Professional contribution

How Likely Is It for a Nurse Student to Become a Competent Nurse? A Protocol for Scale Development and Validation Using a Mixed Methods Study

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SUMMARY

The aim of the paper was to develop and validate a scale for estimating the likelihood of a nurse student to become a competent nurse.

Admitting students to nursing schools without assessing their personal characteristics has led to serious consequences, including low quality of nursing care. Early detection of students who are at risk of attrition or becoming non-competent nurses can save the time, money, and energy devoted to educating and training the future nurses.

A mixed methods design will be employed. Using literature review and interviews with nurse students, clinical nurses, nurse experts, and nurse managers during the first qualitative phase, we will build a comprehensive item pool that has a focus on nurse students' personal characteristics. To increase the trustworthiness of interview findings, we will distinguish competent versus incompetent nurses by measuring their competence levels. In the second quantitative phase, the Nurse Competence Predicting Scale will be developed and tested for psychometric properties.

We believe that Nurse Competence Predicting Scale may help in early identification of nurse students who are at risk of not acquiring expected nurse competencies on graduation or joining the workforce. In such cases, educational managers may take timely remedial interventions.

Key words: nurse competence, personality characteristics, emotional intelligence, nurse student, mixed methods study, scale development, psychometric evaluation

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BACKGROUND

Nurse competence has been extensively addressed in the literature in terms of safety and quality of nursing care (1-3). The competence of nurses directly influences the health status of patients, and could reduce morbidity, mortality, and undesirable outcomes (4-6).

Evidence shows that caring professions necessitate particular personal and psychological characteristics, as well as essential knowledge and aptitude (7-9). Personality characteristics can strongly affect performance (10), educational achievements, job satisfaction, and ability of nurse students (11). Hence, some key personal characteristics are important in acquiring appropriate and effective nursing competence. On the other hand, these characteristics might only change desirably to as little as 30%, even in the excellent educational systems (12, 13). Therefore, applicants must be assessed for such attributes ideally before admission, to ensure that their personality matches with the job requisites (14).

Nursing schools invest money, time, and energy to educate and train nurse students, expecting that they will join the health care workforce. In Iran, about 100 baccalaureate nursing programs are offered all over the country (15). According to the Iranian Ministry of Health report in 2008, at least 6.400 students on average graduate from the nursing faculties in Iran (16). Nursing faculty anticipates students who will be academically successful and become competent in their profession, so as to compassionately provide high quality care to their clients, and remain in the profession for a long time. Early distinguishing of potentially successful students from those who are at risk, may save time and costs, but needs consideration of factors beyond grade point averages (17).

Despite this impetus for predicting (8), in Iran the applicants' personality characteristics are not assessed before admittance to nursing educational program (12). The consequence is that about half of nurse students admitted to nursing programs possess personality types incompatible with the nursing profession (18).

Admission of nurse students in Iranian schools of nursing

Most high school graduates in Iran, who look for higher education, participate in the centralized, nationwide, highly competitive exams, namely the National Higher Education Entrance Examination (NHEEE) to seek place in public and private universities (15). These exams are held annually in different major fields (Science, Math, Humanities, Arts, and Foreign Languages) to evaluate candidates' academic aptitude. Qualified candidates receive a report of their grades and ranks, upon which they expediently select the available educational programs in different fields (19, 20). Admittance will be according to the choice priorities and the vacant seats left in each field (15). This single exam provides the sole measure of students' preparedness for higher education (Figure 1).

High scorers usually choose medicine, pharmacy or dentistry because these majors provide them with better incomes in the future; however, low scorers desperately choose the rest majors, including nursing, while they often lack enough knowledge and realistic insight about the nature of this profession (15, 21). Even if these students successfully complete the program, some of them will not join the nursing workforce; and if they do, still part of them will leave the profession too early. Among those who remain, sizeable proportion will be working at a competence level rather lower than expected because of lacking interest. As a result, they will experience tensions, and gradually become apathetic, ineffective, unmotivated, and dissatisfied, making the work ambience dull. The situation even worsens when they face poor working conditions, heavy workload, low income and restricted autonomy in their profession (21, 22). This adds to the complexity of interrelated factors (e.g. wrong criteria for admission, methods of teaching and evaluation, content of courses, attrition) hold to be associated with low quality nursing care in the country. Relying on this sole measure of students' academic preparedness, as a method of admittance, is believed to be the root for most challenges in nursing profession in Iran (15, 19).
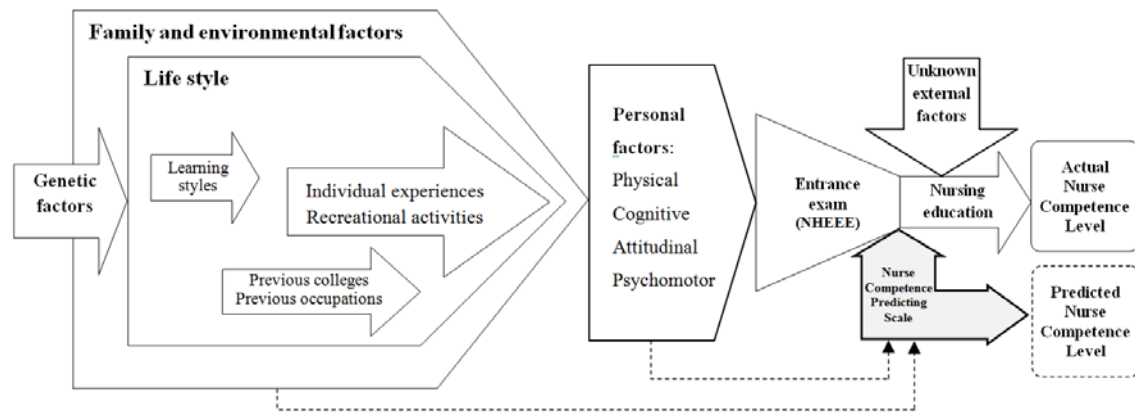
Figure 1. *Hypothetical factors influencing the nurse competence level based on the admission method of nurse students in Iranian nursing schools and Nurse Competence Predicting Scale possible role*

Hence, nursing faculty should inevitably adopt a strategy to ensure that a nurse student will succeed in his or her career as a future competent nurse (23). The present study protocol has been designed to meet this need by developing a predicting scale. Administering to newly admitted nurse students before initiation of nursing educational program, this scale may provide the faculty with a better vision regarding the students' likelihood for becoming a competent nurse on graduation or joining the workforce. Accordingly, the faculty would be able to decisively persuade or dissuade at risk students to remain in the profession or to leave it before wasting time, money, and energy.

Aims and Assumptions

This study aims to develop and validate the Nurse Competence Predicting Scale (NCPS), as a self-report instrument, based mainly on some key personal characteristics of nurse students including personality types and emotional intelligence, to estimate the likelihood of nurse students to become competent nurses on graduation or when they join the workforce. We base our study on the notion that nurse competence is linked with intelligence, which it is, in turn, the product of some key personal characteristics as well as the knowledge acquired by the individual during his or her life (11, 13) (Figure 1).

METHODS/DESIGN

This methodological study will adopt a mixed methods design (24) including two phases (Figure 2). Findings of phase 1 will inform the phase 2, helping to build the item pool that will focus on personal characteristics of nurse students, as possible predictors of their future nurse competence (24, 25). During phase 2, we will perform psychometric analysis of the NCPS, and norm assessment in students' population.
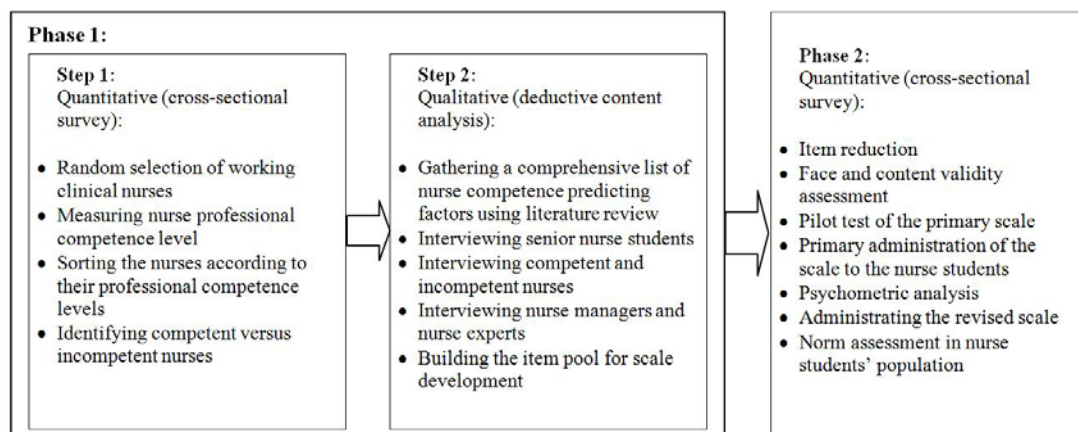

Figure 2. Phases of the study

Objectives of phase 1 (step 1)
- *To measure the nurse competence level of selected nurses working in clinical wards*
- *To identify groups of competent versus incompetent nurses*

Objectives of phase 1 (step 2)
- *To gather a comprehensive list of nurse competence predicting factors discussed in the literature*
- *To identify possible nurse competence predicting factors emerging from data obtained by interviews with nurse students, clinical nurses, nurse managers, nurse experts*
- *Building the item pool for NCPS, using the information from literature and interviews*

Objectives of phase 2
- *To examine the face and content validity of the NCPS*
- *To assess the construct validity, convergent validity; known group validity, and reliability of the NCPS (internal consistency)*
- *To standardize the NCPS scores in nurse student population*

Participants

Participants of phase 1, step 1

A convenient sample including about 200 nurses from different academic hospitals will be selected in this step. Inclusion criteria will be possessing history of clinical working experience at least for 1 year, and to be working as a clinical nurse in one of academic hospital wards.

Participants of phase 1, step 2

Senior nurse students studying in Mashhad School of Nursing and Midwifery, clinical nurses who will obtain the highest and lowest competence scores in step 1 (about 15 nurses from each group), nurse managers working in their position at least for one year in the academic hospitals, and nurse experts who have at least 10 years of academic experience will be interviewed.

Participants of phase 3

All the nurse students studying in Mashhad School of Nursing and Midwifery for the nursing baccalaureate degree at the time of study (n≈330).

Procedures

During the first and second steps, we will collect data to be used in item generation and building item pool for NCPS. In step 1, we will identify two groups of competent versus incompetent clinical nurses, using a nurse competence measuring scale, as well as consulting with their managers. In step 2, we will interview a subsample of typical nurses identified in phase 1, as well as senior nurse students regarding possible personal predicting factors they believe that might have been influential in shaping their present nurse competence level. Also, we will interview nurse managers and nurse experts regarding the key personal characteristics possibly effective in shaping nurses' competence level. During phase 2, we will build item pool for NCPS, develop and administer the primary version of the scale to the nurse student population, evaluate its psychometric properties, and assess its norm.

Phase 1, step 1 (quantitative)

A cross-sectional survey will be used in this phase to measure the nurses' competence level. The nurses with high and low extreme scores will be identified to be interviewed during the step 2. Additionally, nurses' personality type and emotional intelligence will be assessed.

Instruments

Nurse Competence Scale (NCS) (26-28), and a questionnaire for background variables (years of clinical experience, age, sex, marital status, place of residence, high school and university types) will be used. Both the questionnaires will be in paper and pencil form.

Nurse Competence Scale (NCS)

This self-report scale has been shown to be valid and reliable for measuring the dimensions of nurse competence by several studies internationally (28-35). It is sensitive enough to distinguish the levels of nurse competence in different settings and variety of work experiences (26, 30). Persian translated form of NCS, adapted and validated within the context of Iranian hospitals, and used in several studies in Iran (31, 32, 36, 37), will be administered to measure nurse competence level of selected nurses. This scale comprises 73 items in seven categories, including: helping role (7 items), teaching-coaching (16 items), diagnostic functions (7 items), managing situations (8 items), therapeutic interventions (10 items), ensuring

quality (6 items), and work role (19 items). Nurses will rate themselves on each item, using a visual analogue scale (0–100), while 0 denotes very low and 100 denotes very high competence level. Parallel to each competency, the frequency with which it is used by the nurse during their clinical practice will be measured, using a four point rating scale (0, not applicable in my work; 1, used very seldom; 2, used occasionally and 3, used very often in my work). The total competence score will then be categorized into four nurse competence levels as low (0–25), quite good (25–50), good (50–75), and very good (75–100) (26).

Data collection

The researcher will visit the selected nurses at their work place. After introducing the purpose of the research, receiving an informed written consent, and giving necessary instruction, the NCS, as well as demographics, questionnaire will be administered at the same time. In case of any question or ambiguity, researcher will help to resolve the issue. The researcher and the participant will set the time for the next visit to receive the completed questionnaire. Data will be transferred into an electronic file to be analyzed using statistical software.

Data analysis

The data analysis will be performed using SPSS version 11.5. In all analyses, statistical significance level will be set to 0.05. Descriptive statistics will be used to analyze the data. In each scale, subcategory scores as well as total scores will be computed and analyzed separately. Also, the measures of central tendency (mean, median, and mode) and variability (range, variance, and standard errors of mean) for continuous variables, and the relative frequencies for categorical variables, will be calculated.

The nurses' competence scores and their group allocation will be discussed with, and verified by their nurse managers who have worked closely with them. In case of any unresolved incongruity between the nurse managers' judgment and the nurses' competence level, the researchers will skip that case, and will consider the next nurse in the sorted list of nurses' scores.

Dividing nurses into two groups of high versus low NCS scores will bring us two known groups of namely competent versus incompetent nurses, as good sources to achieve enriched qualitative interview data based on their experiences regarding the key personal characteristics they believe to be involved in shaping the nurse competence level.

Phase 1, step 2 (Qualitative)

In this step, a deductive content analysis study will be conducted. Based on the nurses' self-evaluation scores achieved during step 1, we will select about 15 nurses from each group of nurses with the highest and lowest scores, to interview. Also, senior nurse students, nurse managers and nurse experts will be interviewed. Adopting a qualitative approach, we will conduct semi-structured, face to face interviews, in which the following open-ended questions will be asked from clinical nurses and senior nurse students:

How do you evaluate your nurse competence level?

What special characteristics in your personality you think that may have shaped your present level of nurse competence?

Thinking back over, what special things or events in your past history you think that might have caused you to be at this level of nurse competence?

Question to be asked from nurse managers and nurse experts will be:

What personal characteristics in newly admitted nurse students you believe that may help them to become a competent nurse after graduation?

Data collection

Interviews will be conducted in a calm and convenient place and at a planned time. Using an interview guide, the interviews will be digitally recorded. On finishing each interview, verbatim transcription will be made. In addition to the interviews, relevant literature will be reviewed to obtain a comprehensive list of personal characteristics, suggested as possible predictors of nurse competence.

Data analysis

Interview data will be qualitatively content analyzed using deductive approach (38, 39) in order to extract finding which will help to build items pool of NCPS (40). The information regarding the predicting factors of nurse competence, discussed in the literature will be categorized and integrated with the data emerging from interviews. We believe this approach will bring us with some contextual and culturally specific variables with possible predictive value. MaxQDA-10 software will be used for content analysis of the transcribed interviews.

Rigor

Face to face interviews with nursing stakeholders, including known groups of clinical

nurses who possess the highest and lowest extreme nurse competence scores, nurse students, nurse managers, and nurse experts, may provide enriched, triangulated, and valuable data, that if integrated with the relevant information in the literature, can help us in building a comprehensive items pool for NCPS. Adopting a mixed methods approach will increase the trustworthiness, providing more scrutiny for data extraction, analysis and synthesis.

Phase 2 (Quantitative)

Employing a cross-sectional survey, the primary NCPS will be administered to the nurse student population in order to examine its psychometric properties and norm. The scale will be a self-report questionnaire and in a paper and pencil form.

Instrument development steps

We will consider the 7 categories of Meretoja's NCS (helping role, teaching-coaching, diagnostic functions, managing situations, therapeutic interventions, ensuring quality, and work role) during item generation for the NCPS. Primary scale items will be refined during psychometric evaluation process.

Face and content validity

A panel including at least 5 nursing faculties who are experts in content and measurement of nursing competencies will be employed for item generation (41). After receiving needed information about the purpose of the scale, the experts will judge about the extent to which the items sufficiently measure the intended content within each dimension, any missing area, and the logical consistency of the items in the whole scale (42). Content validity index (CVI) will be calculated for each item, as well as the whole scale, using a four-point rating scale (1= not relevant, 2= somewhat relevant, 3= quite relevant, and 4= very relevant). The CVI for each item is calculated by dividing the number of experts who rate the item as 3 or 4, by the total number of experts. The CVI for the whole scale will be the average of all item CVIs. Both the item CVIs and scale CVI range from 0 to 1. According to the Lynn (41), in a panel of 5 experts or fewer, an item is accepted as valid only if all the experts rate it as quite or very relevant (CVI for the item=1.00). Commonly, the acceptable scale CVI is 0.9 (43). The primary version of the scale will be administered to 30 PhD and MS nursing student as potential respondents for pilot testing. They will be

asked to notice any ambiguity in items' wording and suggest any change, if necessary, to enhance the clarity.

Factor validity

Factor validity (latent factor structure) of the scale will be evaluated by exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) with maximum likelihood estimation. Principal component analysis with appropriate rotations (orthogonal and/or oblique) will be used during EFA to reveal factor structure(s) of the scale. Also, the items' distributions and variances will be examined (43, 44).

Known group validity

To assess the known group validity of the NCPS, we will compare the NCPS scores of the talented nurse students, as well as competent clinical nurses with the highest NCS scores, with the NCPS scores in normal population of nurse students.

Convergent validity

We will use nurse students' clinical course GPAs to examine the convergent validity of NCPS. We expect the nurse students with higher clinical course GPAs will achieve higher NCPS scores. The Pearson product-moment correlation coefficient will be calculated for this purpose.

Reliability testing

To evaluate reliability of the NCPS, Cronbach's α coefficient for the whole scale (as well as its subcategories, if any) will be calculated in a pilot test. The lowest acceptable value of Cronbach's α for developed tools is 0.80, whereas the acceptable value for instruments in early developmental stages is 0.70 (42, 45). Since the scales comprising more than 15 items may exaggerate the alpha value, the mean inter-item correlation and the mean item-partial total correlation will be assessed if necessary (46).

DISCUSSION

Some studies suggest that individual personal characteristics are rationally associated with nursing attributes (9, 11, 12, 47-50), hence, it is crucial to consider these characteristic when selecting the individuals to work in critical professions that deal with human life and health, such as nursing (11, 14). High rates of attrition in nursing schools and hospitals as well as low quality of nursing care in many countries confirm this. It is believed that such characteristics are relatively unchanged during individual life time, and educational

systems can barely change such characteristics (51). Moreover, it is conceived that some essential personal characteristics, such as personality traits, function universally in different cultural and societal contexts, and they affect individuals' performance in a similar fashion (52), while the educational systems, even in developed countries with highly disciplined and strict educational systems, can barely alter these characteristics (13). This necessitates more serious attention to the key personal characteristics when investing time, money, and energy to select and train our future nurses among the candidates.

This study intends to develop and validate the NCPS, as a self report instrument that can be administered to newly admitted nurse students in order to predict their nurse competence level on their graduation or when they join the nursing workforce. This scale will be developed based mainly on some personal characteristics that may act as predictors of nurse students' level of professional competencies (11, 53-56).

Previous studies in different countries have tried to predict nurse students' success in different ways; most of them assumed the successfully passing of the NCLEX-RN as a criterion for their nurse competence (7-9, 14, 47-49, 55, 57-61). However, in the present study, through developing the NCPS, we will examine the nurse students' personality type along with other personal characteristics, as predictors of nurse competence level on graduation or joining the workforce, considering the NCS scores and clinical course GPAs of nurse students as the indicators of nursing competencies.

In countries like Iran, in which the nurse students are admitted only through a single central official exam, without being assessed for compatibility of their personal characteristics with nursing profession, the NCPS can be administered to newly admitted nurse students at the beginning of the nursing program to predict their competence level on graduation or when joining the workforce. Also, this scale may be used in other countries with different student admission approaches for the same purpose, before or after admission. In either case, this scale could play an important role in identifying the applicants or students who are potentially at risk of failure. Hence, it may enable nursing faculty to achieve a better view of the scene regarding their students and promptly implement appropriate remedial interventions if necessary.

Strengths and Limitations

What we believe that makes this study stronger than similar ones is that we will use a mixed method design. We will interview both the competent versus incompetent nurses to provide detailed and invaluable contrasting data regarding the factors associated with their present nurse competence level based on their personal experiences. Integrating such data with those obtained from interviews with other stakeholders in nursing (data triangulation), as well as the relevant information in the literature, enhances the richness and rigor of the study. Moreover, selecting a sample of nurses from diverse clinical settings may provide more heterogeneity of the study sample, thus more generalizability of the findings.

Also, we believe that developing our scale based on a set of key personal characteristics that are fairly similar in individuals of different cultures may increase its international applicability. Previous studies regard the NCLEX exam scores as the indicator of nurse competence level, while in the present study we will measure the nurse competence level directly using NCS as the dependant variable.

Moreover, the definition of nurse competence is surrounded by inconsistency and confusion (62), and this complicates the efforts for evaluation and prediction of nurse competence. Moreover, self-perceptions in relation to competence level may be delusive since they are subject to the degrees of response sets, impression management, and deceit (43). Thus, we acknowledge that the NCS has its own inherent limitations which may affect, to some extent, the validity of NCPS.

CONCLUSION

The NCPS may help nursing faculty to identify whether a nurse student will grow as a competent nurse or not. Using this scale, educational managers may be able to recognize at risk students and, accordingly a plan for appropriate remedies to help them successfully finish the educational program, join the workforce, and remain in the profession for long time as competent nurses. We believe this could save considerable costs otherwise imposed to educational and health care systems due to attrition and low quality of nursing care and its outgrowth.

Ethical aspects and conflict of interest

All the participants will be given written description of study details and further supplemental verbal information. An informed written consent will be obtained. Participation in the study will be voluntary. Authors declare no conflict of interest.

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Author contributions

Conception and design **(AH**, **HK, MRA**) manuscript draft **(MRA)** statistical expertise **(HK)** critical revision of the manuscript **(AH, HK)** obtaining the funding **(AH)** final approval the manuscript (**AH**, **HK, MRA**).

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Koliko je verovatno da studenti fakulteta za medicinske sestre i tehničare postanu kompetentni za rad u svojoj struci? Protokol za uvođenje skale uz pomoć studije kombinovanih metoda

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SAŽETAK

Cilj ovog rada bio je da razvije i ustanovi skalu kojom bi se procenjivale mogućnosti studenata strukovnih studija za medicinske sestre i tehničare da postanu kompetentni u svojoj struci.

Upis studenata na studijski program za medicinske sestre i tehničare bez ikakve procene njihovih ličnih osobina je dovelo do ozbiljnih posledica, uključujući i slab kvalitet pružene nege. Rano otkrivanje studenata koji će napustiti studije ili će postati nestručni može uštedeti vreme, novac i energiju posvećenu edukaciji i obuci budućih medicinskih sestara i tehničara.

U radu ćemo primeniti dizajn kombinovanih metoda. Pregled literature i intervjui sa studentima sestrinstva, kliničkim medicinskim sestrama, medicinskim sestrama koje su eksperti u svojim oblastima, sestrama menadžerima u toku prve kvalitativne faze pomoći će nam da formiramo sveobuhvatan skup pojmova koji će se fokusirati na lične osobine studenata. Kako bi se povećala pouzdanost rezultata intervjua, razlikovaćemo kompetentne od nekompetntih medicinskih sestara merenjem nivoa njihove kompetentnosti. U drugoj kvantitavnoj fazi ustanovićemo Skalu za predviđanje kompetentnosti medicinskih sestara koja će biti testirana zbog psihometrijskih karakteristika.

Smatramo da Skala za predviđanje kompetentnosti medicinskih sestara može pomoći u ranom otkrivanju studenata sestrinstva koji nakon diplomiranja ili zapošljavanja neće imati očekivanu kompetentnost. U takvim slučajevima, menadžeri u oblasti obrazovanja mogu pravovremeno preduzeti popravne mere.

Ključne reči: kompetentnost medicinske sestre, lične osobine, emocionalna inteligencija, student sestrinstva, studija kombinovanih metoda, razvoj skale, psihometrijska procena