


# Chapter 6

## The Use of Rasch Analysis to Enhance Measurement Instruments in Education

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### **ABSTRACT**

*Constructing a valid and reliable measurement instrument is essential in education and research to ensure that all respondents are evaluated on the same scale. Validity and reliability ensure that inferences made from the instrument are trustworthy. This chapter discusses the Rasch analysis as a practical method for improving assessments to promote fair and inclusive practices. Consequently, this chapter aims to demonstrate the viability of Rasch analysis as a valuable tool for establishing validity, while also highlighting aspects that prospective Rasch analysis users should carefully consider when applying Rasch analysis to improve assessments. Rasch analysis appears to be a vital method for validating instruments because the model provides outputs that enable the designer to evaluate the dimensionality of the instrument, test hypotheses, and verify the instrument's internal consistency. The model offers statistics that can be used to assess the goodness-of-fit of the instrument items and to identify items that may function differently for respondents. However, Rasch analysis users are advised to carefully select the sample size, pay attention to misfitting items, and address issues related to missing data. Rasch analysis can be recommended as a practical approach for enhancing assessments.*

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## INTRODUCTION AND BACKGROUND

Developing fair and valid measurement instruments has become a prerequisite in modern-day life. Instruments are now developed and translated across languages and cultures to measure varying personality traits, attitudes, and cognitive abilities. The main concern is ascertaining the validity and fairness of an instrument to ensure that each respondent taking the assessment is measured on the same scale. Rasch's analysis offers a variety of statistical models that can be used to ascertain the fitness of the items and their functioning in slightly varying groups. This is because Rasch item analysis provides evidence of how well the item's content yields useful data about the abilities of the respondent (Othman et al., 2012). Use of the Rasch analysis provides designers with a better chance of improving the assessment from pilot testing data before it can be administered to the full sample.

The Rasch model analyses categorical data that include responses from instruments such as a competency assessment and survey questionnaires. Rasch Measurement Theory (RMT) is a model that plots persons and the items of the test on a straight line and thereafter calculates the scores of the respondents to determine where the item might have functioned differently for the respondents or whether the item is a misfit (Combrinck, 2018). This allows the designers to revise the assessment if items show signs of Differential Item Functioning (DIF). Using programs such as the Rasch Unidimensional Measurement Models 2030 (RUMM2030), and Winsteps Software, scholars and assessment designers can validate a measurement instrument and check for DIF using the outputs produced by the programs after running the Rasch analysis (Mthimkhulu, 2023; Roux, 2020; Souza et al., 2017). This chapter examines the literature on the viability of Rasch analysis as a method used to enhance measurement instruments while accounting for the shortfalls that accompany the model. It is important to note that there are a variety of statistical models housed under the RMT, such as multidimensional and unidimensional models. The user must select the appropriate model for their data, and this requires a basic understanding of the principles of measurement.

The Rasch analysis is grounded in the fact that the predictor of a construct lies in the relationship between item difficulty and the ability of the person taking the test (Boone, 2016; Linacre, 1994). Subsequently, it becomes mandatory to first articulate what is measured (Combrinck, 2020), and Rasch analysis will then provide sufficient statistics to determine how well it is measured. Researchers and organisations design instruments to measure various traits across disciplines; however, the method of ascertaining the validity and the fairness of the instrument is often not considered or given the attention it deserves. This chapter, therefore, contributes to the scientific instrument design literature by arguing for the feasibility of the Rasch analysis as a method of validating a measurement instrument for enhanced practices

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