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Psychometric properties and confirmatory factor analysis of nurse interest inventory towards nursing department selection as a model for nurse selection into nursing departments: An application of Holland's vocational interest measurement

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Abstract

The aim of this research and development was to develop an instrument for measuring nurses' interest in nursing department selection by applying Holland's vocational interest measurement. The research was carried out in 2 phases: Phase 1 Instrument Development and Phase 2 Quality Assessment. The participants consisted of 1,556 fourth-year nursing students in Year 2017 under the Office of the Higher Education Commission, Ministry of Education and Praboromarajchanok Institute for Health Workforce Development, Ministry of Public Health. The analysis of IOC, reliability and discriminant index and confirmatory factor analysis (CFA) were performed using SPSS and LISREL. The results are as follows: the IOC was between .71–1; the reliability values of nursing activity interests: realistic (R), investigative (I), artistic (A), social (S), enterprising (E) and conventional (C) were 0.79, 0.72, 0.90, 0.89, 0.83 and 0.89, respectively; the reliability values of nursing activity competencies: R, I, A, S, E and C were 0.84, 0.80, 0.86, 0.78, 0.86 and 0.91, respectively; the discriminant index was between .20–.79. The results of the confirmatory factor analysis show that the nursing activity interest and competency measurement models were consistent with the empirical data ($\chi^2 = 45.61$, $p < .05$, df = 27, $\chi^2/df = 1.69$, GFI = .99, AGFI = .98, RMR = .01, RMSEA = .02), which indicates that the model of the inventory was consistent with the empirical data.

Introduction

Nowadays, Thailand's healthcare system is important since the country has become an aging society. The development and use of technology arising from communicable diseases, international trade and the commencement of the ASEAN Community result in high health expenditures. Economic changes, urban growth, policy changes and reforms impact on the directions for health promotion and power decentralization (Noree, Thanomwat, Phanthunane, & Kongkulwat, 2017). Therefore, the National Health Commission developed the 10-Year National Human Resources for Health Development Plan (2018–2028) with the aim of reforming the workforce production, distribution and management systems integrating all different sectors (Sakolsatayadorn, 2019).

According to the above healthcare workforce development plan, the nursing profession is important and comprises the largest part of the healthcare workforce, driving the healthcare system. Accordingly, nursing workforce development is necessary, especially in terms of adequate nurse staffing and appropriate nursing workforce distribution to ensure that the number of nurses meets the demand for healthcare and to promote work motivation among nurses. According to a study

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by Patthapong and Volrathongchai (2018) on the relationship between work environments and nurses' job satisfaction and work-life balance in Thailand's university hospitals, to encourage nurses to remain in the nursing profession, nurses' job satisfaction and work-life balance must be enhanced by promoting workplace safety, providing sufficient and appropriate resources and planning workforce management strategies. The nursing shortage these days is critical, and is a result of lack of work motivation due to a tremendous amount of work and lack of job stability due to low pay, few benefits and lack of career advancement opportunities. The nurse turnover rates at Srinagarind Hospital, Khon Kaen University between 2001 and 2010 and Thammasat University Hospital between 2011 and 2013 indicate that the number of registered nurses leaving the profession was continuously increasing every year (Jaiboon, Chiangnangarm, & Kuhirunyarath, 2011; Longlalerng & Phombut, 2014).

To solve the nursing shortage, the important thing that needs to be considered is employee retention; therefore, an appropriate selection process and job analysis aimed at determining job qualifications before beginning the recruitment and selection process are required (Wongsarnsri, 2008). The key to human resource management is to select a person whose qualifications match the job requirements as the saying goes 'Put the right man in the right job' (Office of the Civil Service Commission, 2019), which is consistent with Meechat (2013) who stated that people are an important factor in organizational operations and a mechanism that will drive an entire organization towards its goals. Therefore, the researcher was interested in studying and developing an instrument for measuring nurses' interest in nursing department selection by applying Holland's vocational interest measurement and using the developed instrument for selecting nurses into matching nursing departments to reduce future resignations, which can also be used as nursing students' guide to selecting the appropriate nursing departments to prepare nursing students for future practice.

Literature Review

To select employees into an organization, an appropriate employee selection process is necessary for acquiring employees whose knowledge, abilities and qualifications fit the job requirements (Wongsarnsri, 2008). According to Aiken and Patrician (2000), supportive work environments are associated with nurses' job satisfaction and retention. Schmitt (2012) suggested that a successful employee selection process must involve knowledge, skills, abilities and other characteristics (KSAOs) required of an individual for a particular position. In addition, Grobler (2016) stated in Person-Organisational Fit: A Revised Structural Configuration that employees' perceptions of demands-abilities fit and needs-supplies fit contribute to the congruence between the employees and the organizations. Therefore, the selection process plays a vital role in human resource management in terms of effective output production. This applies to nursing organizations as well; however, due to various types of nursing jobs and the nursing shortage, nurse selection into nursing departments needs to take person-job fit into consideration to ensure nurses' job satisfaction leading to high levels of work effectiveness.

Recruitment and Selection Process

To make a selection decision, the correctness of the decision must be considered by selecting candidates with qualifications that fit the jobs. Errors of prediction must also be taken into consideration. The decisions can be divided into 4 types as shown in Figure 1. The right decisions are matching the right person to the right department and not matching the wrong person to the wrong department. The wrong decisions are not matching the right person to the right department and matching the wrong person to the wrong department. (see figure 1)

Holland's Theory

The Self-Directed Search was developed by John L. Holland, consisting of questions about an individual's interests and abilities. An individual whose personality type matches their career will have greater career satisfaction (Holland, 1985).

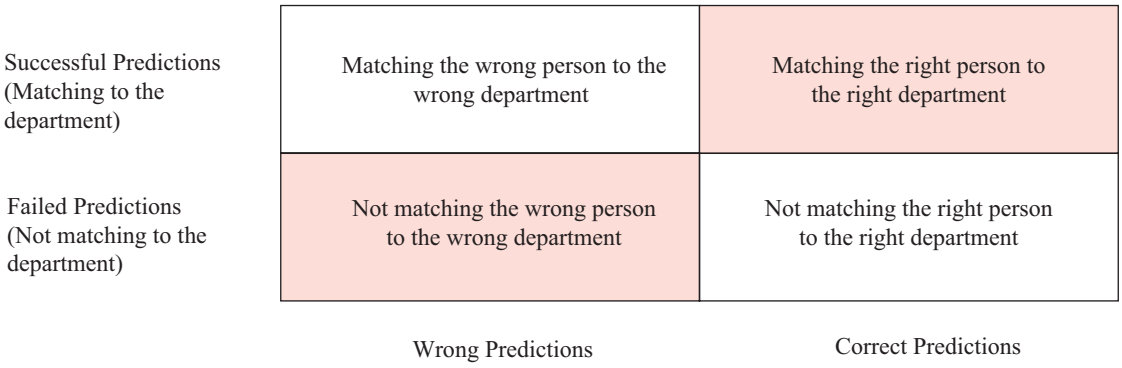

Figure 1 Errors of Nurse Selection into Nursing Departments
Source: Jiarakorn (2014)

Kristof-Brown, Zimmerman, and Johnson (2005) studied the relationships between person-job, person-organization, person-group and person-supervisor fit and found that the relationship between person-job and person-organization fit was consistent. Accordingly, an appropriate selection process is required for selecting a person who fits a certain job. Tests are common selection tools used in selection decision-making and come in many different types; accordingly, the appropriateness of tests should be considered to ensure the right decisions.

According to Holland (1985), an individual's personality type affects their career choice. Career decisions are influenced by personality, vocational interests, leisure activities and hobbies; therefore, an individual's personality is assessed to explore their vocational interests. Holland divided people into 6 personality types: realistic (R), investigative (I), artistic (A), social (S), enterprising (E) and conventional (C). His personality assessment focuses on activity interests, one's activity competencies, vocational interests and interest self-assessment. The researcher classified nursing departments into 4 main groups according to the job characteristics and the Competencies for Registered Nurses as follows: surgery, medicine, childbirth and children.

The knowledge of career guidance has been applied to student guidance on major selection. Therefore, the researcher was interested in applying the concept of career self-assessment to develop an instrument for measuring nurses' interest in nursing department selection which can be used as a model for nurse selection into nursing departments.

Research Hypothesis

The results of a confirmatory factor analysis of the Nurse Interest Inventory towards Nursing Department Selection as a model for nurse selection into nursing departments based on Holland's vocational interest measurement are consistent with the empirical data.

Methodology

This research and development aimed to develop an instrument for measuring nurses' interest in nursing department selection as a model for nurse selection into nursing departments by applying Holland's vocational interest measurement. The research was carried out in 2 phases: Phase 1 Instrument Development and Phase 2 Quality Assessment.

Participants and Data Collection

The research population consisted of fourth-year nursing students in Year 2017 from nursing schools approved by the Thailand Nursing and Midwifery Council.

Samples

The researcher performed the sample selection using multistage sampling by dividing the population into clusters according to geographical regions. Sixteen nursing schools were obtained through simple random sampling. Data were collected from the total sample size of 1,556. The sample size was determined as suggested by Hair, Black, Babin, and Anderson (2010), which should be equal to 5–20 times the number of variables. The Nurse Interest Inventory towards Nursing Department Selection comprised 132 questions.

Data Collection

To begin the data collection process, the researcher selected samples using multistage sampling by dividing the population into clusters according to geographical regions. The researcher also used simple random sampling to obtain 16 nursing schools. The total number of participants was 1,556. The data collection was conducted among fourth-year nursing students near the end of the program between 2 January 2018 and 31 May 2018. The data were collected using the Nurse Interest Inventory towards Nursing Department Selection by the researcher and research assistants. The researcher explained the participation requirements to the research assistants and recorded and analyzed the data gathered from the participants using SPSS and LISREL.

Instrument

The researcher developed the Nurse Interest Inventory towards Nursing Department Selection by applying Holland's SDS and the Competencies for Registered Nurses by the Thailand Nursing and Midwifery Council. The inventory consisted of 3 parts: general information, nursing activity interests and nursing activity competencies. A 5-point Likert scale was used in the interest and competency domains (strongly agree = 5, agree = 4, neither agree nor disagree = 3, disagree = 2 and strongly disagree = 1, comprising 66 items each, totaling 132 items).

Design

This research and development comprised of 2 phases as follows:

Phase 1 The researcher studied the present information on the procedures for assigning new hires to departments and explored the theories, guidelines and research studies on the nurse selection into nursing departments. The competence of nursing and work activities are typically determined as a part of hire and selection process. The Nurse Interest Inventory towards Nursing Department Selection was developed based on Holland's SDS and the Competencies for Registered Nurses and nursing activities in the following departments: surgery, medicine, childbirth and children. The researcher synthesized the data gathered from the literature review and the interviews with nurse supervisors in 8 public hospitals and developed the inventory questions divided into 3 parts: (1) general information, i.e. full name, school, gender, age, nursing department interest, nursing activities that the respondent is proficient in, levels of knowledge classified into theory and practice, (2) nursing activity interests comprising 6 components, 11 items each, totaling 66 items and (3) nursing activity competencies comprising 6 components, 11 items each, totaling 66 items. These items were possibly rated by 11–55 scores.

Phase 2 Quality Assessment

1. The content validity of the instrument was examined by 8 experts in nursing, research and educational measurement and evaluation by analyzing the index of item-objective congruence (IOC).

Four items with an IOC of less than .5 were found (Kanjanawasee, 2013); therefore, the researcher adjusted the items according to the experts' suggestions and had the items reexamined by the experts.

2. The researcher examined the reliability of the instrument using Cronbach's alpha coefficient and the item discrimination among 30 fourth-year nursing students in Year 2017 at the Faculty of Nursing, Suan Dusit University.

3. A CFA was conducted among 1,556 fourth-year nursing students in Year 2017 from 16 public nursing universities and colleges. The data were analyzed using SPSS and LISREL.

Data Analysis

A CFA of the instrument was performed using IBM SPSS Statistics 22.0 while the construct validity was analyzed using LISREL 8.7. The psychometric properties were measured as follows, (1) the IOC index was used to determine the content validity (2) Cronbach's alpha coefficient and the item discrimination were used to test validation.

Results and Discussion

1. The content validity was determined by the experts. The IOC was between .71–1.

2. The reliability of the instrument was assessed using Cronbach's alpha coefficient. The researcher performed the reliability assessment in 2 parts: nursing activity interests and nursing activity competencies. The reliability values of nursing activity interests and nursing activity competencies: R, I, A, S, E and C were 0.79, 0.72, 0.90, 0.89, 0.83 and 0.89, respectively and 0.84, 0.80, 0.86, 0.78, 0.86 and 0.91, respectively.

3. The item discrimination power of the instrument was examined. The discrimination powers of nursing activity interests and nursing activity competencies were .25–.69. and .20 –.79, respectively.

4. A CFA was conducted. Pearson's coefficient correlation was used to investigate the relationship between observable variables. A positive correlation at a significance level of .01 "$p < .01$" was found among all of the components of nursing activity interests and nursing activity competencies; the coefficient correlation ranged between .27 and .73. In addition, Bartlett's test of sphericity equaled 11378.16 "$p < .00$", which indicates that the correlation matrix between the observable variables significantly differed from the identity matrix. The KMO index equaled .91, which indicates that the observable variables had a strong relationship. The results are shown in Table 1.

Considering $\chi^2 = 7.55$, $\chi^2 = 2.29$, df = 4 and Goodness of fit presented in Table 2, it can be summarized that the measurement models of nursing activity interests and nursing activity competencies had construct validity and were consistent with the empirical data. (see Figure 2)

The results show that the model of the Nurse Interest Inventory towards Nursing Department Selection was consistent with the empirical data. Considering $\chi^2 = 45.61$, df = 27, $\chi^2/df = 45.61/27 = 1.69$ and Goodness of fit presented in Table 3, it can be summarized that the measurement models of nursing activity interests and nursing activity competencies had construct validity and were consistent with the empirical data (Figure 3).

Table 1 Pearson's coefficient correlation of nursing activity interests and nursing activity competencies

$n = 1454$

Variables	AIR	AII	AIA	AIS	AIE	AIC	ACR	ACI	ACA	ACS	ACE	ACC
AIR	1.00											
AII	.71**	1.00										
AIA	.38**	.51**	1.00									
AIS	.52**	.62**	.64**	1.00								
AIE	.59**	.66**	.44**	.71**	1.00							
AIC	.57**	.62**	.39**	.56**	.70**	1.00						
ACR	.35**	.41**	.27**	.34**	.41**	.45**	1.00					
ACI	.39**	.48**	.33**	.43**	.49**	.48**	.68**	1.00				
ACA	.29**	.38**	.51**	.48**	.47**	.38**	.51**	.63**	1.00			
ACS	.35**	.43**	.43**	.54**	.54**	.42**	.48**	.60**	.68**	1.00		
ACE	.34**	.41**	.30**	.43**	.52**	.44**	.55**	.67**	.62**	.73**	1.00	
ACC	.33**	.40**	.27**	.37**	.44**	.51**	.51**	.57**	.50**	.55**	.67**	1.00
Bartlett's Test of Sphericity = 11378.16 df = 66 $p < .00$												
Kaiser – Mayer – Olkin measure of sampling adequacy (KMO) = .905												

Note: $^{**}p < .01$. * $p < .05$.

Table 2 Construct validity assessment of the measurement models of nursing activity interests and nursing activity competencies

Statistics	Construct Validity	
	Nursing Activity Interests	Nursing Activity Competencies
χ^2	7.55	2.29
Df	4	4
GFI	1.00	1.00
AGFI	0.99	1.00
RMR	0.002	0.001
RMSEA	0.025	0.0
P	0.11	0.68

Table 3 Construct validity assessment of the measurement models of nursing activity interests and nursing activity competencies

Statistics	Construct Validity of Nursing Activity Interests and Nursing Activity Competencies
χ^2	45.61
Df	27
GFI	.99
AGFI	.98
RMR	.004
RMSEA	.022
P	.014

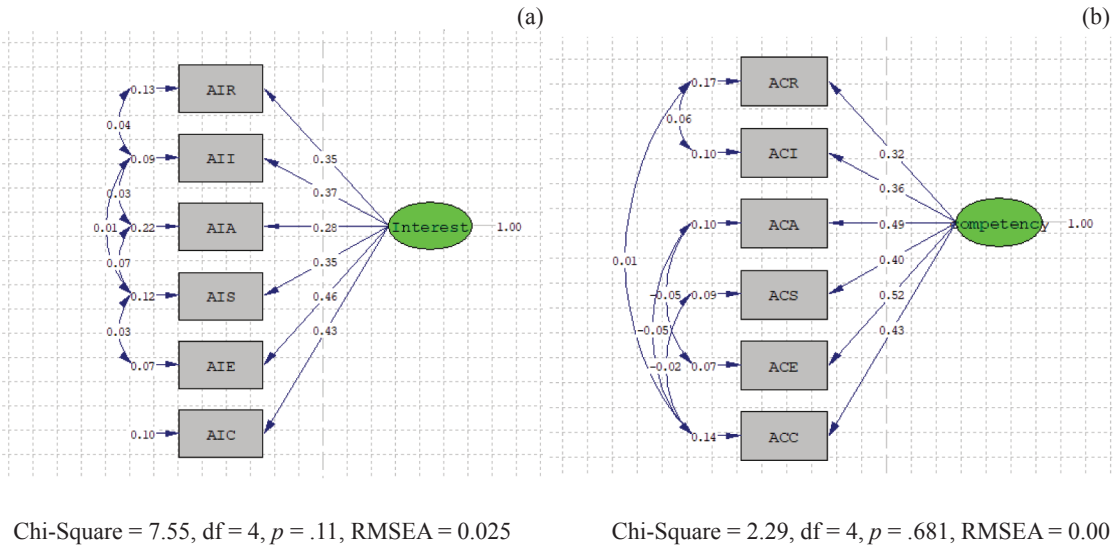

Figure 2 CFA of Part a Nursing Activity Interests and CFA of Part b Nursing Activity Competencies

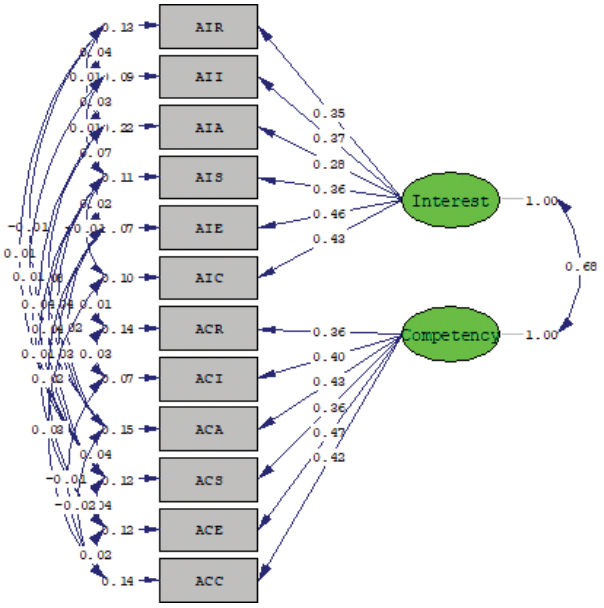

Figure 3 CFA of the Nurse Interest Inventory towards Nursing Department Selection

Discussion

This research studied and developed an instrument for measuring nurses' interest in nursing department selection which can be used for selecting nurses into nursing departments that match their interests and competencies to reduce future resignations and can be used as nursing students' guide to prepare nursing students for future practice by applying Holland's vocational interest measurement (Holland, 1985) and nursing competency (Liu, Yin, Ma, Lo, & Zeng, 2009). The Thai Nursing Council has regulated the competencies of nursing. These competencies need skills, knowledge, ability and attitude toward nursing profession (Thai Nursing Council, 2005). The Nurse Interest Inventory towards Nursing Department Selection developed in this research comprised 2 parts: nursing activity interests consisting of 6 components and nursing activity competencies consisting of 6 components. The quality examination of the Nurse Interest Inventory towards Nursing Department Selection found that the instrument's IOC, reliability and discrimination power (.71–1, .73–.93 and .20–.79, respectively) met the acceptable standards for IOC, reliability and discrimination power as follows: > .5, > .7 and > .2, respectively (Hair et al., 2010; Kanjanawasee, 2013). The results are consistent with a study on the development of a vocational interest, ability and personality inventory for lower secondary school students' education and career planning that found an IOC of .71–1.0, reliability of .30–.84 and item discrimination power of .17–.66 (Kanjanawasee, 2013; Rumsaeng, 2018), a study on Holland's vocational personality types in Korean nursing students that found a reliability of .76–.86 and a study on vocational interests of registered nurses in critical care units, i.e. newborn infants, children, medicine and surgery that found a reliability of .74–.92 and a validity of .35–.60 (Hannink, 1996; Kim & Lee, 2018).

The CFA of the Nurse Interest Inventory towards Nursing Department Selection found that the components of the inventory were consistent with the empirical data. The measurement consisted of 2 parts, 6 components each, totaling 132 items. The results are $\chi^2 = 45.61$, df = 27 and $\chi^2/df = 45.61/27 = 1.69$. The six components of nursing activity interests are as follows: R nursing activity interest, I nursing activity interest, A nursing activity interest, S nursing activity interest, E nursing activity interest and C nursing activity interest. The six components of nursing activity competencies are as follows: R, I, A, S, E and C nursing activity competency. The model of the Nurse Interest Inventory towards Nursing Department Selection was consistent with the empirical data. The measurement reflects six components of personal traits and both nursing activity interests and nursing

activity competencies constructs. The result was consistent with studies on CFA of Holland's RIASEC Model and SDS Instrument by Boyle and Fabris (1992) and Nagy, Trautwein, and Ludtke (2010) which found that the six components of the model were consistent with the empirical data. In addition, a study by Rumsaeng (2018) on the development of a vocational interest, ability and personality inventory for lower secondary school students' education and career planning added interest in technology, technological competency, foreign language learning and passion for learning to the model. However, no research on nursing department interest inventories based on Holland's RIASEC Model and SDS Instrument has been found in Thailand's nursing departments. This measurement will guide nurse administrators in their decision-making in recruiting new nurses into nursing departments.

Conclusions and Recommendation

The results of the CFA of the Nurse Interest Inventory towards Nursing Department Selection as a model for nurse selection into nursing departments based on Holland's vocational interest measurement show that the inventory was consistent with the empirical data.

1. The developed instrument has good quality and is therefore recommended for use in the nurse selection process into nursing departments to acquire a healthcare workforce that matches the job characteristics.
2. The nursing departments studied in this research are surgery, medicine, childbirth and children. Future researchers who want to use the developed instrument to classify individuals into special departments should adjust the items according to suitability and study the quality of the instrument before using the instrument.

Conflict of Interest

There is no conflict of interest.

Acknowledgments

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