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Confirming the Factor Structure of an Intuition Instrument for Nursing Students

Anita Joel Smith
Associate Professor
University of South Alabama
21 Lancers Lane
Spanish Fort, AL 36527
email: anitasmith@usouthal.edu
website: Fajita@Juno.com

Dale Glaser, PhD
Principal--Glaser Consulting
Lecturer--SDSU/USD/AIU
3115 4th Avenue
San Diego, CA 92103
phone: 619-220-0602
fax: 619-220-0412
email: glaserconsult@sbcglobal.net
website: www.glaserconsult.com

ABSTRACT

Purpose The purpose of this study was confirming the factor structure of the Smith Intuition Instrument for Nursing Students. Evidence from prior exploratory findings established need for clarification of the factor structure.

Design A descriptive, comparison design was used.

Methods A sample of 421 nursing students completed the 26-item intuition instrument received through the U.S. mail or in the classroom. Data collection took place between December 2004 and February 2005. Confirmatory factor analysis using the alternative models approach was conducted with Lisrel 8.54.

Findings A seven-factor model obtained the best fit. The factors were labeled as Good Feelings, Spiritual Connections, Reading Cues, Bad Feelings, Physical Awareness, Physical Feelings that Alert, and Sensing Energy.

Conclusion Statistical findings highlighted complexity of factor structure and the difficulty in identifying all possible factors being measured by instrument. The seven factor model was adequate and supports construct validity but further testing is necessary. Confirmatory findings provided insight into timing of physical sensations and emotions. Clarifying the emotions and sensation associated with intuition serves as an impetus to promote the recognition of intuitive abilities among nursing students.

Key words: Intuition Instrument, Psychometric Evaluation, Nursing Students, and Confirmatory Factor Analysis

Confirming the Factor Structure of an Intuition Instrument for Nursing Students

Intuition is acknowledged as a source of knowledge for practicing nurses. It is categorized as personal knowledge,[1] aesthetic knowledge,[2] and tacit knowledge.[3] In addition to being defined as a source of knowing, intuition is identified as an affective component of critical thinking[4-5] and serves an important role in making clinical judgments.[6-7] Critical thinking and clinical judgment are essential outcomes of the educational setting, thus demonstrating the need to foster and promote the recognition of intuitive abilities among nursing students.

For the past twenty years, there has been a repeated request in the nursing literature to include intuition in nursing curricula.[8-11] Mind quieting exercises,[8] journal writing, group brainstorming, and sharing intuitive exemplars[10] are examples of methods that foster intuitive abilities. Curriculum and pedagogical strategies are suggested for promoting intuition in the nursing program. Ruth-Sahd[12] identifies 12 pedagogical strategies to include in a multicultural curriculum. Strategies that are easily introduced include (a) sharing intuitive experiences with students, (b) creating a climate of curiosity and questioning that focuses on the experiences of the student, (c) promoting creativity, a futuristic perspective, and tolerance for uncertainty among the students, (d) developing objectives that focus on process and pattern recognition, (e) including intuitive experiences within the nursing process, and (f) encouraging students to assess patients using their sense and intuitive hunches.[12] McCormack[13] also proposes a curriculum framework which encompasses methods of being receptive to intuition.

There are a myriad of feelings and sensations associated with intuition use, which is evident fromthe findings of qualitative nursing studies.[7, 14-17] Through an experimental approach, McCraty, Atkinson, and Bradley[18] explored the electrophysiological evidence of intuition and their findings indicate both the heart

and brain are involved in receiving, processing, and decoding intuitive information. McKinnon[19] presents neuro-scientific findings illustrating the relationship between thoughts and feelings and emphasizes the importance of paying attention to feelings associated with fear and apprehension when making clinical judgments.

In addition to qualitative studies and bio-physiological studies, instrument development is another modality to explore the sensations and feelings associated with intuition use. Instrument development involves the conceptualization of a concept with subsequent psychometric testing to establish reliability and validity. Instrumentation provides a means to operationalize a complex concept such as intuition. An intuition measure can be used as educational tool to assist nursing students in recognizing the feelings and sensations related to intuition use.

History of Instrument Development

The Smith Intuition Instrument for Nursing Students was developed because the available nursing intuition measures[20-22] had scale items primarily directed at the practicing nurse. The conceptualization of intuition for instrument development included a multidisciplinary review of the theoretical and empirical intuition literature as well as an examination of the existing intuition measures. For instrument development, intuition was defined as a source of nonlinear knowledge that originates from emotional awareness, physical awareness, or making connections at either a physical or spiritual level.[23] The emphasis of the instrument development was on the feelings and sensations associated with intuition use rather than on the reliance on past experiences.

From the review of literature, three measurable dimensions of intuition were identified: emotional awareness, physical awareness, and making connections at the physical and/or spiritual level. Emotional awareness is defined as a knowing that comes through emotions and empathy. Physical awareness is the knowing that comes from body sensations and interpreted by the five sense organs. Making connections is the sensing of a relationship on a physical or spiritual level. Physical connections include an understanding of body language or nonverbal communication. Spiritual connections emphasize the universal and spiritual connectedness of humans and the sensing of energy or energy fields.[23]

The Content Validity Index for the created items in the original instrument was .86.[23] Psychometric evaluation of the developed instrument included two separate administrations of the instrument in samples of nursing students, who were members of the National Student Nurse Association (NSNA). Table 1 provides a summary of the two psychometric evaluations of the intuition instrument.[23-24] Statistical findings from both exploratory studies demonstrated construct validity for the newly developed instrument even though the psychometric evaluation resulted in more than three factors.

Purpose

The purpose of this study was to confirm the factor structure of the Smith Intuition Instrument for Nursing Students using confirmatory factor analysis with an alternative model approach**.** The ability to postulate models allowed researcher to manipulate instrument items based on previous empirical data in order to clarify the factors that described the feelings and sensations associated with intuition use by nursing students.

Design

A descriptive, comparison design was used and a sample of nursing students received the intuition instrument and written consent via U.S. mail or in a classroom setting. Data were collected between December 2004 and February 2005. The items for the 26-item intuition instrument have 5 responses, (1) never, (2) rarely, (3) sometimes, (4) often, and (5) always. The five responses were the same for all psychometric evaluations. Written directions were provided. Students were instructed to check responses reflecting the frequency of behaviours as they applied to their clinical and life experiences. The instrument is measuring use of intuitive abilities in patient care scenarios.

Institutional Review Board approval and permission from the Director and President of the National Student Nurse Association were obtained prior to data collection. The nursing students came from two different samples: a randomly generated sample and a sample of convenience. The initial sample consisted of nursing students who were members of the National Student Nurse Association (NSNA), a U.S. organization for nursing students. This group, which was randomly generated by computer using the number representing birth month, received the intuition instrument via the U. S. mail. The instrument and consent was mailed to 1,000 nursing students in January of 2005. Of the 1,000 members, 500 were enrolled in associate degree programs and 500 enrolled in bachelors of nursing programs. A stamped self –addressed envelope and raffle ticket for a $100 gift certificate to Amazon.com were included to increase response rate. The mailing of 1,000 instruments resulted in a 31.6% response rate.

A convenient sample of nursing students, who were enrolled in an associate degree-nursing program located in the northeast, completed the instrument as an in- class activity in December 2004. No grade was attached to this activity and participation was voluntary. The signed consent form confirmed that a grade was not attached to this in class activity.

Sample

The self-selected sample of 421 students was predominately female (89%), Caucasian (87%), and between the ages of 18-27 (60%). Forty-six percent were enrolled in a bachelors program and 53% in an associate degree program with

93% in their final year of the nursing program. Thirty-seven percent of students worked as a certified nursing assistant, 21% as nurse externs, and 35% had no hospital experience. Three hundred and sixteen students were members of NSNA and returned the completed instrument via mail and 105 nursing completed instrument in the classroom setting. Combining the two samples increased the number of nursing students enrolled in an associate degree program which served to equalize the representation of students from both bachelor and associate degree programs. The key variable that differs between the two samples is how participants were recruited. One group (n = 316) represented membership in NSNA and a mixed degree-sought pool. It is unknown if students from the in-class sample of ADN students (n =105) were members of the NSNA. Other differences between the groups may relate to diversity, geographic distribution, time for completion, motivation for participation and other factors.

Data Analysis

Confirmatory factor analysis was conducted with LISREL 8.54 using the SIMPLIS language.[25] An alternative model approach was employed and five plausible models examined. Two 5-factor models, two 6-factor models, and one 7-factor model were postulated and incorporated the statistical findings from the previous exploratory factor analyses. To assess model fit, various statistics were used to compare the alternative models such as the Root Square Error of Approximation (RMSEA), the Normed Fit Index (NFI), the Relative Fit Index (RFI), Comparative Fit Index (CFI), the Non-Normed Fit Index (NNFI), the Standardized Root Mean Square Residual (SRMR), the Goodness of Fit Index (GFI), and the Akaike Information Criterion (AIC), the latter which can be used to compare nested and non-nested models.[26]

Findings

The seven-factor model demonstrated the best fit indices and incorporated the factors from both exploratory studies. The values for RFI, CFI, and NNFI for the 7-factor model are above .90. The decrease in the AIC value and increase in fit indices as theoretically justified parameters were added suggest the possibility of other latent variables not being captured by factor structure.

Table 2 lists the abbreviated scale items that make up the 7-factor model, the alpha coefficient for each factor, the standardized loadings, error variance, and R^2. The reliabilities were calculated in SPSS (Version 10.1) for the seven factors and ranged from .66-.87. The coefficients are presented for the resulting factors but more testing of factor structure is warranted. The values for the standardized loadings ranged from a low of .172 (read nonverbal cues) to a high of .725 (nauseous). The R^2 values ranged from .275 (nauseous feeling) to .828 (reading nonverbal cues).The standardized residuals ranged from -5.191 to 9.489. The

high-standardized residuals imply more work is necessary despite some evidence of sufficient fit.

Discussion

The seven factor model is adequate and supports construct validity but further testing is warranted to determine factors that are not being adequately delineated by factor structure. There may be feelings and sensations associated with intuitive feelings that are not being captured by the created items and resulting factors or there is an overlapping of sensations and feelings that can not be clearly delineated. For example, being anxious about a patient's condition can be described as an emotional feeling or a physical sensation. The difficulty with differentiating between emotional feelings and physical sensations noted in exploratory factor analysis studies continued with the confirmatory factor analysis.

Various feelings and physical sensations make up the dimensions of physical awareness and emotional awareness. The seven-factor model separated the items designated for the dimension of physical awareness into two factors, physical awareness and physical feelings that alert**.** Both labels include "physical" because the items were created originally to represent physical awareness. The factor of physical awareness includes items representing physical sensations experienced *when something is wrong with a patient*, whereas the factor of physical feelings that alert *represents physical sensations that are experienced prior to something going wrong.* The difference between two factors is the *timing* of the physical sensation. More items related to physical awareness need to be created to assist in deciphering the sensations and feelings associated with physical awareness as well as the timing of the sensations and feelings

McCraty, Atkinson, and Bradley[18] explored the electrophysiological evidence of intuition using skin conductance, the electroencephalogram, and the electrocardiogram. They documented physiological responses to emotionally arousing stimulus, which occurred before the stimulus was administered. Certain electrophysiological indicators responded to future emotionally arousing stimulus prior to the actual experience. Use of confirmatory factor analysis allowed items to be grouped by timing of sensations. In the exploratory studies, factors did not have items with same stems that described timing of physical sensations.

This analysis clarified the items representing emotional awareness into good and bad feelings. Good feelings are experienced when the patient is stable and bad feelings are associated with a patient's general condition. Timing of emotions is not a component of these items. Making connections continues to include the factors of spiritual connections with the patient, reading cues of patient, and sensing energy of the patient. The dimension of sensing energy re-emerged in the confirmatory factor study, even when postulated alternative models provided a means to insert the two sensing energy items into other factors based on a

previous exploratory findings. Creating additional items for the factor of sensing energy, which has only two items, is necessary for future studies in order to better capture the factor.

A significant finding of the confirmatory analysis is items in each factor have the same stem, (ie, about a patient's condition, when a patient is stable, when something is about to go wrong, or when something is wrong with patient). Grouping of items by stems did not occur with the exploratory factor analyses. When items were initially developed and examined for content validity, the focus of item development was on the feeling, sensation, or connection associated with intuition use. Emphasis needs to be on the timing of intuitive behaviours when additional items are created for future testing.

Limitations of this study include sample self-selection and unknown diversity among nursing students. Large diverse samples of students are difficult to contact due to the protected nature of the student role. The National Student Nurse Association provided access to a large random sample. Mail outs offer the availability of a large random sample but high response rates are difficult to obtain.[27]

Conclusion

The significant contribution of this study is the statistical evidence demonstrating factors relevant to nursing and the utility of nursing intuition among nursing students. However, there is a need to identify other latent variables being measured by the instrument, to clarify the existing factors, and to understand the timing of sensations and feelings associated with intuition, which was not evident by the exploratory analyses. Returning to the item development phase would be beneficial since the findings from both the exploratory and confirmatory studies demonstrated the need (a) to focus on the timing of sensations and emotions, (b) for additional items, and (c) for items representing each factor to have same stem.

A valid and reliable intuition instrument is an important educational tool. A measurement tool provides a quantitative means to explore intuition in samples of nursing students. An intuition instrument helps facilitate the reflection and sharing of intuitive clinical experiences among nursing students. Communication of intuitive feelings is difficult as demonstrated by the deciphering of factors. An instrument provides the words for students to share these experiences and fosters discussion in small groups, such as a post conference. The pursuit to understand the concept and clarify the emotions and sensation associated with intuition use through instrument development serves as an impetus in the development of a conceptual model of intuition . A conceptual model can be used by educators both in academia and practice to facilitate more research on this type of knowing. In additional the conceptual model can provide the structure for nursing curricula that incorporate intuition as a valid way of knowing.

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Table 1

Summary of Previous Psychometric Evaluations of Intuition Instrument

Study	Sample	Factors and % Variance	Range of Factor Loadings	Reliabilities (Alpha-Coefficient)
Study 1.				
Smith, Thurkettle, & dela Cruz, (2004) 33-item Instrument mailed out to sample. Principal component factor analysis with Varimax rotation	Members of NSNA Enrolled in BSN and AD programs N=349	1. Physical Sensation (28.4%)	.634-.827	.84
		2. Premonitions (9.7)	.669-.799	.79
		3. Spiritual Connection (7.7%)	.666-.824	.82
		4. Reading Cues (6.3%)	.669-.830	.73
		5. Sensing Energy (5.7%)	.669-.799	.71
		6. Apprehension (4.3%)	.534-.631	.69
		7. Reassuring Feelings (4%)	.838-.853	.80

Study 2.

Smith (2006) 32-item Instrument administered at NSNA national conference Fall 2003 Principal component factor analysis with Varimax rotation	Members of NSNA Enrolled in BSN and AD programs N=326	1. Feelings that Reassure (27.7%)	.614-.814	.85
		2. Spiritual Connections (10.9%)	.626-.846	.80
		3. Feelings that Alert (8.4%)	.627-.807	.80
		4. Feeling that Forewarn (5.8%)	.602-.736	.75
		5. Physical Sensations that Alert (4.7%)	.572-.800	.78
		6. Reading Physical Cues (4.2%)	.605-.848	.73

Table 2

Reliabilities, Standardized Loadings, Error Variance and R^2 for 7 Factor Model

Factors with Items and Alpha Coefficient	**Standardized Loadings**	**Error Variance**	**R^2**
Good Feelings (.87) (when patient stable or okay)			
Calm feeling	.726	0.472	0.528
Peaceful feeling	.839	0.297	0.703
Good feeling	.891	0.206	0.794
Feel relieved	.830	0.310	0.690
Feel encouraged	.843	0.289	0.711
Spiritual Connections (.85) (with a patient)			
Connect at soul level	.880	0.225	0.775
Spiritual connection	.869	0.246	0.754
Deep connection	.797	0.366	0.634
Do not need verbal communication for connection	.710	0.496	0.504
Reading Cues (.80) (of patient)			
Read nonverbal body language	.884	0.219	0.781
Read nonverbal cues	.910	0.172	0.828
Read patient' expression	.694	0.518	0.482
Bad Feelings (.79) (about patient's condition)			
Uneasy feeling	.769	0.409	0.591
Bad feeling	.776	0.398	0.602
Nagging feeling	.685	0.530	0.470
Persistent feeling	.731	0.465	0.535

Physical Awareness (.73) (when something is wrong with patient)			
Shiver down spine	.600	0.640	0.360
Hair on arms and neck	.644	0.586	0.414
Lump in throat	.688	0.527	0.473
Gut reaction	.721	0.481	0.519
Physical Feelings that Alert (.73) (when something is ***about to go wrong*** with patient)			
Terrible feeling	.683	0.534	0.466
Nauseous	.525	0.725	0.275
Anxious	.663	0.560	0.440
Sinking in feeling in stomach	.832	0.307	0.693
Sensing Energy (.66)			
Sense negative energy	.633	0.599	0.401
Sense a energy field	.875	0.234	0.766