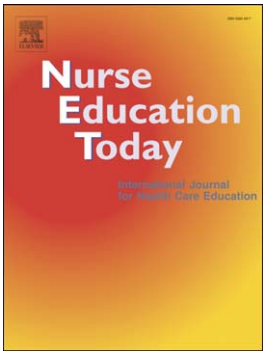

An exploration of the structure of mentors' behaviour in nursing education using exploratory factor analysis and mokken scale analysis

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An exploration of the structure of mentors' behaviour in nursing education using exploratory factor analysis and Mokken scale analysis

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Highlights

- Mentors' behaviour is conceptualized as an inter-related three-dimensional structure: psychosocial support, facilitating learning and professional development.
- Mentorship is hierarchical; some behaviours are perceived as more important than others, which is investigated at the first time.

- This tool can be useful to guide mentors' behaviour and enhance the communication between students and mentors in China
- Policy implication: mentors' training program should contain the three factors; treat students as learner and respect them is the prioritising behaviour that mentor should have.

Introduction

Mentorship can provide better adaptability, role conception, nursing performance and role socialization (Frazer et al, 2014; Webb and Shakespeare, 2008) for nursing students than teaching by traditional school nurse teachers on a ward. It is also beneficial to mentors as they may experience more job satisfaction and self-esteem by sharing knowledge with young nurses and nursing students and they have the opportunity to learn from mentees (Usher et al., 1999; Hyrkäs and Shoemaker, 2007). Therefore, it is widely applied in clinical nursing education throughout the world.

Background

In China, nearly all nursing students go to hospital in the final year for approximately 10-12 months of consecutive clinical practice, which is different from the parallel arrangement in other countries whereby, in each term, there is theoretical learning and clinical placement learning. The situation in China is said to be hospital and school-centred, rather than student-centred. Due to nurse shortages in hospitals, mentors simultaneously act as staff nurses and face a dilemma between providing care to the patients and training the students.

Furthermore, there are no national guidelines about mentorship applied to nursing student learning and teaching. Mentors lack adequate training to perform properly as educators to support and assess nursing students (Eddins et al., 2011). Under this condition, mentors are neither confident nor competent to fulfill their roles, which bring little benefit to nursing students' clinical learning (Eddins et al., 2011).

When nursing students in China study in clinical placements, there are no strict rules to guarantee their supernumerary status, but in terms of nursing human resource management they are not accounted for as staff. In reality, due to severe nurse shortages in hospitals, students are prone to be treated as human resource rather than learners and, commonly, the placement learning is work-led rather than education-driven; in particular， a large proportion of basic nursing procedures are done by them (Eddins et al., 2011). In turn, students' professional identity acquisition, interest in nursing and professional competency development are impaired; their enthusiasm for being a nurse is undermined. To improve this situation, mentors' behaviour and responsibility should be better understood; these should also be incorporated into mentor training programs and they should be assessed regularly to ensure high clinical learning quality and a positive experience for students.

This research project was conducted to develop and validate a scale to measure mentors' behaviour in China. A literature review identified 20 mentoring measurement scales in business, education nursing field, but none of them was considered suitable to guide and assess mentors behaviour in clinical nursing education for a variety of reasons; for instance, these scales showed different conceptualization from nursing students' mentoring and did not providing enough psychometric evidence to support their use (Chen et al, 2016). This paper, a part of the research project, aims to describe the exploration of the structure of mentors' behaviour in an empirical study.

Methods

Design

A cross-sectional design was used.

Participants and data collection

Convenient sampling was applied in one university and three hospitals in China in 2014. Students in their final year of clinical study from degree, associate degree, 3-year diploma and 5-year diploma programs participated in this survey. The sample size estimation (> 470) was mainly based on the requirements for the exploratory factor analysis (Ferguson and Cox,1993).

The Bristol online survey tool was used in one medical university in southwest China. In addition, hard copy surveys were conducted in three hospitals (Hospital 1 has approximately 3000 beds; hospitals 2 and 3 hold more than 1000 beds.) in one city in southwest China with convenient samples, by inviting students to complete the questionnaire at the end of a lecture. Students were asked to rate the importance of each behaviour of mentors in contributing towards their successful learning, using five options from ‘not important at all’ to ‘quite important’ (scoring 1-5).

Response rate ranged from 83% to 86% in the three hospitals, while the online survey had 69 responses. Cases with missing data were excluded after checking the missing pattern and randomised missing data was assumed. Cases with low engagement (0 variance or low variance in response) were also excluded, as the response of these cases may not reflect true reliability and validity of the instrument but respondents’ characteristics, such as conscientiousness, idiosyncratic response behaviour, understanding problems and response motivation (Meijer et al., 2015). Finally 669 cases without missing data were entered in the

data analysis as the Mokken scale analysis does not allow missing data, more theory regarding Mokken scale analysis is presented in data analysis section.

Measurement tool development and validation

The process of scale development and validation is shown in Figure 1. The item pool was developed through a literature review where 49 items were selected or adapted following a three dimensional theoretical framework of mentorship (professional development, psychosocial support and facilitating learning) generated from 43 studies (to be reported elsewhere), then this item pool was enlarged to 84 through six online nursing student and mentor focus groups in China (to be reported elsewhere). The pool was reduced to 52 items after rewording and duplication reduction in research group discussion.

Thereafter, the scale with 52 items was sent to 12 mentoring experts (nine responded) in the UK for content validity review, the items with content validity index over 0.78 were retained (n=47) and the scale level content validity index (S-CVI) was 0.95, (data reported in the unpublished thesis). Discriminant validity ($t=-3.26$, $p<0.05$) and test-retest reliability (Intra-class Correlation Coefficient, ICC=0.92) are reported in the unpublished thesis.

Data analysis

Exploratory factor analysis (EFA) was used to explore the common factors in the latent variable (here, mentoring behaviour) using SPSS 22.0. Principal axis factoring (PAF) was selected for this study, which aimed to explore the theory of mentorship rather than data reduction. Based on eigenvalues>1, there were 9 factors, explaining 56.59% of the variance, which probably overestimated the number of factors, as the number of items is greater than 30 and some communalities are below 0.4 in this study (Field, 2009). The scree plot suggested there might be two or six factors. Therefore, Monte Carlo parallel analysis for

Principal Components Analysis was used to decide the number of factors to extract. Both orthogonal rotation and oblique rotation were tried and the results suggested that oblique rotation gave a simpler solution. The criterion for loading and cross loading was set at 0.4, and based on this, items with loading below 0.4 and cross loading over 0.4 were deleted. This process was repeated until a simple structure was achieved where loadings were maximised on putative factors and minimised on the others.

Mokken scale analysis (MSA) can be used to analyse dichotomous items and polytomous items. It has two models: first, the monotone homogeneity model, which means an item's score increases as the trait increases and this is described by the item response curve (IRC). This can order respondents according to their raw accumulated scores. The other model, invariant item ordering (IIO), assumes that all IRCs do not intersect, which means items can be ordered according to their difficulties and this item ordering is the same for all respondents (Sijtsma and Junker, 1996; Ligtvoet et al., 2010). Scalability strength can be judged by the scalability coefficients (Ligtvoet et al. 2010), such as H_{ij} (item-pair), measuring inter-item correlation; H_i (item), measuring precision of item discrimination: showing the strength of the correlation between an item and the latent trait under investigation; H_s (scale), measuring the quality of total scale, a weighted mean of item coefficients, an index for the precision of ordering person; H^T, assessing precision of invariant item ordering. According to Ligtvoet et al. (2010), the rule of thumb cut-off points are presented below: if the monotone homogeneity model holds, Hij>0; Hi, Hs, HT<0.3, means unscalable; 0.3< Hi, Hs, HT<0.4, implies poor scalability; 0.4< H_i, H_s, H^T<0.5, shows moderate scalability; H_i, H_s, H^T>0.5, displays strong scalability. The package 'mokken' in the software R (R is a free software environment for statistical calculation and graphics) was used to conduct the Mokken scaling.

A Mokken scale analysis was carried out to explore whether there were hierarchical

properties in mentors' behaviour and the dimensions of this new scale. Mokken scale analysis proceeded as described below**.** The items identified in factor analysis were checked first for scalability coefficients. Any item with H_i under 0.3 or the 95% CI (confidence interval) around H_i covering lower limit below 0.3 were excluded. Then scale partitioning was carried out to explore the dimensions of mentors' behaviour through increasing c (Lower bound c defines the minimum value of coefficients H_i in the Mokken scale (Molenaar and Sijtsma 2000)) by 0.05 increments. Monotone homogeneity model and invariant item ordering were investigated at sub-scale level and at whole scale level.

Ethics

Ethical approval was granted by the research ethics committee of the Faculty of Health and Social care, University of Hull, UK and permission was obtained from one university and three hospitals in China. If participants completed the questionnaires, informed consent to participate in the study was assumed. It was explained to participants before they completed the questionnaires that their information could not subsequently be withdrawn but that their confidentiality was protected. The confidentiality and security of data were maintained.

Results

Demographic information

Demographic information is shown in Table 1. Students in this sample came from four programs, degree 137 (20.5%), associate degree 238 (35.6%), 5-year diploma 97 (14.5%) and 3-year diploma 196 (29.3%); the majority of them were female 643 (96.1%). These students mainly had non-one-to-one mentorship such as group mentoring 300 (61.5%) . The students mainly came from Hospitals 1 and 2, accounting for 44.7% (n=299) and 31.1% (n=208) respectively, while the online survey only had 69 (10.3%) students. The average age was

20.29, ranging from 18 to 24 years; average days of study was 75, ranging from 30 to 310 days.

Results of exploratory factor analysis

Principal axis factoring analysis was carried out on 47 items with oblique rotation (direct oblimin). The KMO measure found that the sample was adequate for the analysis (KMO=0.95 and all KMO values for each individual items > 0.85). Bartlett's test of sphericity (χ^2 (1081) =13460.94, $p<0.001$) implies that the correlation coefficients among all the items are large enough to do EFA.

EFA provided a simple three-factor construct with 37 items, explaining 44.65% of the variance, Eigenvalue and percentage of explained common variance are shown in Table 2. All of items loaded on one factor in the initial solution without rotation, shown in Table 3. The factor correlation matrix shows that the three factors are correlated with each other and the correlation coefficients range from 0.56 to 0.69. The whole scale reliability was 0.94 and the reliabilities of the three sub-scales ranged from 0.87 to 0.91, shown in Table 3.

Factor 1 - Professional development (PD). There were 16 items (items 16-17, 20-30, 32-34) in this factor, concerned with showing students nursing skills of patient caring, nursing clinical competency and professionalism, evaluation and assessment, deep learning and challenge.

Factor 2- Facilitating learning (FL).There were 11 items (items 2-11, 14) in this factor, including identifying and realizing students' learning objectives, arranging learning environment, teaching methods as linking theory and practice, reflective learning, active instruction and interdisciplinary learning activity.

Factor 3 – psychosocial support (PS). There were 10 items (items 37-42, 44-47) in this factor, concerned with respecting students, treating them as learners not pairs of hands, listening attentively and being friendly, supportive and encouraging.

Results of Mokken scale analysis

Based on the condition that scalability coefficients (H_is and their 95% CI) should be over 0.3, 13 items were removed and 24 items remained and three sub-scales were selected among the 24 items. All of them were moderate Mokken scales, but no scale showed IIO. Then exploration was carried out in the whole 47 items and a small scale showing IIO was identified. The results were compared with that of EFA.

To explore the dimensions of the 24 items, lower bound c started from 0.05 and increased to 0.45 in 0.05 increments. From 0.05 to 0.35, all of the items formed a single scale after which three reliable scales were selected at c = 0.40. At c = 0.45 five scales were selected; one of them included just two items; two scales had three items respectively and no more meaningful information was discovered. So the final solution to the Mokken scaling was set at c = 0.40.

Basically both EFA and MSA generated identical results: both structures have three dimensions e.g. professional development, facilitating learning and psychosocial support. The differences were that EFA included more items (n=37), while MSA had 24 items. Three items about deep learning and challenge (item 32-34) in the professional development factor in EFA were apportioned to psychosocial support factor in MSA. The sub-scale, psychosocial support, included most items (n=10), the other two Mokken scales shared similar numbers of items (n=6 and 8 respectively). All sub-scales were moderate Mokken scales ($0.4<Hs<0.5$) and were reliable (Rho>0.8) but no scale demonstrated IIO, shown in Table 4.

Item hierarchy

Scale 1 – psychosocial support: has 10 items mainly concerning support, encouragement and respect. This scale describes the hierarchy of importance of each psychosocial support behaviour. The most highly endorsed concept is 'respect' ('Treats me as a learner, not a pair of hands' and 'Shows respect to me'). This is the most basic need as a person and a student, which may not be met adequately now. After this is encouragement and support ('Instils confidence in me', 'Encourages deep-learning', 'Guides personal development' and 'Makes me feel part of the team'). The least endorsed concept is challenge ('Encourage evidence-based practice' and 'Gives best possible care'). The hierarchy of endorsement is from respect to support and encouragement, ending with challenge. This is a moderate Mokken scale (Hs=0.47) but does not show IIO, which means that it is reliable and precise to order students according to their expectations, but they may not all rate the items in the same way.

Scale 2 – facilitating learning: has six items and it describes the hierarchy of the importance of behaviour which can facilitate nursing students to learn effectively in clinical placement. The most highly endorsed concept is 'linking theory with practice' ('Helps me to link theory to practice' and 'Actively instructs me'), which is the main purpose and way of clinical learning and teaching. The less endorsed concept is reflective learning ('Encourages me to reflect on my learning'), which is a key step in experiential learning. The least likely endorsed concept is learning objectives and plan ('Has a clear plan for my learning', 'Discusses learning objectives with me in placement', 'Helps me achieve learning objectives and goals'), which may be more work for mentors other than direct behaviour influencing students' learning as perceived by students. So the hierarchy is from linking theory with practice to reflective learning, ending at planning and discussing learning objectives. This is a moderate Mokken scale (Hs=0.50) but does not show IIO.

Scale 3 – professional development: has eight items and it describes the hierarchy of importance of the behaviours that can promote nursing students' professional development. The most highly endorsed concept is professionalism ('Demonstrates professional integrity' and 'Shows me how to make decisions about patient care'), which is the most important concept: being a nurse, everybody must show professional integrity to save life, be caring and compassionate and understand professional boundaries. This is followed by the concept of professional competency ('Displays clinical competence', 'Shows me how to prioritise tasks' and 'Facilitates good communication skills with staff and patients') and the least endorsed concept is assessment and giving feedback ('Gives me continuous assessment' and 'Gives me constructive feedback'). Therefore, the hierarchy of importance is from showing professionalism to fostering professional competency and assessment. This scale is a moderate Mokken scale (Hs=0.43) but does not show IIO.

Finally seven items remained and formed a reliable moderate Mokken scale showing weak IIO property (H^T=0.31, Hs=0.43, Rho=0.81), shown in Table 5. This scale describes the hierarchy of importance of behaviours that mentor should have towards nursing students in clinical placement. The most highly endorsed concept is 'respect and support' ('Treats me as a learner, not a pair of hands'; 'Shows respect to me'; 'Instils confidence in me'; 'Listens to my ideas and suggestions'), followed by professionalism (Adheres to recognized standards of practice). The least likely endorsed item is 'Arranges interdisciplinary learning activities'. Therefore, the hierarchy is from respecting and supporting students to showing professionalism, ending at ranging interdisciplinary learning activities. Furthermore all students may rate the importance of the seven behaviours in the same order.

Discussion

The three-factor structure of mentorship (professional development, psychosocial support and facilitating learning) has been identified using EFA and Mokken Scaling in a large sample data sets (n=669) of Chinese nursing students.

Factor 1-Professional Development accounts for the largest number of items (n=16), including concepts such as evaluation and assessment, giving feedback, critical thinking, nursing skills and competency nurturing, role modeling of professional integrity, positive image and challenging students (Table 3). Professional development is of substantial importance for students, as they can get a proper understanding of nursing culture and acquire professional identity and competency through professional socialization and practice in the real world of nursing care. This professional development factor is different from the career development function in the business field (Scandura, 1992), which includes concepts like sponsorship, visibility, and challenging assignments. These concepts are more related to helping staff career development such as achieving a higher level in the organization and/or a salary increment. While at the learning stage of students on wards, complying with professional codes, fostering nursing competence and professional identity are pivotal to be a registered nurse (NMC, 2008). Negative experience will prevent students from developing professional, and then increase the turnover rate (Chachula et al, 2015). Helping nursing students to gain knowledge and training in skills, treating them as a team member involving them in inter-professional work and giving constructive feedback are also important (Chachula et al, 2015).

Factor 2-Facilitating learning means guiding and supporting students' learning. It includes concepts such as being responsible for students' learning, helping to link theory and practice, questioning, reflection on learning and organizing inter-disciplinary learning activity. In the nursing field, a mentor needs to demonstrate pedagogical knowledge and competency

because they are responsible for cultivating and teaching the next generation of nurses effectively, as stated by Nursing and Midwifery Council (2008). This is supported by other researchers (Chow and Suen, 2001; Hou et al., 2011; Lofmark et al., 2012) who discuss subtle details about teaching and learning strategies such as 'elaborate clearly', 'stimulates student interest', 'quickly grasps what students are asking or telling'. However, clinical learning is highly related to experiential learning theory and social learning theory (Yardley et al., 2012), which proclaims learning through experience and reflection on experience of observing and doing (Yardley et al., 2012). Therefore, facilitating learning behaviour is mainly about establishing a supportive environment, planning and organizing activities and guiding learning and reflection (NMC, 2008).

Factor 3-Psychosocial support includes concepts about treating students as learners, with respect, guiding personal development, providing support and encouragement, which is similar to those in business (Scandura, 1992); however, it stresses particularly the concept of respect and Treating students as learners, instead of pairs of hands (based on the mean scores of items). This does not mean nursing students ask for more or have higher expectations than people from other fields. On the contrary, it may reflect the actual situation that nursing students are at the bottom of the hierarchical health care setting (Seibel, 2014) and respect is their most common need (100% agreement) (Mao et al., 2014), but they have not been respected sufficiently (Liu, 2014). Previous studies on nursing education placed substantial emphasis on mentors' teaching behaviour and clinical competency (Löfmark et al., 2012; Hou et al., 2011) or simply being friendly (Chow and Suen, 2001), whilst the real experiences and expectations of nursing students may be overlooked or ignored to some extent.

The three-factor structure is student-centred, contextualized and parsimonious compared with the eight-domain theoretical framework of *Standards to Support Learning and Assessment in*

Practice in the UK (Nursing and Midwifery Council, 2008). The NMC mentorship framework was generated mainly from a statutory perspective and it is orientated to mentors based in the UK nursing education and management system; for example, the 'context of practice' domain focusing on clinical practice enhancement on wards to provide a better learning environment, not directly aiming at students learning (Nursing and Midwifery Council, 2008 p.25). This NMC framework may not be compatible with the Chinese nursing system. In China, there is no national guidance or job description of mentors' role and responsibility. Furthermore the nursing education and registration system are different: for instance, mentors do not have reasonable responsibility and accountability for assessment and evaluation of students' learning, as the certificates of graduates are issued mainly based on subject exams in nursing school; registration is based on provincial level exams; and mentors' assessments are not concerned to a large extent. Therefore, to guide mentors' behaviour in China, at this point, the students' expectations and needs are more likely to provide practical guidance, such as this three-dimension construct.

Three reliable Mokken scales were identified, showing the hierarchy of student's expectations, which is identical to the three-factor solution from EFA. This implies that the conceptualization of mentorship is stable as classical test theory and item response theory shows the same solution. But the more useful and unique aspect of MSA is that, it found out the hierarchical properties of mentors' behaviour from respect and support to professionalism and to inter-professional learning. It also shows the precision of the new scale in ordering students according to their expectations about mentors' behaviour. These findings make people understand more about mentors' behaviour and students' needs.

In this newly developed mentor's behaviour instrument, three Mokken scales showing monotonicity demonstrated moderate to strong accuracy (Hs>0.4-0.5) in differentiating

students' expectations (Table 3). The monotonicity model is used to order people when selection of people with a certain trait is needed (Sijtsma and Junker, 1996). In this study, the three Mokken scales, manifesting moderate to strong precision in ordering students' expectation, give a basis to match students with mentors, e.g. match students with high expectations with mentors with high quality of mentorship.

None of the three scales showed IIO and the possible reason might be heterogeneity of sample and/or differentiating function and or item quality tapping multiple traits; only a small Mokken scale with seven items selected from the total 47 items showed weak IIO (Table 5). This small Mokken scale suggests that there is hierarchy in importance of mentors' behaviours and that student from any program, no matter whether diploma, degree or associate degree, will rate the importance of these behaviours in the same way. The item 'treat me as a learner, not a pair of hands' was ubiquitously agreed as being more important or more popular than others; the item 'arrange interdisciplinary learning opportunity' had the lowest mean score which means that the lowest rated need of students is inter-professional learning. A mentor should understand this ordering and meet the most common and important need first when mentoring any student from any program, at any learning stage and then think about other expectations.

The small scale showing IIO can be applied to help mentors to communicate and understand students better using less time, as the items are ordered. Students from a degree program or at the late clinical learning stage may have high expectations, mentors can start with topics with low mean score (means a less popular need). If the least endorsed item is required by the student, other questions with higher mean sores need not to be asked as every student will be more likely to endorse more popular items. If students have low expectations (students from a diploma program or at early stage of clinical learning), mentors can start with the question

with highest mean score and stop at questions which students do not endorse. They do not need to go further to ask other questions with lower mean score behaviours.

As a complement to factor analysis, the three sub-scales from the Mokken scale analysis to a large extent confirmed the three-factor structure of mentorship identified by EFA. The reason why MSA retained less items and apportioned items 32, 33 and 34 differently might be that MSA has stricter assumptions, such as monotonicity, which is likely to exclude more items violating these assumptions; the partitioning method in MSA is different from the factor extraction method in EFA, so the concept 'challenge' conveyed by items 32-34 is more related to psychosocial support in MSA rather than professional development in EFA; it may also be caused by their conceptual multidimensionality.

Conclusion

Mentorship in clinical nursing education is conceptualized as a three–correlated factor model and it is hierarchical in importance. This scale could be used to guide mentors behaviour, to serve as a training material in mentor preparation and to enhance the communication between mentors and students in China.

Conflict of interests. None declared.

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References

Berk, R. A., Berg, J., Mortimer, R., Walton-moss, B. & Yeo, T. P., 2005. Measuring the Effectiveness of Faculty Mentoring Relationships. Academic Medicine 80 (1) 66-71.

Chachula, K M.; Myrick, F; Yonge, O., 2015 Letting go: How newly graduated registered nurses in Western Canada decide to exit the nursing profession.Nurse Education Today 35(7) 912-918.

Chen,YH.,Watson,R., Hilton,A.,2016A review of mentorship measurement instruments,Nursing Education Today, DOI http://dx.doi.org/10.1016/j.nedt.2016.01.020

Chow, F. L. W. & Suen, L. K. P., 2001. Clinical staff as mentors in pre-registration undergraduate nursing education: students' perceptions of the mentors' roles and responsibilities. Nurse Education Today 21 (5) 350-358.

Eddins, E. E., Jie, H. & Huaping, L., 2011. Baccalaureate Nursing Education in China : Issues and Challenges. Nursing Education Perspectives 32 (1) 30-33.

Ferguson, E. & Cox, T., 1993. Exploratory factor analysis: A users' guide. International Journal of Selection and Assessment 1 (2) 84-94

Field, A., 2009. Discovering statistics using SPSS. 3rd ed. London: Sage publications

Frazer K, Connolly M, Naughton C, Kow V. (2014) Identifying clini learning needs using structured group feedback: first-year evaluate of pre-registration nursing and midwifery degree programmes. Nurse Education Today 34(7) 1104-8

Hou, X., Zhu, D. & Zheng, M., 2011. Clinical Nursing Faculty Competence Inventory–development and psychometric testing. Journal of advanced nursing 67 (5) 1109-1117.

Hyrkas, K. & Shoemaker, M. 2007. Changes in the preceptor role: re-visiting preceptors' perceptions of benefits, rewards, support and commitment to the role. Journal of Advanced Nursing 60 (5) 513-524.

Lee, T., Tzeng, W., Lin, C. & Yeh, M., 2009. Effects of a preceptorship programme on turnover rate, cost, quality and professional development. Journal of Clinical Nursing 18 (8) 1217-1225.

Ligtoet, R., Vanderark, L. A., Te E Marvelde, J. M. & Sijtsma, K., 2010. Investigating an invariant item ordering for polytomously scored items. Educational and Psychological Measurement 70(4) 578-595

Liu, C. 2014 Status analysis and strategy of clinical nursing teaching in primary hospital. Chinese Community Doctors. 30 (13) 163-164. (Chinese language journal)

Lofmark, A., Thorkildsen, K., Raholm, M.-B. & Karin Natvig, G., 2012. Nursing students' satisfaction with supervision from preceptors and teachers during clinical practice. Nurse Education in Practice 12 (3)164-169.

Mao, X., Liu, W. & Chen, W. 2014 Survey of nursing students' need studying in surgical department in Traditional Chinese Medicine hospital. Journal of Traditional Chinese Medicine Management. 8 1225-1226. (Chinese language journal)

Meijer, R. R., Niessen, A. S. M. & Tendeiro, J. N. 2015 A Practical Guide to Check the Consistency of Item Response Patterns in Clinical Research Through Person-Fit Statistics: Examples and a Computer Program. Assessment. .1-26

Molenaar, I. W., & Sijtsma, K., 2000. MPS5 for Windows. A program for Mokken scale analysis for polytomous items.

Nursing and Midwifery Council., 2008. Standards to Support Learning and Assessment in Practice. London: NMC

Scandura, T. A. 1992Mentorship and career mobility: An empirical investigation. Journal of Organizational Behavior13 (2) 169-174

Seibel, M. (2014) For us or against us? Perceptions of faculty bullying of students during undergraduate nursing education clinical experiences. Nurse education in practice14 (3) 271-274.

Sijtsma, K. & Junker, B. W., 1996. A survey of theory and methods of invariant item ordering. British Journal of Mathematical and Statistical Psychology 49 (1) 79-105.

Usher, K., Nolan, C., Reser, P., Owens, J. & Tollefson, J., 1999. An exploration of the preceptor role: preceptors' perceptions of benefits, rewards, supports and commitment to the preceptor role. Journal of Advanced Nursing 29 (2) 506-514.

Webb C, Shakespeare P.2008 Judgments about mentoring relationships in nurse education. Nurse Education Today 28(5) 563-71.

Yardley, S., Teunissen, P. W. & Dornan, T. 2012 Experiential learning: transforming theory into practice. Medical Teacher 34 (2) 161-164.

Figure1. Scale development and validation

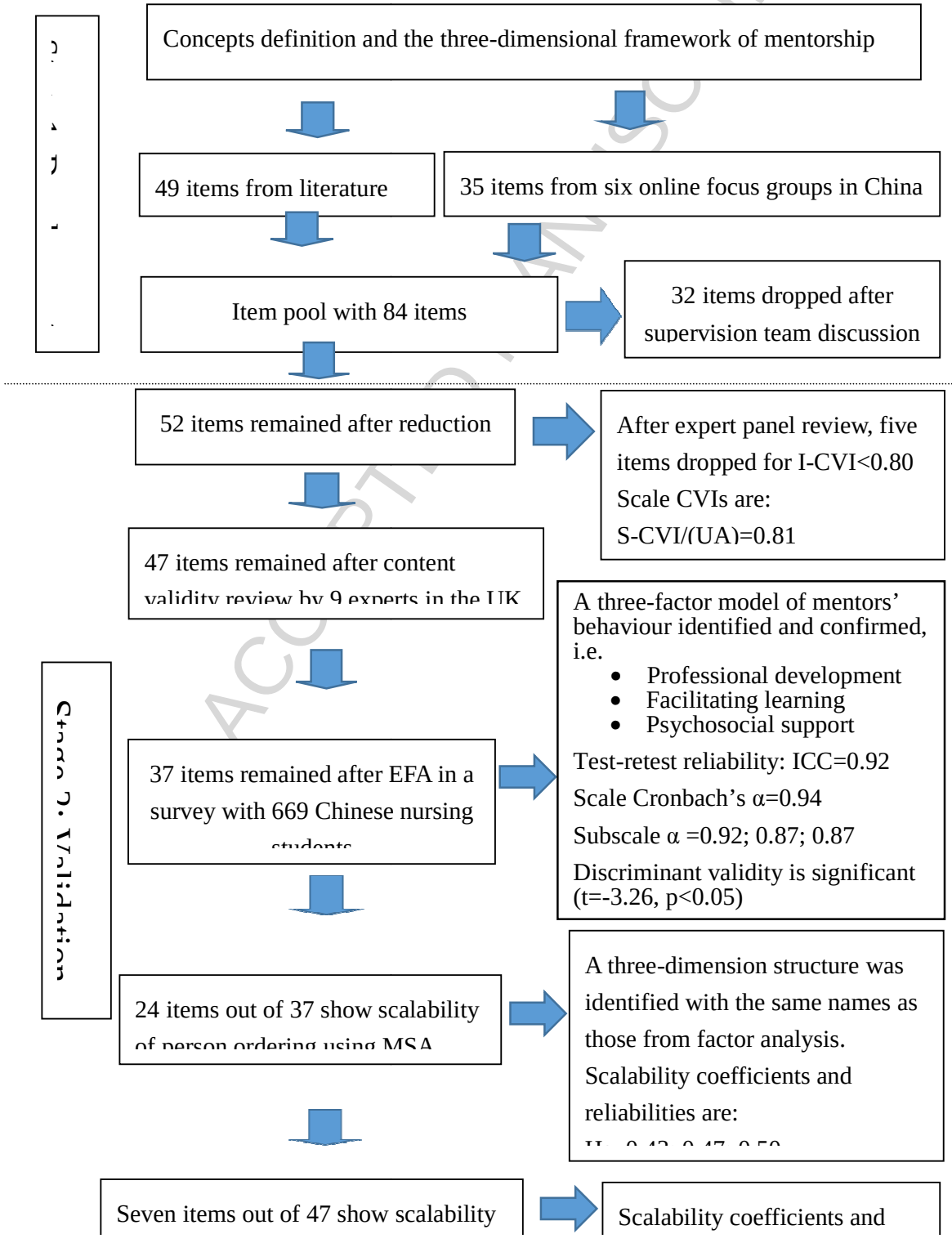

Table 1. Demographic information

		Frequency	Percentage
Program	Degree	137	20.5
	Associate degree	238	35.6
	5-year diploma	97	14.5
	3-year diploma	196	29.3
Gender	Female	643	96.1
	Male	25	3.7
Experienced mentorship	One-to-one	257	38.5
	Group	84	12.6
	Following shift	300	44.9
	Other	22	3.3
	No clear	5	0.7
Preferred mentorship	One-to-one	585	87.6
	Group	45	6.7
	Following shift	32	4.8
	Other	4	0.6
	Do not mind	2	0.3
Location	Hospital 1	299	44.7
	Hospital 2	208	31.1
	Hospital 3	93	13.9
	Online	69	10.3

Table 2. Eigenvalue and Percentage of explained common variance

Factor	Eigenvalue	Percentage of explained common variance	Accumulated percentage of explained common variance
1	12.40	34.44	34.44
2	2.17	6.03	40.47
3	1.56	4.18	44.65

Table 3 Principal axis factoring with oblimin rotation

Item	Commonality	Unrotated loading	Professional development	Facilitates learning	Psychosocial support
v27	0.52	0.67	**0.73**	-0.03	0.02
v22	0.44	0.61	**0.66**	0.09	-0.08
v30	0.36	0.54	**0.65**	-0.05	-0.03
v23	0.42	0.60	**0.65**	0.02	-0.02
v26	0.40	0.58	**0.64**	-0.05	0.04
v29	0.40	0.60	**0.60**	-0.05	0.09
v25	0.38	0.59	**0.54**	0.04	0.07
v21	0.38	0.59	**0.54**	0.15	-0.04
v34	0.45	0.65	**0.51**	-0.04	0.24
v20	0.33	0.56	**0.47**	0.12	0.02
v33	0.45	0.66	**0.46**	0.08	0.20
v28	0.31	0.53	**0.44**	0.00	0.14
v17	0.31	0.54	**0.44**	0.10	0.06
v16	0.39	0.60	**0.43**	0.28	-0.04
v24	0.32	0.55	**0.42**	0.13	0.06
v32	0.37	0.60	**0.42**	0.05	0.19
v7	0.46	0.56	-0.14	**0.71**	0.10
v6	0.46	0.55	-0.02	**0.71**	-0.04
v5	0.46	0.57	-0.05	**0.70**	0.03
v8	0.44	0.55	-0.03	**0.69**	-0.01
v9	0.44	0.58	0.05	**0.61**	0.02
v10	0.40	0.57	0.08	**0.56**	0.03
v3	0.33	0.50	0.06	**0.53**	-0.01
v11	0.40	0.58	0.10	**0.53**	0.04
v2	0.31	0.50	0.09	**0.50**	-0.01
v4	0.31	0.51	0.05	**0.48**	0.06
v14	0.27	0.49	0.13	**0.41**	0.02
v39	0.39	0.52	-0.04	0.01	**0.65**
v38	0.33	0.45	-0.09	-0.01	**0.64**
v46	0.42	0.56	-0.03	0.07	**0.63**
v40	0.49	0.63	0.11	0.00	**0.62**
v42	0.48	0.63	0.05	0.07	**0.62**
v44	0.39	0.55	0.08	-0.03	**0.58**
v45	0.39	0.55	0.04	0.03	**0.58**
v47	0.46	0.62	0.12	0.03	**0.58**
v37	0.41	0.57	0.08	0.01	**0.57**
v41	0.48	0.63	0.14	0.06	**0.55**
Cronbach's α		0.94	0.91	0.87	0.87

*For clarity loadings on putative factors are shown in bold

Table 4. Mokken scaling with items ordered according to their mean score (n=669)

Item	Label	Mean	EFA	MSA	H_i
2	Takes responsibility for my learning	4.54	FL	DNS	<0.3
3	Orientates me to the clinical environment.	4.43	FL	DNS	<0.3
4	Provides a supportive practice environment	4.38	FL	DNS	<0.3
5	Has a clear plan for my learning	4.27	FL	FL	0.39
6	Discusses learning objectives with me	4.20	FL	FL	0.40
7	Helps me achieve learning objectives and goals	4.32	FL	FL	0.37
8	Asks me questions to facilitate and assess learning	4.39	FL	DNS	<0.3
9	Actively instructs me	4.53	FL	FL	0.38
10	Encourages me to reflect on my learning	4.39	FL	FL	0.37
11	Helps me to link theory to practice	4.53	FL	FL	0.38
14	Arranges interdisciplinary learning activities	3.94	FL	DNS	<0.3
16	Assesses my achievements continuously	4.30	PD	PD	0.39
17	Gives me objective and comprehensive assessment	4.44	PD	DNS	<0.3
20	Gives me constructive feedback	4.38	PD	PD	0.37
21	Facilitates good communication skills with staff and patients	4.47	PD	PD	0.37
22	Shows me how to make decisions about patient care	4.50	PD	PD	0.40
23	Shows me how to prioritise tasks	4.47	PD	PD	0.38
24	Guides me to become a registered nurse.	4.36	PD	DNS	<0.3
25	Displays clinical competence	4.47	PD	PD	0.37
26	Demonstrates professional integrity	4.54	PD	PD	0.37
27	Transmits a positive image of the nursing profession	4.45	PD	PD	0.41
28	Fosters critical thinking in me	4.22	PD	DNS	<0.3
29	Makes me feel part of the team	4.50	PD	PS	0.37
30	Makes me aware of the legal implications of nursing care	4.48	PD	DNS	<0.3
32	Encourages the use of evidence-based practice	4.31	PD	PS	0.39
33	Motivates me to give the best possible care	4.36	PD	PS	0.42
34	Encourages in-depth learning about clinical practice	4.49	PD	PS	0.40
37	Always makes time to teach me	4.36	PS	PS	0.38
38	Works the same shifts as me	4.13	PS	DNS	<0.3
39	Works with me while on the same shift	4.19	PS	DNS	<0.3
40	Supports and encourages me	4.47	PS	PS	0.40
41	Instils confidence in me	4.51	PS	PS	0.40
42	Shows respect to me	4.54	PS	PS	0.39
44	Has a warm and friendly attitude	4.43	PS	DNS	<0.3
45	Listens to my ideas and suggestions	4.41	PS	DNS	<0.3
46	Treats me as a learner, not a pair of hands	4.60	PS	PS	0.38
47	Guides my personal development	4.49	PS	PS	0.38

PS= psychosocial support
FL=facilitating learning
PD=professional development
DNS = did not scale.
EFA = factors identified by exploratory factor analysis
MSA=scales selected by Mokken scale analysis
Hi<0.3: the scalability of an item is lower than 0.3 or its 95% CI <0.3
For mean scores, scores are on Likert scale, 1 = not important at all, 3 = not clear, 5 = quite important; a high score indicates more important attitude towards mentors' behaviour.
Mokken Scale 1: PS: Hs = 0.47; Rho = 0.87; H^T= 0.08;
Mokken Scale 2: FL: Hs = 0.50; Rho = 0.82; H^T= 0.11
Mokken Scale 3: PD: Hs = 0.44; Rho = 0.83; H^T= 0.02.

Table 5. Items showing IIO

Item	Labels	Mean	Hi
14	Arranges interdisciplinary learning activities	3.93	0.31
36	Adheres to recognized standards of practice	4.15	0.40
40	Supports and encourages me	4.47	0.48
41	Instils confidence in me	4.51	0.50
42	Shows respect to me	4.54	0.49
45	Listens to my ideas and suggestions	4.41	0.44
46	Treats me as a learner, not a pair of hands	4.60	0.45
	Hs=0.43, implying a moderately precise Mokken scale in ordering people.		
	H^T=0.31, implying a weakly precise Mokken scale in ordering items.		
	Rho=0.81, implying a reliable Mokken scale.		