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Running head: CURVILINEAR EFFECTS OF JOB CHARACTERISTICS

Curvilinear Relations of Job Characteristics to Ill-Being in the Nursing Profession: A Cross-Sectional Study

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Abstract

Aims: To investigate the curvilinear associations between two job characteristics (i.e., task identity and information processing) and negative outcomes (i.e., nurse need for recovery and negative affect).

Background: Research has historically demonstrated the beneficial effects of motivational job characteristics on several individual and organizational consequences. These job characteristics were indeed found to be positively and linearly related to positive outcomes such as job satisfaction. However, another stream of research contends that job characteristics may have curvilinear effects on employee well-being.

Design: A cross-sectional correlational design was used.

Method: Data were collected during June 2014, using a questionnaire survey. A convenience sample of French nurses and assistant nurses was recruited ($n = 269$). All participants were working in centres specialized in providing care to people with disabilities.

Results: This study demonstrated significant curvilinear effects of job characteristics on nurses' ill-being, while controlling for their linear effects.

Conclusions: These findings support that nurses' job characteristics are associated with their ill-being in complex ways and provide organizational and managerial applications for healthcare centres.

Keywords: curvilinear effect; job characteristics; need for recovery; negative affect; nursing; work design.

SUMMARY STATEMENT

Why is this research needed?

- Job characteristics have consistently been identified as a central category influencing nurses' health and motivational characteristics have traditionally been negatively associated with ill-being.
- Job characteristics such as task identity and information processing might have health altering effects in the nursing occupation as they might reach levels where they become more pressuring than challenging.

What are the key findings?

- This study emphasizes the curvilinear effects of two job characteristics (i.e., task identity and information processing) on nurses' need for recovery and negative affect.
- When reaching towards optimum levels, job characteristics are associated with lowered ill-being; when deviating beyond these levels, characteristics relate to increased ill-being.

How should the findings be used to influence policy/practice/research/education?

- Organizations and management should ensure that task identity stays close to an optimum level to prevent nurses from feeling over-responsible and developing need for recovery and negative affect.
- Healthcare organizations should redefine the way jobs require attending to and processing information as, in the healthcare setting, past a certain optimum point, cognitive demands seem to put nurses' health at risk.

INTRODUCTION

Job characteristics have consistently been identified as a central category influencing nurses' well- and ill-being (e.g., Dollard *et al.* 2007) and associating with major consequences such as turnover intentions across different countries (Aiken *et al.* 2013, Heinen *et al.* 2013). Specifically, job characteristics 'constitute a set of environmental variables that are widely thought to be important causes of employee affect and behavior' (Spector & Jex 1991, p. 46) and refer to those very core components of nurse activity. In line with the job characteristics theory (Hackman & Oldham 1975), positive effects of motivational job characteristics on employee well-being have traditionally been demonstrated (for a review, see Humphrey *et al.* 2007). However, scarce research indicates that motivational job characteristics might also have harmful effects on employee health when they reach high levels (e.g., Fried *et al.* 2013). Nursing is internationally well known for being a very demanding occupation (Pisanti *et al.* 2011, Coetzee *et al.* 2013). One might thus argue that characteristics traditionally seen as motivational might have health altering effects in the nursing occupation, for they might reach levels where they become more pressuring than challenging. However, to this day, a paucity of research has investigated how job characteristics -when accumulating above high levels- might lead to an increase in ill-being in nurses.

Hence, we sought to explore a new perspective by investigating whether the relationships between two job characteristics of particular relevance to nursing (i.e., task identity and information processing) and ill-being (i.e., need for recovery and negative affect) could be explained by curvilinear effects, in a sample of French healthcare workers.

Background

Theorists have historically posited that organizational and individual needs could simultaneously be satisfied by manipulating job characteristics (e.g., Turner &

Lawrence 1965, Herzberg 1968, Buchanan 1979). Among these authors, Hackman and Oldham (1975) offered a model that has since been the most consensual framework when studying job content and design. Specifically, they identified the characteristics (i.e., autonomy, task identity, task significance, skill variety and task feedback), also characterized as job enrichment, that would create the conditions under which a higher motivation and satisfaction in employees are possible and, in turn, a higher productivity attainable (Oldham & Hackman 1976, Hackman & Oldham 1980). In the present study, we focused on two specific job characteristics which appeared of particular relevance to the nursing profession.

First, one of the major sources of dissatisfaction in nurses lies in perceived shortness of staff to provide quality care, which generates the frequent impossibility to complete a task out of a lack of time (Aiken *et al.* 2013). This echoes the very definition of task identity as it reflects the ‘degree to which a job involves a whole piece of work’ (Morgeson & Humphrey 2006, p. 1323). According to Hackman and Oldham (1980), the possibility to do one’s job from beginning to end with visible outcomes is far more interesting than performing a job implying only parts of a whole or incomplete tasks. As a matter of fact, the ability to complete their job as a whole gives employees a sense of meaningfulness, which appears to be the ultimate fundamental goal pursued by individuals (Ryan & Deci 2001).

Second, the French healthcare system has undergone a lot of change impacting the organization, the way work is completed and the knowledge required to do so (Beauchet 2008). In such a context, nurses receive a variety of information pertaining to the new ways of performing their tasks. They have to process this information together with all the information regarding patients’ files and follow-up in a context where quality processes imply more and more monitoring (Ghadi & Mounic 2012). This reality reflects the definition of information processing, as it is ‘the degree to which a job requires attending to and processing data or other information’ (Morgeson & Humphrey 2006, p. 1323). Information processing has been shown to be positively associated with positive outcomes such as satisfaction (Humphrey *et al.* 2007) since high cognitive demands can be positively challenging and characterize enriched work (Campion 1989, Bakker & Sanz Vergel 2013) by contrasting with monotony.

Job Characteristics, Need for Recovery and Negative Affect

Motivational job characteristics were typically found to be positively associated with positive outcomes such as job satisfaction (e.g., Judge *et al.* 2000) or flow at work (Demerouti 2006), whereas they would negatively relate to negative outcomes including indicators of psychological health such as job anxiety or burnout (Humphrey *et al.* 2007) and behavioral consequences such as workplace harassment (Astrauskaite *et al.* in press) and absenteeism (Väänänen *et al.* 2003). In an effort to extend the scope of psychological health consequences traditionally associated with job characteristics and to be consistent with nurses’ work realities, we investigated need for recovery and negative affect.

First, ‘the concept of need for recovery refers to the extent that the work task induces a need to recuperate from work induced effort. [...] It is characterized by temporary feelings of overload, irritability, social withdrawal, lack of energy for new effort and reduced performance’ (van Veldhoven & Broersen 2003, p. i3). Some job characteristics (e.g., time pressure) have been found to relate to need for recovery in a positive linear manner (e.g., Sonnentag & Zijlstra 2006) in samples of health service employees. Indeed, healthcare workers’ specificities include shift work and an increase in workload (Pisanti *et al.* 2011, Aiken *et al.* 2013), which might draw on nurses’ resources thus generating an increased need to recuperate (see Hobfoll, 2002).

Additionally, when recovery opportunities are not sufficient to face work demands on the long term, more serious negative consequences (e.g., psychological distress, deterioration of the immune system) may ensue (e.g., Jansen *et al.* 2002, Lindfors *et al.* 2006).

Furthermore, literature suggests that the nursing occupation is, in nature, associated with a variety of affective and emotional consequences (Diefendorff *et al.* 2011). Concurrently, the Affective Event Theory proposes that features of the work environment such as job characteristics can cause short-term affective reactions including negative affect (Weiss & Cropanzano 1996). As negative affect is strongly associated with disease (Krantz & McCeney 2002), there is a necessity to further explore the link between work characteristics and affect, to prevent potential adverse outcomes in nurses. Saavedra and Kwun (2000) demonstrated a negative linear effect of task identity on negative affect, suggesting that workers should be less prone to negative affect when their work allows them to complete their tasks as a whole. This kind of affective response to job characteristics is of great interest as it can, in turn, relate to a wide variety of outcomes in nurses, from commitment to job satisfaction (Weiss & Cropanzano 1996).

Even though the above statements suggest linear effects of task identity and information processing on nurse need for recovery and negative affect, the literature contends that job characteristics may have curvilinear effects on employee ill-being, which we aimed to further explore.

Curvilinear Effects of Job Characteristics

The present research sought to answer Humphrey *et al.*'s (2007) call for more examination of non-linear relationships between work characteristics and outcomes. As a matter of fact, activation theory (Scott 1966) hypothesizes that every task is associated with an optimal activation level which results in maximum possible positive responses in individuals, but past (i.e., below or beyond) that optimal activation level of the task, the positive valence of responses declines (Gardner 1986). Considering job design in the light of activation theory implies that job enrichment being either too low or too high would result in deviating from the optimal activation level of the job characteristic, thus producing negative outcomes.

In consonance with this theory, researchers explored non-linear relationships between job characteristics and affective, behavioral and physiological outcomes. Champoux (1980) was one of the first to show a curvilinear relationship between job complexity and general satisfaction, growth satisfaction and internal motivation. Specifically, Champoux found reversed U-shaped relationships showing that a moderate level of job complexity related to high levels of both general and growth satisfaction and well-being, whereas lower or higher levels of job complexity were associated with a decrease in all three outcomes. This was further confirmed by Chung-Yan (2010) who demonstrated that job complexity did not automatically induce positive psychological and behavioral consequences, but instead -below and beyond a certain level- it could be associated with lowered psychological well-being and job satisfaction, as well as increased turnover intentions.

Xie and Johns (1995) also illustrated the activation theory hypothesis by indicating that task significance had a curvilinear relationship with emotional exhaustion and that task identity showed curvilinear relationships with both emotional exhaustion and anxiety. When job enrichment was at low or high levels -versus moderate levels- it led to increased levels of ill-being. Furthermore, Fried *et al.* (2013) recently investigated how job enrichment (i.e., skill and task variety, identity, significance, autonomy, job and supervisory feedback) relates to abdominal obesity

and found a curvilinear relationship between these constructs. Specifically, their results indicated that the level of abdominal obesity decreased when job enrichment was moderate, but it increased when job enrichment reached higher or lower levels. Altogether, these findings have converged to indicate a shift in the traditional relationship between job characteristics and ill- and well-being.

In line with the above findings, we investigated non-linear effects of task identity and information processing on nurse ill-being. Indeed, one can argue that, when deviating from an optimum level, these two job characteristics could be associated with gradually heightened ill-being. In other words, we can expect for information processing and task identity to relate to a decrease in nurse ill-being only until a certain point where the relationship would eventually inflect and be associated with more and more ill-being. Indeed, jobs implying too little information processing or low levels of job identity could feel monotonous (Elsbach & Hargadon 2006) or not allow nurses to find closure in doing their work and might thus create uncertainty. Coping with this uncertainty might draw on nurses' resources, potentially causing an elevated need for recovery and negative affect (see Hobfoll, 2002).

In addition, as suggested by the literature (Humphrey *et al.* 2007), when task identity and information processing increase from these low levels towards higher levels, they imply a decline in ill-being as they gain in motivational potential (i.e., job enrichment process). Yet, we can expect for this beneficial effect to shift direction at a certain point where job characteristics would start to associate with heightened ill-being (e.g., Fried *et al.* 2013). Indeed, jobs involving extremely high levels of job identity -because they make nurses responsible for their task as a whole (Morgeson & Humphrey 2006)- might induce feelings of being over-responsible and accountable for any potential mistake, thus putting pressure on their shoulders. Similarly, the high level of cognitive demands underlying a lot of information processing could feel overwhelming. Both this exerted tension and overwhelming flow of information might then draw an important amount of resources to be coped with, thus increasing nurses' need for recovery (van Veldhoven & Broersen 2003) and creating negative affect towards their job.

THE STUDY

Aims

From a theoretical standpoint, our study sought to extend the literature by investigating the curvilinear effects of task identity and information processing on nurses' need for recovery and negative affect. In other words, from a preventative standpoint, we aimed to understand whether motivational job characteristics in the nursing occupation were beneficial only to a certain extent. Indeed, we explored how the lowest levels of both job characteristics would associate with high levels of need for recovery and negative affect in nurses, which we supposed would both decrease when task identity and information processing reach moderate to high levels. We conjointly anticipated that the highest levels of task identity and information processing would relate to heightened need for recovery and negative affect. Hence, we formulated several hypotheses:

- After controlling for linear effects, we expect curvilinear U-shaped relationships between task identity and both nurses' need for recovery and negative affect (hypothesis 1).
- After controlling for linear effects, we expect curvilinear U-shaped relationships between information processing and both nurses' need for recovery and negative affect (hypothesis 2).

Design

A correlational cross-sectional design was used to assess the associations between nurses' job characteristics and ill-being.

Sample

A convenience sample of nurses and assistant nurses was recruited. All nurses and assistant nurses ($n = 910$) working in eighteen French facilities specialized in providing care to people with disabilities were included in the sampling frame. Healthcare centres and their employees were recruited using the network of the present research's sponsor. Overall, 269 questionnaires were collected (response rate = 29.56%).

Data collection

Data were collected during June 2014 using a questionnaire survey. Participants were explained the purpose of the study and were instructed about the completion of the survey. They were conjointly assured of their responses' anonymity and were reminded that their participation was voluntary. Participants returned their completed questionnaires either through a ballot box placed in their organization or through anonymous envelopes. After two weeks, a reminder was distributed.

Measures

All scales of the questionnaire were developed and validated in French, except for the Need for Recovery scale which was translated to French using the standard back-translation technique (Brislin 1970).

Job characteristics. Eight items assessed the variables of task identity and information processing. We used both the task identity and information processing scales from Bigot *et al.*'s (2014) French version of the Work Design Questionnaire. Participants were asked to rate on a 7-point scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*) the extent to which their job characteristics involved the described situations. Two sample items are: 'The job is arranged so that I can do an entire piece of work from beginning to end' (i.e., task identity) and 'The job requires me to monitor a great deal of information' (i.e., information processing). Recent research (e.g., Bigot *et al.* 2014, Gillet *et al.* in press) reported adequate psychometric properties for both of these subscales

Need for Recovery. Using the five items from the short form of van Veldhoven and Broersen's (2003) need for recovery scale by Sonnentag *et al.* (2010), participants were asked to indicate on a 4-point scale ranging from 1 (*never*) to 4 (*always*) how often they experienced the described feelings (e.g., 'Often, after a day's work I feel so tired that I cannot get involved in other activities'). Past research has reported good concurrent and predictive validity of the scale (e.g., De Croon *et al.* 2004).

Negative Affect. We used the five items from the French version of the Positive And Negative Affect Schedule (PANAS; Gaudreau *et al.* 2006). Contextualizing in the work context and using the short-term instructions (Watson *et al.* 1988) (e.g., 'At work, I currently feel angry'), participants were asked to rate the intensity of each affect on a scale from 1 (not at all or very slightly) to 5 (extremely). Previous studies showed adequate internal consistency for this subscale of the PANAS (e.g., Merz *et al.* 2013).

Ethical considerations

According to local regulations, no formal ethical scrutiny was required as no ethics committee existed in the institution at the time of the study. However, nurses were surveyed only on approval from their centres' Committees for Health, Safety and Working Conditions. All centres executives signed a written consent form. In return for their participation, all stakeholders were provided with an extensive feedback of study findings.

Data analysis

Survey data were entered into SPSS 15 (SPSS Inc. 2006) to conduct descriptive analyses. Confirmatory factor analyses (CFA) were conducted using AMOS to assess the dimensionality of the constructs of interest, using Maximum Likelihood. To examine whether a curvilinear effect of job characteristics explained additional variance over and above the strength of a linear effect, we performed a series of hierarchical multiple regression analyses for both studied outcomes, on SPSS. The composite variables for all studied dimensions were estimated through the calculation of a mean score. In case of missing data, such data were replaced by the mean score calculated on the corresponding item. According to Aiken and West's (1991) procedures, the independent variables (i.e., task identity and information processing) were centered before running the analyses. To test the hypothesized relationships in the study, the independent variables were transformed using a quadratic transformation (i.e., squared term). In Step 1, we entered all studied control variables (i.e., gender, age, organizational tenure, occupational tenure, contract type and time worked). In Step 2, linear task identity and information processing scores were entered. In Step 3, the squared terms for task identity and information processing were entered.

Instrument rigor

All Cronbach alphas were above 0.70, thus demonstrating a good reliability of the scales we used in this study. More specifically, all scales including task identity ($\alpha = 0.82$), information processing ($\alpha = 0.79$), need for recovery ($\alpha = 0.75$) and negative affect ($\alpha = 0.73$), showed high internal consistency.

We conducted separate confirmatory factor analyses for each of the studied variables. Results indicated that the models we tested obtained good fit at the data regarding task identity, $\chi^2(1) = 6.04, p < 0.05, \chi^2/df = 6.04, RMR = 0.04, GFI = 0.99, NFI = 0.99, IFI = 0.99, CFI = 0.99$; information processing, $\chi^2(1) = 5.70, p < 0.05, \chi^2/df = 5.70, RMR = 0.03, GFI = 0.99, NFI = 0.99, IFI = 0.99, CFI = 0.99$; need for recovery, $\chi^2(4) = 10.21, p < 0.05, \chi^2/df = 2.55, RMR = 0.02, GFI = 0.99, NFI = 0.97, IFI = 0.98, CFI = 0.98$; and negative affect $\chi^2(3) = 8.62, p < 0.05, \chi^2/df = 2.87, RMR = 0.03, GFI = 0.99, NFI = 0.97, IFI = 0.98, CFI = 0.98$. All items loaded on their latent constructs with standardized loadings above 0.36 (ranging from 0.46 to 0.91 for task identity, from 0.50 to 0.95 for information processing, from 0.40 to 0.81 for need for recovery and from 0.36 to 0.78 for negative affect).

RESULTS

Characteristics of sample

Among participants, 239 were women (88.8%) and 26 were men (9.7%), 4 respondents did not specify their gender (1.5%). Participants were from 18 to 62 years old (*mean* = 40.28; *SD* 10.95). Average tenure in the organization was 9.00 years (*SD* 8.21), while average tenure in the occupation was 13.35 years (*SD* 9.87). Out of all respondents, 199 worked full-time (73.9%), 49 worked part-time (18.2%) and 21 did not specify (7.8%). Sample was made of 223 nurses with permanent contracts (82.9%), 35 with fixed-term contracts (13.1%) and eight did not mention their contract type (2.9%).

Preliminary Analyses

Correlation analyses' results (Table 1) showed that task identity was negatively related to need for recovery and negative affect, while information processing was positively associated with both outcomes.

Hierarchical Regression Analyses

Task identity. In Step 1, only contract type had a significant and positive impact on negative affect ($\beta = 0.21, p < 0.001$). Controlling for covariates, in Step 2, the linear task identity predictor was negatively related to need for recovery ($\beta = -0.16, p < 0.01$) and negative affect ($\beta = -0.25, p < 0.001$). Adding the squared term in Step 3 resulted in a significant increase in explained variance in all outcomes. Specifically, the squared task identity predictor term was positively associated with both need for recovery ($\beta = 0.23, p < 0.001$) and negative affect ($\beta = 0.14, p < 0.05$) (Table 2). These results supported hypothesis 1.

We further tested the shape of these curvilinear relationships, demonstrating that there is a bend in each of the studied scattered plots. As task identity increases towards moderate to high levels, both need for recovery and negative affect decrease; and as task identity reaches its highest levels, both need for recovery and negative affect increase (see Figures 1 and 2). Inflection points of the curves were calculated for each non-linear relationship (Berger & Gostiaux 1988) by calculating the first and second derivatives of the function. Then, the second derivative was equalized with zero and the resulting equation provided the inflection point. Results revealed that the inflection point of the curve is at 5.19 in the relationship between task identity and need for recovery and at 6.28 in the relationship between task identity and negative affect (on a 7-point scale).

Information processing. In Step 1, only contract type was significantly and positively related to negative affect ($\beta = 0.21, p < 0.001$). Controlling for covariates, in Step 2, the linear information processing predictor was positively associated with need for recovery ($\beta = 0.17, p < 0.01$) and negative affect ($\beta = 0.22, p < 0.001$). Adding the squared term in Step 3 resulted in a significant increase in explained variance in all outcomes. Specifically, the squared information processing predictor term was positively related to both need for recovery ($\beta = 0.20, p < 0.01$) and negative affect ($\beta = 0.15, p < 0.05$) (see Table 3). These results supported hypothesis 2.

Each relationship showed a bend in its scattered plots. Indeed, as information processing increases towards moderate levels, both need for recovery and negative affect decrease; and as information processing reaches moderate to high levels, both need for recovery and negative affect increase (see Figures 3 and 4). The inflection point of the curve is at 4.42 in the relationship between information processing and need for recovery and at 3.99 in the relationship between information processing and negative affect (on a 7-point scale).

DISCUSSION

The present study demonstrated that the relationship between nurses' job characteristics and their psychological health is more complex than the way it has commonly been approached. As a matter of fact, it showed that curvilinear effects of job characteristics explained additional variance in employee ill-being, while controlling for their traditionally studied linear effects (e.g., Morgeson & Humphrey 2006). We thus answered Humphrey *et al.*'s (2007) call for more examination of non-linear relationships between work characteristics and outcomes. More generally, the present results confirm and extend previous research on the curvilinear effects of task identity (Fried *et al.* 2013) on employee health, in the nursing occupation.

Results revealed that increasing levels of task identity and information processing in nursing are associated with a decline in need for recovery and negative affect until each characteristic reaches its optimum level (i.e., inflection point) beyond which the increase in both job characteristics relates to gradually heightened need for recovery and negative affect in nurses. These results can be interpreted in light of the conservation of resources theory (Hobfoll, 2002), which posits that individuals seek to

obtain, preserve and protect their resources. Indeed, our results suggest that when increasing towards an optimum level, job characteristics would activate a positive process of conservation of resources associated with decreased negative outcomes. However, when deviating below or beyond this optimum level, job characteristics would draw on nurses' resources, thus starting a negative process of depletion of resources linked to an increase in negative psychological consequences (Schaufeli *et al.* 2009).

Importantly, depending on the job characteristic, this optimum level substantially fluctuates. Indeed, one should note that the inflection points are situated differently in the curves pertaining to task identity and in the curves implying information processing. As a matter of fact, on one hand, despite the curvilinear relationship, very high task identity still is more beneficial than very low task identity. In other words, being in charge of one's task as a whole –even though it starts being detrimental when it reaches its highest levels– is still less detrimental than not being able to complete such task from beginning to end at all. These results are consistent with previous research considering that task identity allows employee to find meaning by completing their task as a whole (Morgeson & Humphrey 2006). Indeed, meaningfulness being the ultimate fundamental goal pursued by individuals (Ryan & Deci 2001), low levels of job identity induce efforts to face such dissonance thus increasing nurses' need for recovery and creating negative affect.

On the other hand, high information processing appears to be less beneficial than low information processing. More precisely, information processing starts being detrimental at moderate levels. This counterintuitive observation indicates that, in the nursing occupation, information processing does not match the way motivational job characteristics are traditionally seen in a positive light (see Humphrey *et al.* 2007). Instead, the present results suggest that rising information processing can have harmful effects on nurse health. Indeed, duties implying a lot of information processing such as administrative responsibilities and keeping up with national changes in health service are found to be major sources of stress in nurses (Rout 2000), as a symptom of rapid change and an inadequate backing in terms of information resources.

Altogether, our results extend the literature by demonstrating that curvilinear effects allow a more precise analysis of the associations between nurses' job characteristics and their ill-being, than their sole linear effects. We thus encourage future nursing research to explore such curvilinear effects of job characteristics on a wider variety of outcomes pertaining to physical health or organizational consequences such as absenteeism, quality of care, or turnover intentions.

Limitations

The present study provides new insight into job characteristics and their effects on nurse ill-being, however it also has several limitations raising issues for future research to explore. First, one should note that our study had a relatively low response rate and that participants were nested in 18 institutions, which might have influenced our results and lowered generalizability. Moreover, our sample was a specific one (i.e., nurses and assistant nurses working in non-profit making facilities for disabled people, in France). Consequently, to generalize the present findings to other organizational settings and cultures, they need to be replicated in different and more important samples, in different types of healthcare centres and in different countries as job characteristics have been shown to vary across cultures (Pisanti *et al.* 2011). Second, our design was correlational in nature and no causality can therefore be concluded. Future research using experimental or longitudinal designs should attempt to make conclusions about causality between the studied variables. Third, the present study

only relied on self-reported measures, yet such measures can be biased by factors including social desirability. We thus recommend researchers to conduct additional studies using objective assessments of physical symptoms or absenteeism. Fourth, we only considered task identity and information processing, thus we encourage researchers to explore curvilinear effects associated with other characteristics including social or contextual characteristics of the job (Morgeson & Humphrey 2006). Fifth, even though the explained variance increased in all studied associations as we entered the squared term (i.e., curvilinear), this amount of explained variance remained relatively low (8-13%). Therefore, other factors that we did not control for may play a role in explaining nurses' need for recovery and negative affect. Hence, future studies examining the effects of additional dimensions (e.g., nurses' personality, leaders' behaviors) are needed to confirm and extend our results. Finally, we did not further explore these non-linear effects by testing how some participants (e.g., outliers) might have influenced the curves we observed. Therefore, future studies should test for heterogeneity in the data (e.g., heteroscedasticity), which would allow for a more cautious analysis of curvilinear associations.

CONCLUSION

Despite these limitations, the present research's findings provide fundamental implications for healthcare organizations and managers. They should indeed be aware that jobs involving too little or too much task identity or information processing have adverse effects on nurses' psychological health which, in turn, may lead to negative behavioral and organizational consequences such as a decrease in job performance or an increase in turnover (e.g., Binnewies *et al.* 2009, Taylor & Pillemer 2009). In other words, managers should not necessarily expect these two job characteristics, traditionally seen as positive (Humphrey *et al.* 2007), constantly to lead to positive outcomes, instead they should ensure that job characteristics stay close to an optimum level.

On one hand, healthcare organizations should be aware that shortness of staff could imply impossibility for nurses to do their jobs from beginning to end with visible outcomes, or pressure to feel over-responsible for an entire piece of work. As both are associated with ill-being in nurses, this urges healthcare organizations to regulate their human resources management, for instance by implementing reasonable patient to nurse ratios (Coetzee *et al.* 2013) or by adequately adjusting labor planning and task assignments, as well as consequent nurse scheduling.

On the other hand, healthcare organizations should comprehend information processing in a very specific way. Indeed, not only does information processing relate to nurses' need for recovery and negative affect in a curvilinear manner, but it starts associating with such negative outcomes at a moderate level. In other words, in the healthcare setting, moderate to high cognitive demands seem to put nurses' health at risk. This urges healthcare organizations to drastically redefine the way jobs require attending to and processing data or other information. One can argue that information processing appears to be a threat to nurse psychological health more than it is an obstacle that can be overcome and that contains potential gain (Bakker & Sanz-Vergel 2013). Therefore, in a globally changing healthcare system (Davidson *et al.* 1997, Beauchet 2008), nurses should be consulted and their needs in terms of knowledge and information should be taken into consideration to make information processing more challenging than it is hindering. Allowing to adequately readjust the ways of processing information would benefit both employees and healthcare facilities as access to information is associated with better coping with organizational change (Armstrong-Stassen 2005, Falkenberg *et al.* 2009).

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Table 1

*Means, Standard Deviations, Alpha Reliabilities, and Correlations Involving Control Variables,
Job Characteristics and Outcomes*

Variable	<i>M</i>	<i>SD</i>	1	2	3	4	5	6	7	8	9
1. Gender	1.90	0.30	—	-.04	.02	.03	.01	.09	.03	.05	-.03
2. Age	40.27	10.68		—	.50*	.70*	.25*	.16*	.08	.03	.11
3. Organizational tenure	9.00	7.98			—	.60*	.01	.09	-.01	-.01	.14*
4. Occupational tenure	13.33	9.59				—	.31*	.17*	-.05	-.01	.10
5. Contract type	1.86	0.35					—	.11	-.09	.08	.07
6. Time worked	1.18	0.39						—	.02	.02	.04
7. Task identity	5.04	1.27							(.82)	.07	-.16**
8. Information processing	5.96	0.89								(.79)	.17**
9. Need for recovery	2.25	0.61									(.75)
10. Negative affect	1.94	0.68									

Note. $N = 269$; Alpha coefficients are reported in parentheses along the diagonal. Gender was coded as 1 = males and 2 = females. Contract type was coded as 1 = non-permanent and 2 = permanent. Time worked was coded as 1 = part-time and 2 = full time. * $p < .05$; ** $p < .01$; *** $p < .001$

Table 2

Hierarchical Regression Analyses of Linear and Curvilinear Effects of Task Identity on Need for Recovery and Negative Affect

Variable	Need for Recovery		
	Step 1	Step 2	Step 3
Gender	-.03	-.03	-.04
Age	.06	.08	.06
Organizational tenure	.12	.11	.11
Occupational tenure	-.03	-.02	-.04
Contract type	.03	.01	.01
Time worked	.02	.02	.02
Task identity		-.16**	-.04
Task identity squared			.23***
R ²	.03	.05	.09
Δ R ²	.03	.02	.04
Δ F	1.11	6.73**	11.88***
Negative Affect			
Gender	.01	.02	.01
Age	-.06	-.03	-.04
Organizational tenure	.09	.07	.07
Occupational tenure	-.02	-.01	-.02
Contract type	.21***	.19**	.19**
Time worked	.04	.04	.03
Task identity		-.25***	-.19**
Task identity squared			.14*
R ²	.06	.12	.13
Δ R ²	.06	.06	.01
Δ F	2.56*	18.65***	4.59*

Note. N = 269; Regression coefficients are standardized betas. * $p < .05$; ** $p < .01$;

*** $p < .001$

Table 3

Hierarchical Regression Analyses of Linear and Curvilinear Effects of Information Processing on Need for Recovery and Negative Affect

Variable	Need for Recovery		
	Step 1	Step 2	Step 3
Gender	-.03	-.04	-.05
Age	.06	.05	.06
Organizational tenure	.12	.12	.13
Occupational tenure	-.03	-.02	-.01
Contract type	.03	.01	-.00
Time worked	.02	.02	.02
Information processing		.17**	.30***
Information processing squared			.20**
R ²	.03	.06	.08
Δ R ²	.03	.03	.02
Δ F	1.11	8.21**	6.88**
Negative Affect			
Gender	.01	-0.01	-.01
Age	-.06	-.07	-.07
Organizational tenure	.09	.09	.10
Occupational tenure	-.02	-.01	-.01
Contract type	.21***	.19**	.18**
Time worked	.04	.04	.03
Information processing		.22***	.31***
Information processing squared			.15*
R ²	.06	.10	.12
Δ R ²	.06	.04	.02
Δ F	2.56**	13.45***	4.30*

Note. $N = 269$; Regression coefficients are standardized betas. * $p < .05$; ** $p < .01$; ***

$p < .001$

Figure 1. Curvilinear Effect of Task Identity on Need for Recovery

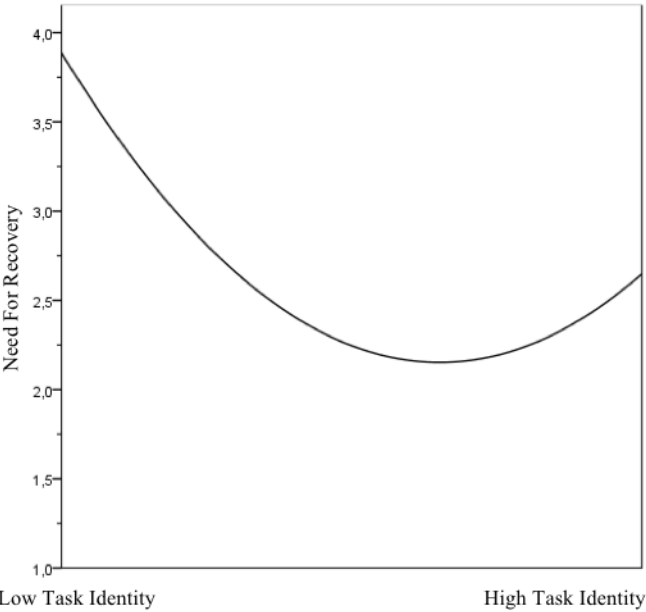


Figure 2. Curvilinear Effect of Task Identity on Negative Affect

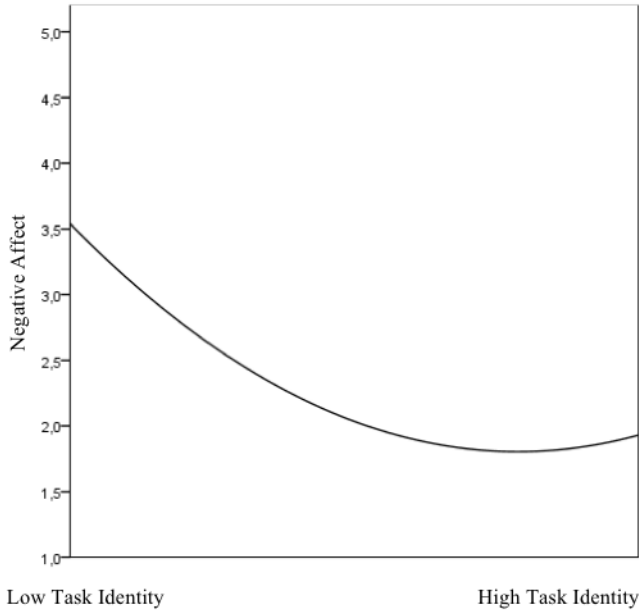


Figure 3. Curvilinear Effect of Information Processing on Need for Recovery

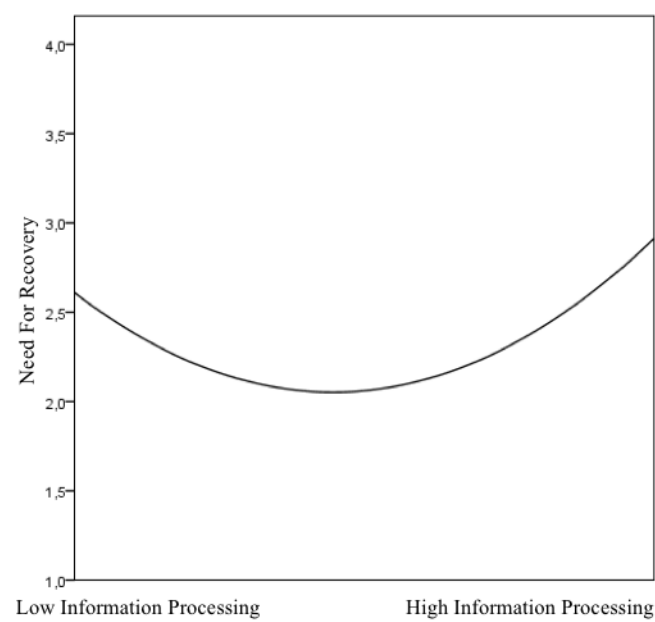


Figure 4. Curvilinear Effect of Information Processing on Negative Affect

