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Research article

Development and validation of challenge-hindrance demands scale for the nursing profession: A mixed-methods research study

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ABSTRACT

Background: Although common work conditions cannot be clearly classified as positive or negative, previous challenge-hindrance demands scales have failed to address this issue.
Objective: The purpose of this study was to develop and validate scales that allow the assessment of perceived levels of challenge-hindrance demands in the nursing profession and that are in conformance with the nature of the construct.
Design: The study employed an exploratory sequential mixed-methods design, composed of two phases. Firstly, the qualitative method was employed to find out the common work environment that is typically linked to the job demands of nurses; new scales were generated following the results. Secondly, the quantitative method was employed to refine and assess the validity and reliability of the instruments.
Participants: The key informants for the interview were 11 registered nurses from seven private hospitals in Bangkok, Thailand. In addition, the sample of the quantitative study, consisting of 761 Thai nurses from 16 private hospitals in Bangkok was randomly divided into three parts for different analyses (i.e., exploratory factor analysis, confirmatory factor and reliability analysis, and nomological validity analysis).
Results: The findings demonstrated that the assessment of the challenge-hindrance demands consists of three parts: The amount of experience with stressors, the appraisal of challenges, and the appraisal of obstacles. The analyses led to the creation of two scales: the challenge demands scale and the hindrance demands scale, each with 14 variables and four dimensions.
Conclusions: The separation of the scales into three parts made it evident that, since job demands themselves are part of an inevitably stressful work environment, hospitals have to focus on the individual interpretation of each job demand in order to manage the burnout and engagement of nurses. In addition, the scales have potential use in studies relevant to problems encountered in the nursing profession (e.g., opting to pursue a different career).

What is already known about the topic?

- Job demands can be separated into challenge demands and hindrance demands.
- Existing challenge-hindrance demands scales usually classify each work condition under either challenge demands or hindrance demands.

What this paper adds

- This study provides the empirical foundation for the creation of instruments to measure nursing challenge-hindrance demands whose format is congruent with the true nature of the job demands construct (i.e., most work conditions are neither absolutely positive or negative).
- The challenge-hindrance demands scales consist of three parts: The job demands part (the extent to which a nurse experiences each stressor), the challenge appraisal part (the extent to which each stressor can be considered an opportunity), and the hindrance appraisal part (the extent to which each stressor can be considered an obstacle).

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- The format of the scales suggests that in order to manage the burnout and engagement of nurses, practitioners have to focus on the individual interpretation of each job demand, instead of on the job demands themselves.

1. Introduction

Job demands, in the present study, refer to "those physical, social, organizational aspects of the job that require sustained physical or mental effort and are therefore associated with certain physiological and psychological costs" (Demerouti et al., 2001, p. 501). Generally, job demands are studied as part of the job demands-resources (JD-R) model, which explains the effects of the work environment of an organization (i.e., job demands and job resources) on employee burnout and work engagement (Schaufeli and Bakker, 2004).

The JD-R model has received a great deal of attention from researchers because it can be applied to explain various positive and negative work outcomes, such as organizational commitment, performance, absenteeism, and accidents (see Schaufeli and Taris, 2014). However, the model was not without its flaws, and one of the most concerning weaknesses was the lack of concurrence about the impact of job demands on work engagement. Previous research has been contradictory; some researchers have found a positive relation between the two variables (e.g., Schaufeli et al., 2008) while others have found none at all (e.g., Schaufeli and Bakker, 2004).

In this regard, Crawford et al. (2010) suggested that the inconsistencies occurred due to the failure of the model to consider the differences between two distinct types of job demands. As job stress researchers before them (e.g., Cavanaugh et al., 2000; Lepine et al., 2005), Crawford et al. (2010) separated job demands into challenge demands (i.e., work conditions that can cause stress but can promote professional growth and achievement) and hindrance demands (i.e., work conditions that can not only cause stress but can also hinder professional growth and achievements). This distinction yielded further consistent results of the relationship between different types of job demands and engagement, where challenges were positively related to engagement while hindrances were negatively related to engagement (Crawford et al., 2010). In addition, it became obvious that not all types of job demands caused trouble. It was only hindrance demands (i.e., the stressors appraised as barriers to work success) that caused difficulties (Van den Broeck et al., 2010).

In order to study challenge-hindrance demands as a single construct or as part of the JD-R model, previous research (e.g., Min et al., 2015; Searle & Lee, 2015) sometimes employed the challenge-hindrance-related stressor measures (Cavanaugh et al., 2000) or the challenge-hindrance stressor measures (Rodell and Judge, 2009). The shortcoming of these scales was that the job stressors were categorized into either challenge demands (i.e., workload, job responsibility, time pressure, and job complexity) or hindrance demands (i.e., hassles, politics, role ambiguity, role conflict, red tape, job insecurity, lack of opportunities for advancement), despite the fact that several ordinary demands could not be clearly classified as positive or negative work conditions and that personal appraisal should be taken into consideration (Hobfoll, 1989). This argument was supported by Bakker and Sanz-Vergel (2013) and Webster et al. (2011), who posited that each job stressor could be perceived as both a challenge demand and a hindrance demand simultaneously. Consequently, researchers can use this kind of measures once they determine whether a stressor is a challenge or a hindrance in the context under investigation. However, once a stressor can be considered differently by different persons, these measures cannot be adequately utilized (Searle and Auton, 2015).

In order to address this problem, we developed new challenge-hindrance demands scales, whose format is congruent with the true nature of the constructs. These new scales are based on the suggested definition of job demands by Schaufeli and Taris (2014), namely that job demands should be defined as the amount of effort an individual exerts to deal with each stressor and the individual's positive or negative appraisal of those demands.

In this regard, the first part, the experience, was based on the job demands knowledge of the JD-R model (Demerouti et al., 2001). The second part, the appraisals, was based on the challenge-hindrance appraisals of Searle and Auton (2015). In addition, the scoring procedures of the scales were adapted from the attitude scores in the theory of planned behavior (Ajzen, 1991).

In addition, the nursing profession was an ideal subject for these instruments because the shortage of nurses is a global issue that even developed nations (e.g., Great Britain, Germany, and Japan) are experiencing. One practical way to remedy the shortage of nurses is by improving their work conditions (Marć et al., 2018). It is argued here that the JD-R model can most properly describe the inherently stressful nursing profession (Montgomery et al., 2015) because it provides a theoretical framework that accounts for the influence of work conditions on nurse burnout, work engagement (Vander Elst et al., 2016), and other issues, such as job satisfaction (McVicar, 2016; Olsen et al., 2017) and leaving the nursing profession altogether (Jourdain and Chênevert, 2010; Moloney et al., 2018). Consequently, this paper aimed to lay the empirical groundwork for the development and validation of challenge-hindrance demands scales for the nursing profession. Since challenge-hindrance demands scales tailored to the nursing profession has not been previously developed, the new scales will be more adequate than the existing general-use scales for use in future nursing-related studies. The three research questions guiding this study are:

1. What are the underlying factors of the job demands of nurses?
2. What is the structure of the challenge-hindrance demands scales for nurses?
3. To what extent is the newly-developed challenge-hindrance demands scales for nurses valid and reliable?

2. Method

The most appropriate research design for this study was the exploratory sequential mixed-methods design because it is the most commonly used procedure to develop previously inexistent instruments (Creswell, 2009). In accordance with this design, this study is composed of two phases. The first phase, qualitative data collection and analysis, was conducted to both identify the potential factors of job demands and to develop scales whose format was consistent with the suggestions of Schaufeli and Taris (2014) on future research into this matter. The second phase, quantitative data collection and analysis, aimed to refine, as well as assess the validity and reliability of the newly-developed scales.

2.1. Ethical considerations

Approval for this study was obtained from the research committee of the School of Human Resource Development of the National Institute of Development Administration (Reference number: 0526.12/2563).

3. Phase 1: qualitative data collection and analysis

The purpose of this phase is twofold: To identify the work conditions that could become job demands in the nursing profession and to develop new challenge-hindrance demands scales for nurses.

3.1. Part 1: the factors of job demands of nurses

The aim of the review was to find out the potential factors of job demands in the nursing profession. To this end, a thorough review of the literature on the construct was made subsequent to the interviews of nurses about their personal experience with job demands in hospitals.

Upon researching the nursing profession in several countries (e.g., New Zealand, Singapore, Thailand, China, Israel, Iran, Sweden, the UK, South Africa, Canada, and the USA) regarding their job demands (Admia and Eilon-Mosheb, 2016; Boamah et al., 2017; D'Emiljo and du Preez, 2017; Hu et al., 2017; Jourdain and Chênevert, 2010; Lim et al., 2011; Moloney et al., 2018; Montgomery et al., 2015; Mosadeghrad, 2013; Sundin et al., 2008; Van der Colff and Rothmann, 2014; Vander Elst et al., 2016; Wu et al., 2012; Zito et al., 2016), we found that the common work environment factors that created stress are difficulties related to job performance (e.g., workload, job variety, job complexity, and role ambiguity), scheduling (e.g., time pressure, shift rotation, and work-life imbalance), patients and their relatives (e.g., death, complaints, threat of litigation, and the risk of contracting a disease), coworkers (e.g., understaffing, underqualified staff, and conflicts with fellow nurses and doctors), lack of vital skills and resources (e.g., capability to use modern equipment, support from supervisors and co-workers, and proper medical equipment), and intra-organizational issues (e.g., job insecurity, stalled career, unjust remuneration, and restrictive hospital policies). By no means exhaustive, this list provides a broad perspective for the preparation of the next step in the research process: The individual interview.

The main researcher carried out in-depth, semi-structured interviews (either face-to-face or by telephone) in order to explore the critical work conditions that cause stress in the nursing profession and the personal interpretation of each work characteristic as either a challenge or a hindrance. The inclusion criteria were that the key informants had to be nurses that had been working for private Thai hospitals for more than two years. The researchers employed purposeful sampling to recruit informants who met the criteria and were also available to provide detailed information about their work environment. In total, the key group of informants for the interviews consisted of 11 registered nurses between the ages of 24 and 47 working in various positions (i.e., nurse managers, a nurse supervisor, a head nurse, a charge nurse, and staff nurses), in seven private hospitals in Bangkok; job experience ranged from 2 to 25 years.

Ethical concerns (i.e., confidentiality and informed consent) were taken into account. The interviewer—the main researcher—began each interview by asking the key informants for their formal consent. Once the consent was obtained, the interviewer asked the open-ended question "Could you tell me about the events or things that cause stress in your workday?" followed by "How have the stressors impacted you in a positive way (i.e., you learn from them) or in a negative way (i.e., they get in the way of your achievement)?" and "Do you think those stressors are more positive or negative?" In addition to the main questions, the interviewer brought up some work environment factors from the literature review (e.g., job responsibility or conflicts), in case the key informants had not referred to those work conditions during the interviews. The interviewer conducted the interviews until data saturation was reached. All of the interviews were recorded for further analysis.

The researchers adapted the qualitative data management method for mixed-methods research into the nursing profession put forward by Halcomb and Davidson (2006) for this part of the study. In this part, the interview began by taking field notes during the interviews and reflecting on the information obtained (e.g., identifying further ideas, comments, or perceptions) immediately after each interview while the memory was still fresh. Then the interviewer reviewed the recordings, alongside the field notes. In this step, the interviewer amended the notes until they adequately conveyed the essence of the interview. In this way, the previous interview provided the interviewer with a line of questioning for the next interview. After all of the interviews were completed, the interviewer undertook the process of content analysis.

The present study adapted the process of content analysis used in research into the nursing profession by Graneheim and Lundman (2004). The interviewer began by reading through the interview text several times to obtain a general understanding of the text. Next, certain texts were divided into meaning units which were then labeled with a code. Different codes were compared and classified into categories. The interviewer conducted the content analysis at two-time points over a two-week period in order to ensure that the data were coded consistently at another time. In order to enhance the creditability of the study, the co-author (a professional nurse) and two other experts in human resource development or psychology verified the accuracy and comprehensiveness of the categories by ensuring that a very clear distinction was made between the categories and their descriptions, and that the selected quotations did adequately represent the categories.

3.2. Results

The fourteen main categories related to the nurses' perceptions of job demands emerging from the interview data were illustrated in Table 1.

In summary, three significant issues were brought to light by the analysis. Firstly, the 14 work environment factors that characterize job demands in the nursing profession are job complexity, job variety, heavy workloads, hectic work conditions, long work hours, rotational shiftwork, problematic patients, problematic relatives, uncooperative doctors, understaffing, incompetent or uncooperative nurses, unfairness, conflicts in the organization, and the risks of injury or illness. Secondly, some work conditions were interpreted, according to the interviews, as both a challenge and a hindrance simultaneously, depending on the appraisal of each nurse. Thirdly, the appraisals made as challenges and hindrances were independent of one another. This means that challenges and hindrances are not necessarily on opposite ends of the spectrum and they are two different constructs.

3.3. Part 2: scale development

In order to generate initial items that are easily accessible to nurses, the researchers used the information from the interviews in addition to the review of the literature. It became clear that the interview results supported the argument of Hobfoll (1989, p. 518), that "many daily stressors are neither clearly positive nor negative and so are most likely to be open to personal appraisal." Consequently, challenge demands and hindrance demands would be assessed, according to Schaufeli and Taris (2014), by the extent to which the nurses experienced each stressor and the extent to which each nurse interpreted each stressor as a challenge or a hindrance. The experiencing part is supported by the knowledge of job demands in the JD-R model (Demerouti et al., 2001) which these researchers concisely define as to any kind of work conditions that cause stress in employees. The interpretation part is supported by the challenge-hindrance appraisals of Searle and Auton (2015) who developed appraisal scales to measure the extent to which an event, a stressor, or a task is considered a challenge (e.g., help an individual to learn, grow, or achieve) or a hindrance (e.g., hinder an individual's learning, growth, or achievement). The appraisals are based on the transactional theory of Lazarus and Folkman (1984) whose primary appraisal suggested that a situation can potentially be appraised as a gain (i.e., the gain or growth a person anticipated from encountering a situation) or as a loss (i.e., the harm or losses that a person anticipated from dealing with a situation).

Accordingly, the initial challenge-hindrance demands scales were composed of three parts, job demands, challenge appraisal, and hindrance appraisal. The fourteen themes of job stressors resulting from the interviews became the 14 items in both parts. In addition, the job stressors were in the same sequence in both parts and were slightly altered for the purposes of each scale. The job demands items were framed in relation to monthly situations ("Please indicate the extent to which each statement was true for you during the past month.") and an example of the first item of the job demands part was "I have carried out complicated and complex work." A five-point Likert scale ranging from 1 (not at all true or 0–20%) to 5 (completely true or 81–100%) was used in this part. In addition, the instructions for the appraisal parts included

Table 1. The 14 Categories and their Meaning Units.

Category	Meaning unit
Job complexity: The difficulty of tasks that nurses perform involving sophisticated medical procedures and complicated organizational tasks.	"The new medical procedures and technology are continually changing and are more complicated. I have been updating my knowledge over ten years since I started this career."
Job variety: The range of tasks performed by nurses (e.g., medical procedures, training and development, and quality assurance), and the range of job functions of a position (e.g., managing, supervising, and assisting in operations).	"I am a charge nurse and I have to be responsible for 32 rooms at one time… My responsibilities are not limited to nursing care or nursing management. I belong to a journal club and have to present at least two interesting cases a month to other nurses."
Heavy workload: The excessive amount of work that nurses need to complete.	"They [workloads] are more than I could handle... 10%–20% of it [dealing with heavy workloads] can be an obstacle because I expect good quality of work which I could not achieve."
Hectic work conditions: The need for nurses to complete several tasks within a specific amount of time.	"When we rush to attend our patients, normally we feel bad at the beginning because we feel tired. Then we can see the advantages of it. It makes us work better and faster afterward."
Long work hours: The workload on nurses in excess of the normal working schedule or routine.	"Long work hours affect my health. I am old now. Sometimes working long hours slows down my physical and cognitive performance."
Rotational shiftwork: Work shifts rotates on a monthly basis	"Today I work a night shift and sleep in the next morning. Tomorrow I work in the afternoon and have to sleep at night …Some nurses have sleeping problems, which affect their health and cause irritability."
Problematic patients: Difficult patients who are fussy or "high maintenance," or who have unrealistically high expectations.	"High maintenance patients cause me to have a bad temper and these negative emotions slow down my work process."
Problematic relatives: Difficult relatives of patients who are temperamental, garrulous, or uncooperative concerning treatment plans, or who have unrealistically high expectations regarding the services.	"Some relatives wanted us to take the patients, who needed special care, out of the ICU to a common room. Moreover, the relatives refused to turn on the lights in the room. So we could not even see the patient's face. This hindered the effective delivery of nursing care."
Understaffing: An inadequate amount of nurses in a team to do their work properly.	"When our team is understaffed, I am unable to be away on holiday, nor can I travel to other provinces or countries... it causes stress in terms of not having enough rest, which affects my health."
Incompetent or uncooperative nurses: The nurses that neither have the necessary competency to perform their job nor intend to pursue the common policies (e.g., providing the best service) that other nurses do.	"I [a charge nurse] have to train new staff members… some of them are so incompetent that I wonder how they graduated in nursing science. The patients often complain about the service quality of those nurses so I have to deliver nursing care for them."
Uncooperative doctors: Uncooperative doctors who have a big ego, are temperamental, or do not comply with the hospital policies.	"I am rather concerned when I have to work with doctors with big egos. They do not try to improve themselves even when they are the center of the problem…we ask the doctors to come on time, but he never improves himself. Instead, we have to adjust our work process to reduce the negative effect on patients."
Unfairness*:* The negligence of superiors to fairly implement certain policies and favoritism.	"Favoritism is a challenging issue. Sometimes I am just closer to some subordinates than others so I buy them some snacks. This incident raises doubt about the fairness within the team… I have to be more cautious when it comes to this issue."
Conflicts within and between departments: An intra-department conflicts can be, for instance, an argument between the members of a team. Alternatively, a conflict between departments sometimes arises in the form of ignoring a request, delaying a response to a request, or avoiding responsibilities.	"Other departments might not welcome my requests so I have to find out how to respond positively to the patients' requests on my own and then will consider how to deal with those departments the next time."
The risks of injury or illness: The possibility that nurses will contract a disease or suffer minor injuries from using medical tools.	"When there are not enough sharps disposal containers, the nurses have to use their hands to remove the needle from the syringe and they can hurt themselves by accident… I can learn something from this but they are more likely to be barriers to work."

"Please indicate the extent to which each situation is an opportunity and the extent to which it is an obstacle"; the first item of the challenge appraisal part was "Complicated or complex is an opportunity to improve my job-related skills, knowledge, or abilities" and the first item of the hindrance appraisal part was "Complicated or complex is a hindrance to success at work." A five-point Likert scale ranging from 1 (minimal or 0–20%) to 5 (high or 81–100%) was used in both appraisal parts.

The scoring procedures of the challenge demands and hindrance demands were adapted from the calculation of the attitude scores in the theory of planned behavior (Ajzen, 1991). According to the theory, the attitude towards behaviors is the function of the sum of the beliefs (b_i) of an individual that his/her behavior will lead to an outcome weighted by the positive or negative evaluation (e_i) of the outcome by the individual. The function can be shown in the following equation: $A_b \, \alpha \, \sum_{i=1}^{n} b_i e_i$. Consequently, the scores for each variable of the challenge demands scale were derived from the multiplication of each item of the job demands part (d_i) by that of the challenge appraisal part (c_i) in the same sequence. The total score for the challenge demands scale was derived from the summation of the scores of all variables ($\sum_{i=1}^{14} d_i c_i$). The same logic was applied to the calculation of the scores for each variable ($d_i h_i$) of the hindrance demands scale, as well as that of the total score of the scale ($\sum_{i=1}^{14} d_i h_i$).

The comprehensibility of both parts of the scale was scrutinized by four nurses from the interviews. Subsequently, the researchers requested five experts in the field of nursing or human resources to examine the content validity of the items based on the index of item-objective congruence (IOC; Rovinelli and Hambleton, 1977). Afterward, some items were revised according to the suggestions of the experts. Finally, the preliminary sets of 14 items, of the job demands and the appraisal parts, were used for the next step, scale refinement.

Table 2. Demographic information about the randomized sample.

Demographic Information	Part 1	Part 2	Part 3	Total
Number of participants	150	211	400	761
Average age (years)	32.98	33.17	32.81	32.94
Average experience (years)	9.70	10.01	9.53	9.70
Female	100%	97%	97%	97%
Single	69%	74%	69%	70%
Bachelor's degree	94%	96%	95%	95%
Analysis	EFA	CFA	SEM	
	CITC	AVE & CR Cronbach's Alpha		

Note. EFA = exploratory factor analysis; CITC = corrected item-total correlation; CFA = confirmatory factor analysis; AVE = average variance extracted; CR = construct reliability; SEM = structural equation modeling.

4. Phase 2: quantitative data collection and analysis

This phase aimed to refine, as well as to assure, the validity and reliability of the new scales. This could be achieved by carrying out exploratory factor analysis (EFA), confirmatory factor analysis (CFA), Cronbach's alpha coefficient analysis, and nomological validity analysis based on the JD-R model (Demerouti et al., 2001) and the meta-analytic study of the challenge-hindrance framework of Crawford et al. (2010).

4.1. Participants

The participants of the following quantitative study were registered nurses of Thai nationality working in private hospitals in Bangkok, Thailand. The researchers contacted 54 private hospitals in Bangkok via mail and telephone and finally obtained permission to collect data from the authorities of 16 hospitals. The researchers then requested the point persons at each hospital to distribute and collect the questionnaires. The total number of distributed questionnaires was 1,020 with 882 returned. Finally, 761 questionnaires were deemed valid for further analysis. Table 2 illustrates the demographic information of the three groups of data that the researchers randomized for use at each step of the analyses.

4.2. Instruments

Challenge-hindrance demands were measured with the recently-developed nursing challenge-hindrance demands questionnaires from the previous phase, which consisted of three parts: The job demands part with a response format ranged from 1 (not at all true) to 5 (completely true); the challenge appraisal part with a response format ranging from 1 (minimal) to 5 (high); and the hindrance appraisal part also with a response format ranging from 1 (minimal) to 5 (high).

Burnout was measured using 16 items of the Oldenburg Burnout Inventory (OLBI; Demerouti et al., 2010), comprising two dimensions (i.e., exhaustion and disengagement). The response format ranged from 1 (strongly disagree) to 4 (strongly agree). Cronbach's alpha coefficient of the OLBI in the present study was .86.

Work engagement was measured by means of 17 items of the Utrecht Work Engagement Scale (UWES; Schaufeli, Salanova, González-romá, & Bakker, 2002), consisting of three dimensions (i.e., vigor, dedication, and absorption). The response format ranged from 0 (never) to 6 (always or every day). Cronbach's alpha coefficient of the UWES in our study was .96.

4.3. Part 1: scale refinement

In this part, the aims were to refine the scales by removing inappropriate items and to identify the underlying structure of measured variables which were achieved by considering the values of the corrected item-total correlation (CITC) and the results of the EFA using maximum likelihood analysis and promax rotation (Howard, 2016).

Regarding the Cronbach's alpha coefficient analysis, the CITC values of the 14 variables of challenge demands and hindrance demands were

Table 3. Factor loadings for the 14-variable challenge demands scale (N = 150).

Challenge Demands' Indicators	F1	F2	F3	F4
Job complexity	.22	.41	.58	.17
Job variety	.14	.23	.86	.26
Heavy workloads	.22	.29	**.73**	.46
Hectic work conditions	.31	.38	.49	**.57**
Long work hours	.41	.28	.31	.83
Shiftwork rotation	.46	.22	.13	.60
Problematic patients	.46	.93	.38	.37
Problematic relatives	.42	.95	.32	.31
Understaffing	.49	.49	.27	.45
Uncooperative nurses	**.57**	.28	.19	.26
Unfairness	.62	.31	.17	.34
Conflicts	.74	.29	.06	.44
Uncooperative doctors	.66	.33	.22	.37
Risks of injury	.67	.37	.17	.41
Eigenvalues	4.81	1.89	1.36	1.08
% of the variance	34.36	13.52	9.70	7.68
Cumulative % of the variance	34.36	47.88	57.58	65.26

Table 4. Factor loadings for the 14-variable hindrance demands scale (N = 150).

Challenge Demands' Indicators	F1	F2	F3
Job complexity	.74	.40	.45
Job variety	.85	.38	.40
Heavy workloads	.88	.41	.49
Hectic work conditions	.83	.48	.51
Long work hours	.66	.37	.40
Shiftwork rotation	.50	.33	.34
Problematic patients	.56	.56	.95
Problematic relatives	.53	.56	.97
Understaffing	.57	.59	.57
Uncooperative nurses	.39	.58	.34
Unfairness	.41	.66	.50
Conflicts	.37	.83	.41
Uncooperative doctors	.32	.77	.42
Risks of injury	.36	.59	.39
Eigenvalues	6.35	1.79	1.04
% of the variance	45.36	12.77	7.42
Cumulative % of the variance	45.36	58.13	65.55

between .37-.57 and .50-.72 respectively. Consequently, all of the variables were forwarded for the EFA.

As regards the EFA of the challenge demands indicators, the value of Bartlett's test of sphericity (χ^2 (91) = 857.06, p < .01), which was significant, and that of the KMO of .78 indicated that the data were suited for the factor analysis. The EFA suggested having 14 variables with four dimensions, which accounted for 65% of the total variance. The first factor consisted of six variables representing intra-organizational interaction, accounting for 34% of the variance. The second factor consisted of three variables representing job difficulty, accounting for 14% of the variance. The third factor consisted of two variables representing patient and relative management, accounting for 10% of the variance. The last factor consisted of three variables representing time requirements, accounting for 8% of the variance (see Table 3).

Regarding the EFA of the hindrance demands indicators, the significant values of Bartlett's test of sphericity (χ^2 (91) = 1280.05, p < .01), and the KMO statistic of .85 confirmed the appropriateness of the factor analysis. The EFA results suggested that hindrance demands included 14 variables with three dimensions, which accounted for 66% of the total variance. The first factor, namely job difficulty and time requirements, had six variables with 45% of the variance. The second factor, intra-organizational interaction, contained six variables with 13% of the variance. The last factor, patient and relative management, had two variables with 7% of the variance (see Table 4).

A few variables (e.g., understaffing) seemed to have a cross-loading issue on both scales. However, those overlapping variables were retained and forwarded for the CFA because their removal might cause a content coverage issue, based on the results of the qualitative part.

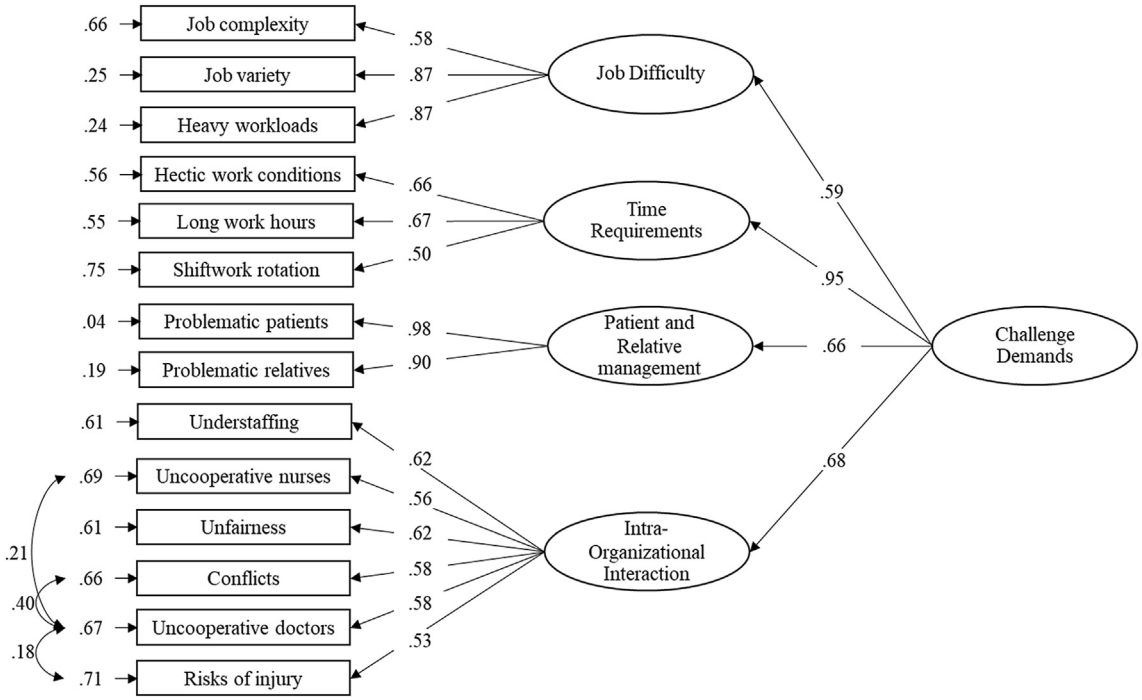

Figure 1. Confirmatory factor analysis of the four-factor challenge demands scale (*N* = 211).

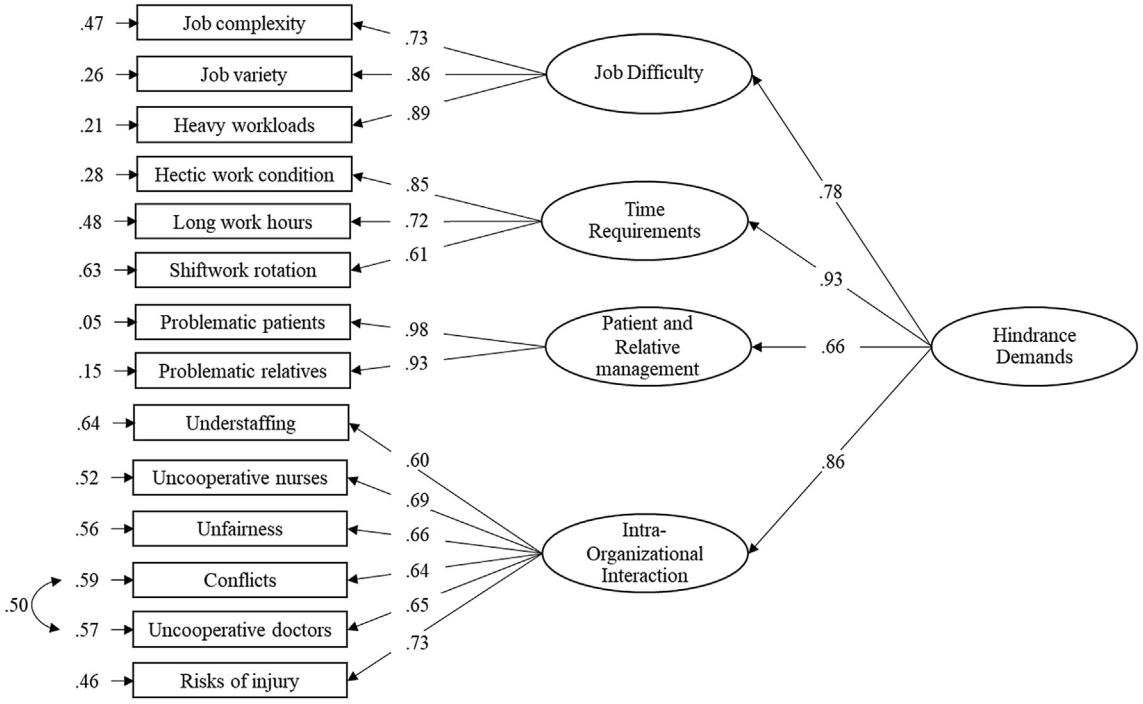

Figure 2. Confirmatory factor analysis of the four-factor hindrance demands scale (N = 211).

4.4. Part 2: construct validity and reliability analysis

Confirmatory factor analyses with new data (N = 211) were conducted to confirm that the structure of the challenge demands scale was indeed a four-factor model with 14 variables and that the structure of the hindrance demands scale was a three-factor model with 14 variables, consistent with the results of the preliminary factor analyses.

The CFA results for the first-order 14-variable four-factor model of the challenge demands scale suggested a good fit ($\chi^2(68) = 159.08$, $p < .01$, CMIN/df = 2.34, CFI = .92, TLI = .90, RMSEA = .08, and SRMR = .07). The second-order 14-variable four-factor model of the challenge demands scale also suggested a good fit (χ^2 (70) = 163.36, p < .01, CMIN/df = 2.33, CFI = .92, TLI = .90, RMSEA = .08, and SRMR = .07). The range of factor loadings was between .50-.98 at a .01 significance level (see Figure 1). The $\chi 2_{diff}$ value (Δdf = 2) was .4.28, which was not significant, indicated that the second-order model, was preferable to the first-order model. The CFA results corroborated the four-factor structure identified in the EFA.

On the other hand, the CFA results for the first-order 14-variable three-factor model of the hindrance demands scale revealed unacceptable fit indices ($\chi^2(73) = 232.51$, $p < .01$, CMIN/df = 3.19, CFI = .90, TLI = .88, RMSEA = .10, and SRMR = .07). The problem might be rooted in the first six-variable dimension which contained the meaning of both job difficulty and time requirements. In this regard, Yang (2005) suggested that apart from the outcomes of EFA, researchers can consider domain definitions in order to determine the number of dimensions included in the final scale. Consequently, the researchers tested a four-factor CFA model following the EFA and CFA results for challenge demands, which were more practically meaningful. The CFA results for the first-order 14-variable four-factor model of the

Table 5. Correlations among factors of challenge demands and hindrance demands (N = 211).

Factors	1	2	3	4	5	6	7	8
1. CDJ	-	.14	.13	.06	.48	.08	.06	.10
2. CDT	.37**	-	.21	.22	.11	.35	.08	.09
3. CDP	.36**	.46**	-	.14	.14	.08	.32	.08
4. CDI	.24**	.47**	.38**	-	.12	.12	.08	.34
5. HDJ	.69**	.33**	.38**	.34**	-	.29	.22	.31
6. HDT	.28**	.59**	.29**	.35**	.54**	-	.27	.40
7. HDP	.25**	.29**	.57**	.29**	.47**	.52**	-	.26
8. HDI	.31**	.30**	.28**	.58**	.56**	.63**	.51**	-
M	8.61	7.12	5.49	9.99	7.16	6.78	5.28	11.54
SD	2.47	2.70	2.17	4.10	2.52	2.76	2.29	4.89
AVE	.62	.38	.88	.35	.69	.54	.91	.44
CR	.82	.64	.94	.76	.87	.77	.95	.82

Note. CDJ = challenge demands (job difficulty); CDT = challenge demands (time requirements); CDP = challenge demands (patient and relative management); CDI = challenge demands (intra-organizational interaction); HDJ = hindrance demands (job difficulty); HDT = hindrance demands (time requirements); HDP = hindrance demands (patient and relative management); HDI = hindrance demands (intra-organizational interaction); AVE = average variance extracted; CR = construct reliability. Values below the diagonal are correlation among factors of challenge demands and hindrance demands, and values above the diagonal are squared correlations.
**p < .01.

Table 6. Cronbach's alpha coefficient analysis of the challenge-hindrance demands scales (N = 211).

Scales/Factors	No. of variables		Cronbach's alpha	
	CDS	HDS	CDS	HDS
Scales	14	14	.84	.91
Job difficulty	3	3	.81	.87
Time requirements	3	3	.65	.78
Patient and relative management	2	2	.94	.95
Intra-organizational interaction	6	6	.77	.83

Note. CDS = the challenge demands scale; HDS = the hindrance demands scale.

hindrance demands demonstrated acceptable fit indices ($\chi^2(70) = 139.84$, $p < .01$, CMIN/df = 2.00, CFI = .96, TLI = .95, RMSEA = .07, and SRMR = .05). The $\chi 2_{diff}$ value ($\Delta df = 3$) was 92.67, which was significant, indicating that the four-factor model was preferable to the three-factor model.

In addition, the CFA results for the second-order four-factor 14-variable model of the hindrance demands demonstrated acceptable fit indices ($\chi^2(72) = 139.94$, $p < .01$, CMIN/df = 1.94, CFI = .96, TLI = .95, RMSEA = .07, and SRMR = .05). The range of factor loadings was between .60 and .98 at a .01 significance level (see Figure 2). The $\chi 2_{diff}$ value ($\Delta df = 2$) was .01, which was not significant, indicating that in comparison with the first-order model, the second-order model was preferable.

The estimates for the average variance extracted (AVE) and construct reliability (CR) of the challenge demands scale were .49 and .93, and those of the hindrance demands scale were .58 and .95. All values (with the exception of one) were greater than the recommended criteria of .50 and .70 respectively (Hair et al., 2010). Consequently, these results indicated that the convergent validity of both the challenge demands scale and the hindrance demands scale was adequate.

Table 5 lists the AVE and CR estimates, as well as the correlation estimates and squared correlations among factors of challenge demands and hindrance demands. The findings demonstrated that the values of AVE for any two factors were greater than the squared correlation value between these two factors, which indicated that the discriminant validity of the challenge demands and the hindrance demands was acceptable (Hair et al., 2010).

A final Cronbach's alpha analysis was conducted in order to measure internal consistency reliability, which indicates the appropriateness of the domain sampling of the new scale (Hinkin, 2005). The results of Cronbach's alpha coefficient analysis showed that the challenge demands scale and the hindrance demands scale had good internal consistency ($\propto$ = .84 and .91 respectively; see Table 6).

4.5. Part 3: nomological validity analysis

Nomological validity was assured by the extent to which the newly-developed scales accurately predicted other constructs based on a theoretical model (Hair et al., 2010). According to the meta-analytic study of Crawford et al. (2010), based on the JD-R model, persons are more willing to invest their resources in dealing with challenge demands because the investment will potentially yield personal growth, which in turn arouses positive emotions. In addition, persons are less keen on the management of hindrance demands since they are perceived as unnecessary obstacles to achieving their goals, which in turn activates negative emotions. Furthermore, both types of demands can lead to burnout because they contribute to a stressful work environment that demands the exertion of sustained physical and psychological effort. Consequently, in this study, the JD-R model and the challenge-hindrance demands framework were used in this study as the theoretical basis for the nomological validity analysis, which was tested using structural equation modeling (SEM).

The SEM results revealed an unacceptable overall fit (χ^2 (59) = 704.95, $p < .01$, CMIN/df = 11.95, CFI = .81, TLI = .75, RMSEA = .17, and SRMR = .08). The researchers decided to covary the error terms between the factors of challenge demands and hindrance demands whose factors were similar, such as the error terms of job difficulty of both challenges and hindrances. The error terms were likely to covary because each shared the same part, job demands, between them. Because of this, the results supported the adjusted model ($\chi^2(55) = 174.39$, $p < .01$, CMIN/df = 3.17, CFI = .97, TLI = .95, RMSEA = .07, and SRMR = .05). Most paths in the model were significant and in the theorized directions. Challenge demands had a positive effect on work engagement ($\beta = .22$, $p < .01$). In addition, hindrance demands had a negative effect on work engagement ($\beta = -.40$, $p < .01$) and had a positive effect on burnout ($\beta = .55$, $p < .01$; see Figure 3). However, a significant relation between challenge demands and burnout was not found.

5. Discussion

The purpose of this study was to lay the empirical groundwork for the development and validation of challenge-hindrance demands scales for the nursing profession. In order to achieve this aim, the researchers carried out a two-phase study: The qualitative phase, including individual interviews and scale development, and the quantitative phase, involving EFA, CFA, Cronbach's alpha coefficient analysis, and nomological validity analysis.

The analyses of the first and second phases of the present study resulted in the 14-variable nursing challenge demand scale with four factors (χ^2 (70) = 163.36, $p < .01$, CMIN/df = 2.33, CFI = .92, TLI = .90, RMSEA = .08, and SRMR = .07), with sufficient evidence for the reliability ($\propto$ = .84), and the 14-variable nursing hindrance demands scale with four factors ($\chi^2(72) = 139.94$, $p < .01$, CMIN/df = 1.94, CFI = .96, TLI = .95, RMSEA = .07, and SRMR = .05), with the Cronbach's alpha reliability of .91. The results also provided sufficient evidence for the nomological validity for the scales ($\chi^2(55) = 174.39$, $p < .01$, CMIN/df = 3.17, CFI = .97, TLI = .95, RMSEA = .07, and SRMR = .05). Although no significant effect of challenge demands on burnout was found, the result was not surprising. In fact, the studies of Van den Broeck et al. (2010) and Ventura et al. (2015) yielded the same results; the underlying reason is probably that challenge demands lead to energy expenditure instead of energy depletion (Van den Broeck et al., 2010). In other words, although nurses need to expend energy dealing with challenge demands, the loss may not be high enough to produce burnout.

The challenge-hindrance demands scales for nurses (Supplementary file - The CHDS) consists of four factors: Job difficulty (i.e., handling complex, diverse, and heavy workload; Cavanaugh et al., 2000; Lim et al., 2011; Montgomery et al., 2015), time requirements (i.e., preparing themselves for hectic work conditions, long work hours, and shift rotation; Wu et al., 2012), patient and relative management (i.e., dealing with over-demanding, temperamental, or non-cooperative patients and their families; Admia and Eilon-Mosheb, 2016; Zito et al., 2016), and Intra-organizational interaction (i.e., dealing with understaffed teams; dealing with problematic staff members in hospitals, such as fellow

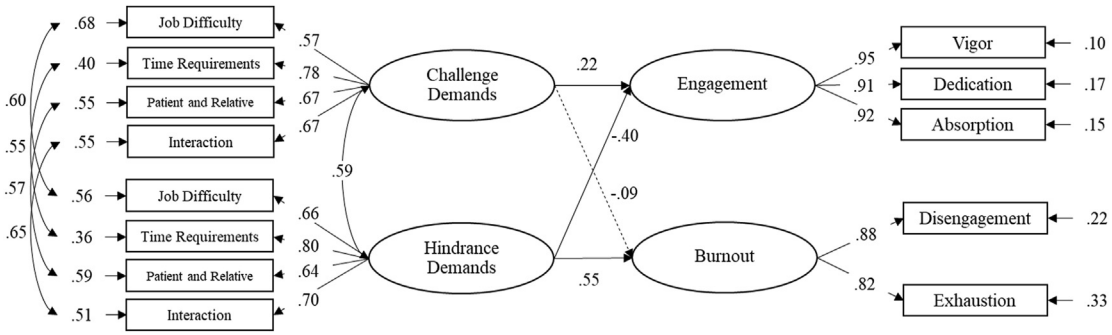

Figure 3. Nomological validity analysis for the challenge-hindrance demands scales ($N = 400$).

nurses, physicians, and members of other departments; as well as working in unsafe conditions; Jourdain and Chênevert, 2010; Van der Colff and Rothmann, 2014).

The findings emphasized two important issues. Firstly, the job demands of nurses are unique. Some work conditions, such as workshift rotation, problematic patients and relatives, uncooperative doctors, and risk of injury are found almost exclusively in the nursing profession. In addition, some common work factors included in the existing challenge-hindrance demands scales were not considered to be on the job demands scale for nurses. For instance, the lack of job security is not a stressor for nurses due to a chronic worldwide shortage of nurses (Marć et al., 2018). This fact provided support for Demerouti et al. (2001), in which it is argued that each occupation has particular work aspects that can explain its well-being, further highlighting the importance of developing nursing challenge-hindrance demands scales.

Secondly, when it comes to the assessment of challenge-hindrance demands, it is important to consider both the extent to which each individual experiences each job stressor and to what extent an individual interprets each job demand as a challenge or hindrance, as suggested by Schaufeli and Taris (2014). The previous challenge-hindrance demands scales usually classified each work aspect under either challenge demands (e.g., job complexity) or hindrance demands (e.g., red tape), which is in contrast with the nature of typical work characteristics, which is not clearly positive or negative (Hobfoll, 1989) and can be translated into both challenges and hindrances concurrently (see Bakker and Sanz-Vergel, 2013; Webster et al., 2011). Consequently, the format of the newly-developed scales has important implications for solving this problem and is more in line with the true nature of the construct.

6. Implications for practice

This study has some implications for nursing and human resource practice. The separation of the instruments into three parts made it clearly evident that job demands are not an issue because there are stressful work environments inherent in any type of profession or workplace.

Going forward an interesting question is how hospitals will be able to derive benefits from unavoidable job demands. The answer lies in the second and third parts of the newly-developed instruments. Whether a job demand becomes either a challenge or a hindrance depends on individual interpretations. In addition, it was found that challenge demands lead to engagement, and hindrance demands cause burnout. Consequently, in order to deal with nurses' engagement and burnout, hospitals should alter the perception of job demands. For instance, one way to raise the positive perception while reducing the negative one is to provide nurse training programs which involve positive thinking with the aim of encouraging them to reframe their perception of the work environment as more of a challenge and less of a threat.

In addition, trainers can use the scales to identify specific work environment perceived as a low challenge and a high hindrance, which would indicate the existence of opportunities for further enhancements. In this regard, the trainers can request trainees to complete the appraisal parts of the scales before the training in order to determine the tendency of each situation towards either a challenge or a hindrance. This information can help trainers of this group tailor a training program to suit the requirements of the trainees by providing them opportunities for role-playing the situations that they perceive to have a high hindrance level. This would help promote the retention of what trainees learn, as well as the transfer of training to the actual job situations (DeSimone and Werner, 2012).

Academic researchers, especially in the nursing or human resource fields, could use the scales as part of the JD-R model in order to study the turnover intent or the intent of nurses to leave their careers. The results might partially suggest some solutions to the shortage of nurses in many countries.

7. Limitations and recommendations

Although academic literature was drawn upon at the international level, this study developed and validated the challenge-hindrance demands scales based exclusively on the experiences of nurses in Bangkok, Thailand. Therefore, the scales can be appropriately used with Thai nurses. However, prior to the direct application of the scales to nurses in different countries, reliability and validity analyses of the scales are necessary, as well as further consideration on the type of response scales to be used.

Also, further studies are encouraged to psychometrically test the scales with diverse nurse samples and with different types of analyses (e.g., criterion-related validity analysis), which were not included in this study. In addition, as these scales were developed to be used with nurses in general, researchers who need to measure the challenge-hindrance demands of nurses in specific positions might have to develop a special scale for that purpose.

Finally, future studies should pay attention to the symmetry in the item content of the appraisal parts. For instance, both challenge and hindrance appraisal items should be further improved in order to more accurately reflect the impact of work-related situations on learning, growth, or success of an individual.

8. Conclusion

This study portrays in detail the development and validation of new challenge-hindrance demands scales for the nursing profession consisting of three parts: The amount of experience with demands, the challenge appraisal of demands, and the hindrance appraisal of demands. This format of assessment is congruent with the true nature of job demands that can be assessed concurrently as challenges and hindrances.

The scales have proved to be a valid and reliable tool that allows researchers in the nursing profession to study a topic relevant to challenge-hindrance demands as a single construct or as part of the JD-R model. In addition, the format of the scales allowed the researchers to

gather useful information suggesting that hospitals can deal with the burnout and engagement of nurses by influencing the perceptions of nurses towards stressors.

Declarations

Author contribution statement

Korkiat Mahaveerachartkul and Nanta Sooraksa: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

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Data availability statement

Data will be made available on request.

Declaration of interests statement

The authors declare no conflict of interest.

Additional information

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