Review on instruments for measuring competence of scope of research in nursing study

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Abstract:

Increasing nursing research competence instruments have been developed. However, a systematic review and evaluation of nursing research competence instruments is lacking. This scoping review was conducted by updated methodology for scoping reviews and reported according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews checklist. Reviewers searched articles in eight the literature screening and data extraction were conducted by two reviewers, independently. A third reviewer was involved when consensus was needed. The Consensus-based Standards for the selection of health Measurement Instruments methodology was used to evaluate the methodological quality and measurement properties of the nursing research competence instruments. Ten studies involving eight nursing research competence instruments were included. None of the existing instruments have assessed all measurement properties.

Keywords:

Research, Nursing study, competence, health Measurement, Nurse, Health care

1. Introduction:

Nursing research competence (NRC) refers to the individual nurse's ability to conduct nursing research activities. Evidence-based nursing has developed rapidly in recent years, and the importance of evidence-based nursing in improving clinical nursing quality has been confirmed by many researchers. However, there is currently a lack of relevant available evidence focusing on clinical problems, so it is necessary for some nurses with nursing research competence to conduct original research on clinical practice in order to generate relevant available evidence and promote evidence-based nursing practice. Specifically, enhancing the NRC of nurses holds significant importance in the advancement of high-quality clinical nursing research. For clinical nurses who are inclined towards research, possessing a strong NRC competence can motivate them to address clinical issues scientifically, apply evidence-based practices, and contribute to bridging the gap between theory and practical application. As future nursing researchers and nurses, improving the NRC of nursing students has a positive promoting effect on the future development of nursing. Using NRC instruments are necessary to evaluate the NRC of nursing staff and the effectiveness of interventions.

Measuring the NRC of nursing staff is important for research, education, and management purposes. Research has shown that clinical nurses are the end users and producers of nursing research, and nurses with research competence can promote the development of nursing discipline. The prerequisite for improving nurses' research competence is to clarify the current situation and influencing factors of nurses' research competence, which provides a precise theoretical basis for formulating intervention plans to improve nursing staff's research competence. However, an important way to clarify the current state of NRC and its associated factors was to use precise NRC instruments to measure NRC. COSMIN (Consensus-based Standards for the Selection of Health Measurement Instruments) is a consensus-based standard for the selection of health measurement instruments, which can evaluate the methodological quality and measurement properties of measuring instruments and provide recommendations for instrument selection. This study evaluated all measurement properties of the NRC instruments based on COSMIN methodology.

2. Literature review:

Recently, many NRC instruments have been developed, such as the Self-evaluated Nursing Research Capacity Questionnaire for nursing staff and the Scientific Research Competency

Research performed with outcome measurement instruments of poor or unknown quality constitutes a waste of resources and is unethical. Selecting a measurement instrument with good reliability and validity is crucial to accurately evaluate NRC. While there are numerous instruments available for measuring NRC, to our knowledge there is still a lack of comprehensive evaluation and research on the selection and development of guiding NRC instruments. Therefore, the purpose of this scoping review is to identify, evaluate, compare, and summarize the current NRC instruments and their usage, to provide guidance for researchers in selecting appropriate NRC instruments and developing new ones in the future.

This scoping review could answer the following questions:

(1)   Which NRC instruments have been developed and how they were used in related studies?

(2)   Were there any well-validated and reliable instruments for measuring NRC?

(3)   If there were more than one well-validated and reliable instrument for measuring NRC, were there circumstances under which certain instruments were more appropriate for measuring NRC than the other instruments?

(4)   What were the differences between NRC instruments designed for different groups (e.g., clinical nurses, nursing students)?

(5)   What were potential directions for the future development and improvement of NRC instruments?

3. Methods:

The inclusion criteria were as follows: (1) the instruments aim to measure NRC; (2) studies that targeted various nursing personnel (e.g., nurses, nursing students, nursing teachers et al.); (3) studies should concern NRC instruments; (4) the aim of the study should be the evaluation of one or more measurement properties, the development of NRC instruments, or the evaluation of the interpretability of the NRC

3.1. Study screening:

All studies were exported to an EndNote X9 library and duplicates were removed using its deduplication function. Two reviewers independently screened the titles and abstracts, followed by assessment of full tests of potentially eligible articles. Disagreements between the two reviewers were resolved by a third reviewer (QC). Any articles that were not available

online or through author contact were excluded, and the references of the included studies were also screened using the same process.

Two reviewers independently extracted data in the published protocol of this scoping review. A third reviewer (QC) reviewed the results and any disagreements were solved by discussion.

For all eligible studies of objective (1), we extracted information including the development and verification of instruments, measurement properties of the included the development and verification of instrument. However, none of the self-designed scales provided details about the development of NRC instruments or psychometric testing. Furthermore, the evaluation of these scales did not adhere to the COSMIN methodology nor was their data extracted in this study. The extracted data are shown in table. 1.

Table. 1: The methodological evaluation results of studies on measurement properties of NRC instruments

Instrument	Reference	Content validity	Structural validity	Internal consistency	Cross-cultural validity	Reliability	Measurement error	Criterion validity	Hypothesis testing for construct validity	Responsiveness
The Student Research Competence Instrument ①	(Arthur & Wong, 2000)	—	—	very good	—	doubtful	—	—	—	—
The Nursing Research Questionnaire among Nurse Clinicians ②	(Gething et al. 2001)	inadequate	—	very good	—	—	—	—	—	—

The Research Competency Scale for Nursing Students ③	(Qiu et al. 2019)	inadequate	very good	doubtful	—	doubtful	—	—	—	—
Scientific Research Competency Scale ④	(Duru & Örsal, 2021)	doubtful	adequate	very good	—	doubtful	—	—	(1) doubtful (2) doubtful	—
Self-evaluated Nursing Research Capacity Questionnaire ⑤	(Liu, 2004)	doubtful	adequate	very good	—	doubtful	—	—	—	—
The Nursing Scientific Research Ability Scale ⑥	(Wu et al. 2016)	inadequate	adequate	very good	—	doubtful	—	—	—	—
Self-evaluated Nursing Research Capacity Questionnaire (refined) ⑦	(Pan, 2011)	doubtful	very good	very good	—	doubtful	—	—	—	—

	(Chu et al. 2013)	doubtful	very good	very good	—	doubtful	—	—	—	—
Research Capacity Self-rating Scales of Nursing Staff ⑧	(Yin et al. 2016)	doubtful	adequate	very good	—	doubtful	—	—	doubtful	—

3.2. Quality appraisal and data synthesis:

Two reviewers appraised the quality of the studies, with a third reviewer (QC) resolving any disagreement. First, the content validity (instrument development and content validity) was considered the most important section to determine whether the instrument items were suitable for the construct of interest and target population. Next, evaluating the internal structure (structural validity, internal consistency, and cross-cultural validity) was crucial to understand how the items were combined into a scale or subscale. Finally, the remaining measurement properties (reliability, measurement error, criterion validity, hypotheses testing for construct validity, and responsiveness) were also taken into account. Based on the COSMIN methodology, the studies for objective (1) were evaluated through the following three sections.

4. Grading of the evidence:

The modified GRADE approach was used to rate the quality of evidence, based on the number and quality of available studies, their results, reviewer ratings, and consistency of results. The overall quality was graded as "High", "Moderate", "Low", or "Very low". Evidence quality was further downgraded based on the presence of risk of bias, inconsistency, and indirectness

Studies that only used the NRC instrument as a variable without testing its properties would not be evaluated, but their characteristics would be extracted.

5. Results

5.1. Search results:

A total of 3265 articles were retrieved, 920 duplicates were removed, and 454 were screened for eligibility. From these, 10 studies on NRC instrument development and psychometric properties, 177 empirical studies using a psychometric tested NRC instrument, and 23 empirical studies using a self-designed NRC questionnaire (without describing the development or/and the psychometric testing) were identified (Fig. 1).
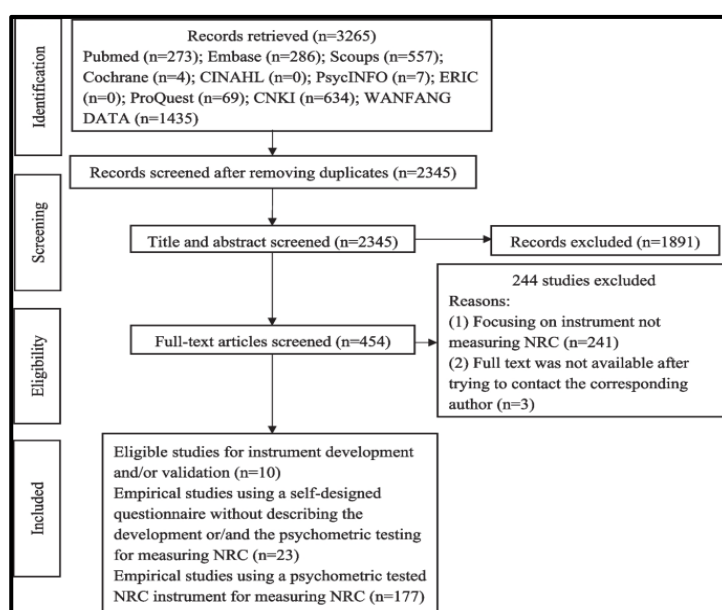

Figure. 1: PRISMA flow diagram for this scoping review

Table.1 presents characteristics of eligible NRC instruments and study populations for objective (1). Six original instruments, two modified instruments, and one psychometric property testing of one NRC instrument are featured in these tables. However, among the ten articles, two articles (one dissertation and another published in a peer-reviewed journal) were published by the same author describing the same instrument. Therefore, we only extracted and evaluated data from the dissertation for this instrument. Self-designed scales without description of the development or psychometric testing were not included in the quality appraisal.

6. Discussion:

Lack of reference to the target population during development was an important disadvantage in developing NRC instruments. The items in NRC instruments should be both relevant and

comprehensive for the "construct" being measured, as well as comprehensible for the study population. These elements are crucial for ensuring content validity, which is crucial for ensuring an instrument's psychometric properties, and? Requires cognitive interviews with the target population. However, only two NRC instruments conducted cognitive interviews with the target population during development, and these interviews lacked detail. However, details of the cognitive interview process were missing. Additionally, three studies asked the target population about the relevance, comprehensiveness, and comprehensibility of the instrument's content validity, while experts were consulted about the relevance and comprehensiveness of the instruments in all three studies.

By summarizing the usage of all NRC instruments, we found that nurses and nursing students were currently the main focus of research using NRC instruments, and more than 50% of the research was cross-sectional. This provides a theoretical basis for nursing researchers to understand the current situation of nurses and nursing students' NRC and develop precise intervention plans to improve their NRC.

It is worth noting that although RCT and Before-after study in the same patient have been conducted, there were few studies with a large sample size and a lack of longitudinal evaluation of the effectiveness of NRC intervention by nurses and/or nursing students. In addition, almost all research was conducted in China, which may be due to the fact that the majority (87.5%) of NRC instruments were first developed by Chinese researchers. Therefore, in the future, nursing researchers from different countries should improve existing NRC instruments, select appropriate NRC instrument based on specific contexts and cultural backgrounds, and conduct cross-cultural testing to clarify the NRC competence of nursing staff from different countries and provide a theoretical basis for formulating intervention measures.

7. Conclusion:

The study recommended NRC instrument as the most suitable among existing instruments, but calls for further research on the measurement properties of NRC instruments, especially cross-cultural validity, measurement error, and criteria validity. Additionally, researchers should evaluate and report on the interpretability and feasibility of NRC instruments, and explore the development of more reliable and feasible instruments for different nursing populations based on a unified concept of nursing research competence.

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