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## The Advantages of Factor Analysis as a Method of Testing Questionnaires in Health Research

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Heru Santoso Wahito Nugroho<sup>1</sup> (Corresponding Author), Abdullah Al Mamun<sup>2</sup>, Tanko Titus Auta<sup>3</sup>, Bahtiar<sup>4</sup>, Sanglar Polnok<sup>5</sup>, Joel Rey U. Acob<sup>6</sup>, Hammad<sup>7</sup>, I Putu Suiraoaka<sup>8</sup>, Ragu Harming Kristina<sup>9</sup>

<sup>1</sup>Center of Excellence of Community Empowerment in Health, Poltekkes Kemenkes Surabaya, Indonesia; heruswn@gmail.com

<sup>2</sup>Knowledge Dynamics, Rangpur, Bangladesh

<sup>3</sup>Department of Nursing, Bingham University Karu, Nasarawa State, Nigeria

<sup>4</sup>Nursing Department, Poltekkes Kemenkes Makassar, Indonesia

<sup>5</sup>Faculty of Nursing, Naresuan University, Thailand

<sup>6</sup>Faculty of Nursing, Visayas State University, Philippines

<sup>7</sup>Department of Nursing, Poltekkes Kemenkes Banjarmasin, Indonesia

<sup>8</sup>Department of Nutrition, Poltekkes Kemenkes Denpasar, Indonesia

<sup>9</sup>Department of Environmental Health, Poltekkes Kemenkes Kupang, Indonesia

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### ABSTRACT

Questionnaires are a data collection method that is widely used in health research. Nowadays, the validity test that is often used to assess the quality of questionnaires is the item-total correlation test. This study aims to introduce another method that is often said to be better by experts, namely factor analysis. When compared with item-total correlation analysis, factor analysis has the advantages of: 1) it can reveal the latent structure of the variables being measured; 2) can capture multivariate variations; 3) can test construct validity, namely whether the questionnaire is able to measure concepts or constructs theoretically; 4) can determine how many factors are needed to explain the variance in the data. It was concluded that taking into account its advantages, factor analysis is the best choice for testing the validity of questionnaires in health research.

**Keywords:** health research; questionnaire; validity test; categorical variables; factor analysis

### INTRODUCTION

Questionnaires are a data collection method that is widely used in health research.<sup>(1)</sup> A questionnaire is a measuring tool that contains a number of questions or statements that must be answered by the respondent in writing.<sup>(2)</sup> Questionnaires can be used to measure various aspects of health,<sup>(3)</sup> such as knowledge, attitudes, behavior, satisfaction, quality of life, etc. Questionnaires have several advantages, including: easy to compile and distribute, cost and time saving, can cover a wide and diverse population, reduce bias because there is no direct interaction between researchers and respondents, and allow objective statistical analysis.<sup>(2,4)</sup> However, questionnaires also have several weaknesses, including: requiring cooperation and honesty from respondents, susceptible to errors in filling or returning, difficult to capture nuances or implicit meanings, limited in explaining cause-and-effect relationships, and requiring high validation and reliability.<sup>(4)</sup> Therefore, questionnaires must be prepared carefully and in accordance with the research objectives, and tested first before being widely used.<sup>(5)</sup>

### TEST THE VALIDITY OF THE QUESTIONNAIRE

More specifically, questionnaires must be tested before being used in research to ensure that the data collection instrument meets the validity, reliability and readability of the questions.<sup>(2,3,5)</sup> Validity is the level of conformity between questions and research objectives. Questionnaires must be tested for validity to ensure that the questions asked are able to measure the variables studied precisely and accurately.<sup>(6)</sup> Questionnaire validity shows how much conformity there is between theoretical concepts and the operational indicators used in the questionnaire.<sup>(7)</sup> If the questionnaire is invalid, then the research results obtained from the questionnaire cannot be trusted and cannot be generalized.<sup>(6,8)</sup> Therefore, testing the validity of the questionnaire is an important step that must be carried out by researchers before using the questionnaire as a data collection tool.<sup>(2)</sup>

Reliability is the level of consistency of measurement results from the same question.<sup>(9)</sup> Questionnaire reliability is the extent to which a questionnaire can produce consistent and reliable results if repeated under the same conditions.<sup>(10)</sup> The reliability of the questionnaire must be tested to determine the validity and quality of the research instrument. If the reliability of the questionnaire is low, then the research results cannot be generalized

or interpreted correctly.<sup>(11)</sup> The method chosen depends on the type and objectives of the research, as well as the characteristics of the respondents and the variables being measured.

Readability of questionnaire questions is the level of ease for respondents to understand and answer the questions.<sup>(4)</sup> The readability of the questionnaire must be tested because it can affect the validity and reliability of the research results.<sup>(6,12)</sup> If the questionnaire is not easy to read, respondents may be confused, misunderstand, or not be interested in filling out the questionnaire.<sup>(13)</sup> This can lead to measurement error, bias, or low response rates. Therefore, questionnaire readability testing aims to evaluate how well the questionnaire can be delivered and understood by respondents, as well as to identify and correct problems that may exist in the design, content or presentation of the questionnaire.

Returning to validity, there are several ways to test the validity of a questionnaire, one that is often used is correlation analysis between each item and the total items.<sup>(14)</sup> Actually, there is another good method for testing the validity of a questionnaire, namely factor analysis.<sup>(15)</sup> Many experts even say that this method is the best way to test the validity of a questionnaire. Factor analysis is a statistical method that can identify the relationship between variables measured in a questionnaire and group them into factors that represent theoretical constructs. With factor analysis, we can find out whether the questionnaire we created is able to measure the constructs we want validly and reliably. In addition, factor analysis can also help us to reduce the number of questionnaire items that are redundant or irrelevant to the construct being measured.<sup>(16)</sup> Factor analysis can help reduce the dimensionality of the data and extract the latent factors underlying the variables. Factor analysis can also help test the construct validity of a questionnaire, namely the extent to which the questionnaire is able to measure the desired concept or construct.

If detailed, the advantages of factor analysis over item-total correlation analysis in testing the validity of questionnaires are as follows:

- 1) Factor analysis can reveal the latent structure of the variables being measured, while item-total correlation analysis only measures the linear relationship between items and the total score.<sup>(15,17)</sup>
- 2) Factor analysis can capture multivariate variations, while item-total correlation analysis only captures univariate variations.<sup>(15,18)</sup>
- 3) Factor analysis can test construct validity, namely whether the questionnaire is able to measure the concept or construct theoretically, while item-total correlation analysis only tests content validity, namely whether the questionnaire covers all aspects of the concept or construct empirically.<sup>(15,16)</sup>
- 4) Factor analysis can determine how many factors are needed to explain the variance of the data, while item-total correlation analysis cannot determine how many items are needed to form a reliable and valid scale.<sup>(15)</sup>

## CONCLUSION

It was concluded that taking into account its advantages, factor analysis is the best choice for testing the validity of questionnaires in health research.

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