). Simple slope tests showed that vigor at work was more positively related to relaxation at

home in days that emotional job demands were low ($\gamma = 0.525$, $SE = 0.091$, $z = 5.73$, $p < .001$), while vigor at work was unrelated to relaxation on days that emotional job demands were high ($\gamma = -0.175$, $SE = 0.104$, $z = -1.66$, n.s.). Thus, these results would not entirely confirm Hypothesis 3b because the significant slope occurs only in the condition of low emotional job demands (see Figure 3).

Insert Figure 3 here

Interaction effects for mastery experience at home at night

In the case of mastery, we can see in Table 4 that Model 4 added the interaction terms and increased the model fit (difference of $-2 \times \log = 9.258$, $df = 1$, $p < .01$). There was a significant interaction effect between emotional job demands and vigor at work with mastery experience at home at night ($B = -0.235$, $SE = .07$, $t = -3.05$, $p < .01$). Simple slope tests showed that vigor at work was more positively related to mastery at home in days that emotional job demands were low ($\gamma = -0.569$, $SE = 0.059$, $z = 9.50$, $p < .001$), whereas vigor at work was unrelated to mastery on days that emotional job demands were high ($\gamma = -0.069$, $SE = 0.104$, $z = 0.65$, n.s.). Again, these results do not fully confirm Hypothesis 3c because the significant slope occurs only in the condition of low emotional job demands (see Figure 4).

Insert Figure 4 here

Interaction effects for time control experience at home at night

Finally, in the prediction on time control, we can see in Table 5 that Model 4 added the interaction terms and increased the model fit (difference of $-2 \times \log = 22.684$, $df = 1$, $p < .001$). There was a significant interaction effect between emotional job demands and vigor at work on time control experience at home at night ($B = -0.381$, $SE = .07$, $t = -4.82$, $p < .001$). Simple slope tests showed that vigor at work was more positively related to psychological detachment at home in days that emotional job demands were low ($\gamma =$

0.259, $SE = 0.104$, $z = -2.469$, $p < .05$), while they were more negatively related on days that emotional job demands were high ($\gamma = -1.402$, $SE = 0.288$, $z = -4.86$, $p < .001$). These results are in line with Hypothesis 3d (see Figure 5).

Insert Figure 5 here

Discussion

The aims of this study were to analyze whether the daily level of energy in terms of vigor at work could explain the way in which workers have experiences of recovery from their work (i.e. psychological detachment, relaxation, mastery and time control); and to check if the daily emotional job demands could hinder that relationship, reversing the positive effect of vigor in those recovery experiences. Thus, we have explored and added knowledge about how a specific personal resource, i.e. vigor, is specifically related to each of the recovery experiences under specific working conditions (high emotional demands).

Overall, the results show that workers who had greater daily levels of vigor at work also had higher levels of recovery experiences at home, which supports the idea that the worker's energy resources can also become an antecedent for recovery experiences at a daily-level (Sonnentag et al., 2012; Sonnentag et al., 2014). These results are in line with those studies that show how positive emotional experiences related to work also explain daily recovery at home (Bono, Glomb, Shen, Kim, & Koch, 2013; Michel et al., 2016; Rodríguez-Muñoz et al., 2018). Thus, the presence of energy resources related to work could be transferred to the personal level to facilitate greater recovery experiences (Kinnunen et al., 2011; ten Brummelhuis & Bakker, 2012a). Vigor, being a component of the approach-oriented behavior facilitation system that directs and approaches the individual to pleasant situations (Shirom, 2007), can help to get people involved in more activities that pose a challenge outside of work, as well as to exercise greater control over

their free time (Bradley, 2010; Kinnunen et al., 2011). In addition, it is likely that in those days when more energy and vigor is experienced, the workers can better control the psychological and emotional processes that are activated by daily events, and therefore have greater experiences of psychological detachment and relaxation (Sonnentag, 2018b). Nevertheless, although we did not test it in this study, recovery experiences at home may also affect the level of energy and vigor experienced at work the next day, generating positive well-being spirals as pointed out by COR theory (Hobfoll, 2011), and reflected in previous empirical studies (Parker et al., 2019; ten Brummelhuis & Bakker, 2012b). In the case of this study, it contributes to the literature on how work experiences can enrich a worker's personal life (ten Brummelhuis & Bakker, 2012a).

Being more psychologically linked to work, it might be expected that a person who experiences vigor would find more difficulty recovering from it. However, vigorous workers enjoy doing other things outside of work and do not feel anxious when they do not work, as opposed to workaholic workers (van Beek, Taris, & Schaufeli, 2011). In contrast, workaholics have the uncontrollable need to work incessantly, forgetting personal life and beyond work prescriptions. In this sense, unhealthy involvement such as overcommitment, work addiction or compulsive work would be related to lack of recovery (Bakker, Demerouti, Oerlemans, & Sonnentag, 2013).

Daily vigor acts as an energy resource that helps the worker to recover and therefore obtain more resources, producing what Hobfoll called a *caravan of resources* (Hobfoll, 2002; ten Brummelhuis & Bakker 2012a). However, this spiral of gains, according to Hobfoll (2002), occurs in situations in which no stressors are present. In our study, those workers who show high levels of energy, effort and persistence in the face of daily difficulties encountered at work on days when they have to deal with a high amount of emotional demands, experience less psychological detachment from their work and less

sense of control over their free time at the end of their day. This fact could be explained by a greater over-activation of the psycho-physiological and cognitive systems of the workers who are under these conditions. (Sonnentag & Fritz, 2015). Thus, when workers feel vigor, they show commitment to their work. However, if the content of the workday has been emotionally demanding, then it may take more effort to mentally disconnect from those situations. This produces something similar to the idea of the *recovery paradox* that was described by Sonnentag (2018b). In this case, the workers who have displayed the highest levels of energy at work in a day with high emotional demands are those who need more recovery, but paradoxically, and due to their over-activation, it is harder for them to recover.

Nevertheless, in our study, it could not be observed that workers found it more difficult to relax and have mastery experiences on those days with more vigor and greater emotional demands (although there was a tendency to do so, as shown in the graphs). This could be due to the fact that workers under these conditions, even though they are not able to disconnect and experience control of their time, they still are capable of starting activities that help them relax or get involved in other activities that can be a challenge.

In summary, we have verified that on those days when more vigor is experienced, in conditions of lower daily emotional demands, the workers experienced the four experiences of recovery to a greater extent after their work day, which has clear practical implications for organizations and workers, as we will discuss later.

Unexpectedly, this study showed an opposite result to the hypothesized one because there was a significant and positive association between emotional job demands and the experiences of relaxation and control of leisure time outside of work. On the one hand, the positive relationship with the relaxation experience could be explained by the fact that we did not consider the emotional valence of these emotional demands (positive vs.

negative), and the scale we used made more reference to the emotional work that professionals must do in their day to day. In addition, the emotional demands for a collective such as health professionals can be perceived as challenging (Bakker & Sanz-Vergel, 2013). In this sense, the presence of high emotional demands may be satisfying the personal need that these workers may have to face this type of task, and therefore can be considered as an experience that generates positive, comforting emotions, and not necessarily an unpleasant experience that provokes high activation (Blinded for review#1). This result would be in line with Bono et al. (2013), who showed how both the occurrence of positive work experiences and thinking about them after the day helps to reduce stress thanks to their ability to satisfy human needs. However, in our case, we could not evaluate whether emotional demands during work were experienced as positive or negative events, and therefore we need to continue investigating the relationship between the challenging demands and the recovery experiences to better understand their relationships and underlying mechanisms.

On the other hand, the positive relationship that was found between emotional job demands and the experience of control of leisure time could be due to two facts: i) health professionals put themselves in the place of others in their work and try to satisfy the care needs of users who provide a service during the day, i.e. the focus of their daily activity is constantly directed towards the well-being of others; ii) the experience of regaining control of leisure time is closely related to the feeling of self-determination, and to the fact that one can freely choose what to do at any given moment. From this point of view, it is possible that the direct association between emotional job demands and time control may reflect the need for workers to gain back the control of their time and dedicate it to themselves when they get home. This involves an exercise in self-determination, since

their personal needs have been left behind during their work time, while focusing on others and not on themselves.

Finally, it should be noted that two socio-demographic variables had significant relationships with the recovery experience of time control: age and number of children. In the case of age, the relationship was positive. This indicates that older workers had greater levels of control of their leisure time. This result could be explained to the extent that as age progresses, it is possible that people have learned more strategies to control and manage their free time, or to segment the different domains of their lives (Spieler, Scheibe, & Stamov-Roßnagel, 2018). Meanwhile, in the case of professionals who have children, their time may be more controlled by the demands that childcare requires and not so much by their own demands (Håkansson, Axmon, & Eek, 2016).

Theoretical Implications

Most studies in the literature show the association between job demands and resources with recovery. The results of this study clarify that personal resources can also facilitate recovery experiences. In fact, personal resources, such as vigor at work, can also offer us opportunities to engage in other activities outside of work that allow us to acquire new skills and competencies, increase the perception of control over our free time and the confidence in our ability to better balance our work and personal lives, thus allowing the worker to disconnect and relax (Steed et al., 2019). Workers' energy reserves have always been seen as the end result of recovery processes. However, the results of this study imply that personal states related to occupational well-being (i.e., energy or vigor) may also be predecessors of the recovery processes at the daily level, an idea that had not been sufficiently explored until now and that needs more scientific evidence (Rodríguez-Muñoz et al., 2018, Sonnentag 2018). In addition, the results of this study revealed that, in the presence of high emotional job demands, the effects of vigor on recovery

experiences are not that positive and, therefore, this research helps to clarify under what specific working conditions recovery processes can occur. So, during those days when workers experience high levels of energy at work and have to deal with high emotional demands, they may be overactivated cognitively, emotionally and physiologically and that may block the emergence of recovery experiences. In this sense, these results may add empirical evidence to the theory of stress and to models that emphasize the negative role of prolonged activation (Brosschot, Pieper, & Thayer, 2005; Ursin & Eriksen, 2004). Finally, we have found evidence of a direct and significant relationship between emotional job demands and experiences of relaxation and control of one's leisure time. However, in the case of psychological detachment and the experience of mastery, the relationship was not significant. As recently pointed out by Bennett et al., (2017) in their meta-analytic work, it appears that not all demands interfere equally with recovery experiences and work/home balance, and this paper provides evidence for this. However, more studies are needed to explore what mechanisms explain these differential associations.

Practical Implications

First, at the organizational level, health organizations must create working conditions that promote that their workers experience high levels of vigor and work engagement. For example, organizations must ensure that health workers have the necessary material and human resources to carry out their work. Practices such as providing positive feedback to workers, establishing positive leadership styles, or offering professional development opportunities, have previously been associated with experiencing higher levels of energy and dedication to work. This issue is relevant, not only because it has been seen that those professionals who experience higher levels of vigor on a daily basis show better performance but also because, as we have seen in this study, they are also the ones that

recover the best, which would therefore be reflected in higher levels of health, well-being, and performance in the short, medium and long term. In this regard, organizations could also encourage recovery opportunities, for example, by stabilizing shifts, planning and communicating schedules well in advance, so that workers can enjoy their leisure time, or providing wellness-related services among their employees. In addition, these organizations must ensure that job demands are reduced to tolerable levels for the worker and that they allow work-family balance, especially for workers who have children.

Emotional demands are not inherently negative. For example, they can have positive motivational effects (Blinded for review#1). Moreover, with sufficient material and personal resources, these demands would not necessarily affect the worker's well-being. However, our results suggest that on days when there are excessive emotional job demands on workers who deploy a lot of work energy, recovery can be blocked. Therefore, the objective is not to eliminate the emotional job demands, but to reduce them to tolerable levels and/or to provide the workers with the necessary resources so that they can face demands successfully, favouring the possibility that their stress response diminishes when the work day ends and experience recovery. These practical implications may be especially relevant to the current times in which we live. For example, in the face of a health crisis such as that caused by the COVID-19 outbreak, the emotional demands on health professionals have increased exponentially. Many professionals have been playing psychologists during this pandemic. These emotional demands cannot be eliminated, but health organizations could offer job resources to their workers to mitigate their negative effect, including psychologists and other experts, for the management of crisis and emergencies and also provide psychological support to families and patients, so that it is not the health professionals themselves who bear this burden. Alternatively, nurses and other health professionals could receive training and coaching in the critical

handling of these issues, which would increase their self-efficacy and control in the midst of the crisis. Both measures could help to reduce the worker's stress and enhance their chances of recovery when the workday ends.

Finally, this study shows that it is necessary to pay attention to professionals who are highly committed to their profession, carrying out prevention and health promotion actions, because excessive demands can also compromise the short-term recovery of these professionals and, consequently, could affect their stress and motivation levels in the short and long term. Sometimes organizations only intervene when professionals are already exhausted and, in this sense, what we would like to point out is the need to carry out preventive actions also aimed at professionals who demonstrate high levels of energy and commitment.

Limitations and Future Research

This study has observed some limitations. First, we assessed all of the data with self-report measures raising concerns about common-method variance. However, by using person-centred scores in the analyses, we eliminated the potential influence of response tendencies stemming from individual differences. Moreover, we measured the predictor variables (daily vigor and emotional demands) in the afternoon after work and recovery experiences at home at night to try to minimize the problem of common-method variance by temporally separating predictor and outcome variables (Podsakoff et al., 2003). Second, the participants in our study were predominantly women, which could make it difficult to over-generalize the results of our study. Nevertheless, the over-representation of the female gender in nursing is well known. Future studies should try to replicate the results with a representative sample of males and females.

It would be interesting for future studies to continue exploring how highly motivated workers recover when faced with emotional demands of different affective valences,

whether positive (e.g., witnessing a patient's recovery) or negative (e.g., seeing the suffering and pain of a patient), and the role that moderating variables such as rumination, mindfulness, emotion regulation strategies and emotional support (e.g. from co-workers or the couples) could have in this process. It would also be of interest to investigate the role of other affective-motivational and cognitive variables related to work involvement (such as passion for work in its two dimensions - i.e. obsessive vs. harmonious - or the experience of flow at work) and its effect on recovery after work. Finally, it would be also of interest to delve further into the consequences for the worker (in terms of energy and work motivation) of being exposed to high levels of emotional job demands along with the experience of high levels of vigor and poor recovery. That is, to extend the study of the dynamics explored in this research to exploring the process beyond the day.

Conclusion

As the main conclusion of this study, it can be established that when workers have experienced a large amount of work-related energy (i.e. vigor) during their workday, and return home, they can better recover from the efforts made in the workplace. However, this positive effect would occur on those days when work-related emotional stressors are not present in high intensity, since in those cases the positive effect of vigor on recovery would become negative, making it difficult for workers to experience recovery.

Declarations

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Conflicts of interest/Competing interests: the authors report no conflict of interest

Availability of data: The data that support the findings of this study are available from the corresponding author, [blinded for review], upon reasonable request.

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