Revised Competitiveness Index for use in China: Translation and Rasch analysis

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A B S T R A C T

To assess trait competitiveness, the 14-item Revised Competitiveness Index has become a frequently used measure, but to date it is not available in Chinese. The present study translated the instrument into Mandarin and tested its psychometric properties using Rasch analysis with a large sample of undergraduate students recruited from China. For the *Enjoyment of Competition* sub-scale, best fit to the Rasch model was obtained after discarding the misfitting items 1, 6, and 7. For the five-item *Contentiousness* sub-scale, suitable fit required two sub-tests. There was no evidence of threshold disordering or differential item functioning by personal factor for either of the sub-scales. These results support reliability and internal construct validity of an 11-item Mandarin version of the RCI.

1. Introduction

Theoretical models relevant to predicting student success and achievement typically refer to a number of key variables including motivation and self-efficacy (Pintrich, 2003) but also to variables encompassing wider contexts such as physical, psychological, social, and environmental quality of life (Henning, Krägeloh, & Wong-Toi, 2015). Another relevant variable is trait competitiveness or the personality characteristic that affects how people behave in various personal and professional situations (Smither & Houston, 1992). China, in particular, is known for its highly competitive schooling system, where children may often feel substantial academic pressure such as when preparing for entrance into university (Li & Li, 2010). For example, all students seeking university education must participate in competitive entrance examination (CEE), which is only offered once a year, and the CEE score is the single determinant of university admission for the vast majority of students (Bai, Chi, & Qian, 2014). Despite expansion of higher education over recent years, the number of applicants far exceeds the admission quota. In 2010, for instance, 6.5 million of 9.5 million were admitted to university as a result of the CEE. Recent reforms such as the Shanghai educational reforms do not address the selective nature of education, although they aim to address some of the unbalanced access to university entrance examinations and provide fairer opportunities to compete with other students (Deng & Zhao, 2014). The pressure to perform well in the exam, however, remains intense for Chinese students.

The role of competitiveness is complex and depends on a number of contextual factors (Honkimäki, Tynjälä, & Valkonen, 2004). At times it may be performance enhancing such as when peer support is available, or it can lead to debilitating anxiety in other circumstances (Bailey & Nunan, 1998). While competitiveness is typically associated with Western individualist cultures as opposed

to Eastern collectivist societies, empirical findings do not necessarily confirm this view (Jin, de Bot, & Keijzer, 2015). Other studies specifically highlight the different role of competitiveness across cultures: While competitiveness is generally associated with performance goals (competence in relation to others) in the West, this is not necessarily the same in the East where competitiveness may be related to mastery goals, as well (King, McInerney, & Watkins, 2012). Further research on the role of competitiveness in Eastern cultures such as China is necessary to understand cross-cultural differences, but such work is currently hindered by lack of suitable psychometric instruments in Chinese.

A number of competitiveness measures are currently available in English. The 28-item *Competition-Cooperation Attitude Scale* (Martin & Larsen, 1976) measures five factors relevant to competition: aggression orientation, fascist tendencies, independence orientation, power orientation, and work ethic orientation. The 15-item *Competitiveness Questionnaire* (Griffin-Pierson, 1990) distinguishes between interpersonal competitiveness and goal competitiveness, and the 15-item *Personal Development Competitive Attitude Scale* (Ryckman, Hammer, Kaczor, & Gold, 1996) assesses competition relevant to personal development, such as feelings of enjoyment and mastery. While these scales assess situational or behavioral aspects of competitiveness, another approach is to define competitiveness as a more stable personality trait. These include the recently developed 37-item *Competitiveness Orientation Measure* (Newby & Klein, 2014) and the more established *Competitiveness Index* (Smither & Houston, 1992).

The original version of the *Competitiveness Index* (Smither & Houston, 1992) presented 20 items on a true-false format. The *Revised Competitiveness Index* (RCI; Houston, Harris, McIntire, & Francis, 2002), in contrast, contains questions on a five-point Likert scale, which thus improved the instrument's psychometric properties. Unlike the *Competitive Index*, which contains the three factors *argument, emotion*, and *games*, the RCI does not contain items on winning in games and thus only has two factors denoted *Enjoyment of Competition* (nine items) and *Contentiousness* (five items). The proposed two-factor structure of the RCI was based on results from principal components analysis (PCA) using a sample of United States university students (Houston et al., 2002). Subsequent work also reported evidence for this structure when conducting PCA with other samples of university students in the United States (Harris & Houston, 2010) and also an exploratory factor analysis with United States university graduates (Ward & Eagle, 2013).

A more systematic and detailed investigation of the psychometric properties of the RCI was recently reported by Krägeloh et al. (2018) using Rasch analysis with samples of university student from New Zealand and the United States. Satisfactory fit for the *Enjoyment of Competition* could only be achieved after discarding item 9. For both sub-scales, there was evidence of local response dependency between some items, which could be resolved by creating sub-tests. For the *Contentiousness* sub-scale, one of these sub-tests exhibited differential item functioning by country, which could be resolved by splitting the item by country when estimating the Rasch model.

While the RCI has previously been used with Asian students, there is limited information about the performance of the scale in such populations. Houston, Harris, Moore, and Brummett (2005) compared levels of competitiveness of undergraduate university students in China, Japan, and the United States. Students in the United States and China completed the RCI in English, while students in Japan received the Japanese-language version. PCAs conducted separately for each sample revealed some differences in factor loading patterns. For the Chinese students, seven of the nine items from the *Enjoyment of Competition* sub-scale loaded together as a factor, and six of nine for the Japanese students. Four of the five *Contentiousness* items loaded together for the Chinese sample, and three of five for the students in Japan. These results indicate the need for more systematic investigation of the validity of the RCI for use in Asian student samples

The present study reports on the translation the RCI into Mandarin, followed by detailed psychometric testing of this Chinese version. Using a large sample of university students from a large university in central China, the psychometric performance of the translated scale were then analyzed in detail to inform a final set of items and a proposed factor structure. Rasch analysis (Rasch, 1960, 1961) is used in many different areas to investigate and improve psychometric properties of scales and in particular to evaluate internal construct validity (Mitchell-Parker, Medvedev, Krägeloh, & Siegert, 2017; Tennant & Conaghan, 2007). Therefore, Rasch methodology was chosen as a suitable method for that purpose as it provides detailed information about the overall scale and individual item functioning. Rasch analysis assumes that scores on a self-report response scale are determined by person ability (person quality) and item difficulty (item quality) and is able to display the spread of item thresholds by mapping both person and item parameters along the same log-odds interval scale. Items can be distinguished in terms of difficulty, which in this case refers to the probability that a person with a certain latent trait level endorses a certain score on an item. For example, if an item tends to be scored as "2" by a person with an average level of trait competitiveness, this item is more difficult to endorse than an item scored as "4" by the same person.

An important advantage of Rasch analysis is its ability to address limitations of ordinal scales such as Likert scales commonly used in self-report questionnaires. Technically, scores from ordinal scales can only be analyzed in terms of median and range instead of means and standard deviations (Merbitz, Morris, & Grip, 1989). Not only do ordinal scales have lower precision, but their use also breaks assumptions of parametric statistics, which can be rectified using Rasch analysis. If a satisfactory fit to the Rasch model is achieved for dataset, the final step of the analysis is to produce algorithms that allow the transformation of original ordinal scores to interval-level scores. Such data conversion has been demonstrated empirically to increase reliability and accuracy of measurement (Norquist, Fitzpatrick, Dawson, & Jenkinson, 2004) and has recently been recommended as a standard for reporting results from Rasch analysis (Leung, Png, Conaghan, & Tennant, 2017). The present study will follow this recommendation.