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METHODS FOR DECISION-MAKING IN SURVEY QUESTIONNAIRES BASED ON LIKERT SCALE

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ABSTRACT

Opinion-based questionnaires on Likert scales are commonly used in assessing health care utilization, facilitating factors and barriers. There is a need to set up a cut-off point in them to arrive at a conclusion. It is also important to set up a cut-off point on overall items in Likert scale-based questionnaires used for assessing Knowledge, Attitude and Practice. In this article, we show how to formulate a tool for decision-making in survey questionnaires and readjust their cut-off points to incorporate the population variation for items containing ordinal variables. This method can be used for setting up a cut-off point to arrive at a diagnosis in a newly developed instrument with ordinal variables which does not have any gold-standard instrument for comparison.

Keywords: Ordinal; reliability; item; analysis; Cronbach's alpha; correlation.

INTRODUCTION

A Likert scale is a psychometric scale commonly involved in research based on survey questionnaires. Here, the respondents specify their level of agreement or disagreement on a symmetric agree-disagree scale for a series of statements while responding to a particular Likert questionnaire item. The range of Likert scale captures the intensity of their feelings for a given item. However, the result of analysis of multiple items reveals a pattern that has scaled properties. (Likert, 1932; Jamieson, 2004; Carifio and Rocco, 2007)

In a Likert scale-based instrument, item analysis provides a way to exercise additional quality control over the tests by providing feedbacks on how successful the assessment actually was. An item analysis gets at the question of how well does it discriminate. If there are lots of items that didn't discriminate much at all then they need to be replaced by some better ones. Item analyses can also help the investigators diagnose why some items did not work especially well and suggest ways to improve them. (Ebel, 1954; Lentz, 1988; Jamieson, 2004)

It is also difficult to set up a cut-off point on overall items considered to assess Knowledge, Attitude and Practice (KAP) levels in Likert scale-based questionnaires to decide whether the overall knowledge of the respondents is adequate or not, their overall attitude is positive or negative and their overall practice is satisfactory or unsatisfactory. Setting up a cut-off point is also necessary for opinion-based questionnaires on health care utilization, facilitating factors and barriers to arrive at a conclusion of whether people are utilizing or recommending a procedure adequately or not, but it is often difficult to determine it. In this background, a study was conducted to formulate a tool for decision-making in Likert scale-based survey questionnaires and readjust their cut-off to incorporate the population variation for items containing ordinal variables.

Objective

To determine the Cut-off Point of an instrument with ordinal variables in Likert Scale without any reference gold-standard.

METHODS

This procedure is applicable for items having Ordinal Variables - e.g., scale of disagree to agree where the respondents are instructed to provide their personal opinions or perceptions in a ordinal Likert scale. In the first step, the individual items in the Likert Scale Questionnaire need to be given equal weightage by at least three Content Experts. In the second step, the weightage of each response in each item is directly proportional to the Discrimination Index (DI) as well as Internal Reliability or Cronbach's alpha. Hence, the weighted score for reach response in each item is obtained by getting the Observed Item Score multiplied by the product of Discrimination Index and Internal Reliability or Cronbach's alpha. The "Correction Factor" is developed for making an adjustment in the overall cut-off value of the instrument. It is obtained from the ratio of the total weighted score and the total raw score. The overall cut-off value for the instrument is obtained by multiplying the "Correction Factor" with the [Median of individual Raw Score – 25^{th} percentile of Interquartile Range (IQR)] of each item and finally summing them up together.

The detailed mathematical model for the determination of a cut-off level in test instrument is described below:

(A) Equal Weightage to Individual Items by Content Experts (weightage of each individual item in the Likert Scale Questionnaire by at least three content experts)

All the individual items in the Likert Scale Questionnaire are given equal weightage.

(B) Calculation of Discrimination Index (DI) of individual items

= Spearman's Correlation Coefficient

(C) Weightage of each response in each item of the questionnaire

= (Observed Item Score) X (Weightage by Content Experts) X (Discrimination Index) X (Internal Reliability or Cronbach's alpha)

(D) Correction Factor = (Total Weighted score) / (Total Raw Score)

(E) The cut-off point of an instrument without any gold standard

= Sum [(Median of Individual Raw Score – 25^{th} Percentile of IQR) X (Correction Factor)]

RESULTS AND DISCUSSION

This statistical procedure needs to be verified with the content experts with various Likert scale-based instruments. Item discrimination indicates the extent to which success on an item corresponds to success on the whole test. Since, all items in a test are intended to cooperate to generate an overall test score, any item with negative or zero discrimination undermines the test. The Discrimination Index (D) is computed from equal-sized high and low scoring groups on the test. (Ebel, 1954; Lentz, 1988) It is the Spearman's correlation coefficient between responses to a particular item and scores on the total test (with or without that item). (Symonds, 1928; Ebel, 1954; Tzuriel and Samuels, 2000) Summated scales are often used in survey instruments to probe underlying constructs that the researcher wants to measure. These may consist of indexed responses to multi-point questionnaires, which are later summed to arrive at a resultant score associated with a particular respondent. The development of assessment scales also need to follow predictor variables for use in objective models. The concept of reliability rises as the function of scales is stretched to encompass the realm of prediction. Reliability tests are especially important when derivative variables are intended to be used for subsequent predictive analyses. If the scale shows poor reliability, then individual items within the scale must be re-examined and modified or completely changed as needed. One of the most popular reliability statistics in use today is Cronbach's alpha. It determines the internal consistency or average correlation of items in a survey instrument to gauge its internal reliability. (Symonds, 1928; Cronbach, 1951; Santos, 1999)

CONCLUSION

The procedure discussed in this study can be used for setting up a cut-off point to arrive at a diagnosis in a newly developed instrument with ordinal variables in Likert scale which does not have any gold-standard instrument for comparison.

REFERENCES

Carifio, J. and J. Rocco, 2007. Ten common misunderstandings, misconceptions, persistent myths and urban legends about likert scales and likert response formats and their antidotes. Journal of Social Sciences, 3(3): 106-116.

Cronbach, L., 1951. Coefficient alpha and the internal structure of tests. Psychometrika, 16: 297-334.

Ebel, R., 1954. Problems of communication between test specialists and test users. Educational and Psychological Measurement, 14: 277-282.

Jamieson, S., 2004. Likert scales: How to (ab)use them. Medical education, 38(12): 1217-1218.

Lentz, F., 1988. Direct observation and measurement of academic skills: A conceptual review. New York: Guilford: Behavioral assessment in schools.

Likert, R.A., 1932. Technique for the measurement of attitudes. Archives of Psychology, 140: 1-55.

Santos, J., 1999. Cronbach's alpha: A tool for assessing the reliability of scales. Journal of Extension, 37(2): 34-36.

Symonds, P., 1928. Factors influencing test reliability. Journal of Educational Psychology, 19: 73-87.

Tzuriel, D. and M. Samuels, 2000. Dynamic assessment of learning potential: Inter-rater reliability of deficient cognitive functions, type of mediation and non-intellective factors. Journal of Cognitive Education and Psychology, 1: 41-64.