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Research Article

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The Validity and Reliability of the Group Regulation Scale Turkish Form: A Study with the Rasch Model

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Abstract

In this study, the group regulation scale was adapted to Turkish and validity was checked using Rasch Model. The original scale was created by adapting the form developed by Papamitsiou and Economides (2019) by Lai (2021). The scale used in this study was adapted into Turkish by the researchers with permission from Lai (2021). The original scale consists of 12 items scored on a five-point Likert type scale and 4 sub-dimensions (effort regulation, goal expectancy, help seeking and time management). This research was carried out on 170 university students based on voluntary participation using purposive sampling method. Rasch analysis was used for analyzing data in order to examine validity and reliability of the scores. According to the Rasch analysis results, it was concluded that the group regulation scale is a unidimensional measure of group regulation among university students.

Key Words

Group regulation • Rasch model • Regulation • University students

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Self-regulation is the use of the power of influence on the motivation, cognitive processes, emotional and behavioral states, and patterns of the individual (Bandura, 1994). The concept of self-regulation is the individual's awareness of his potential and inner abilities about the actions she/he will take (Bandura, 1991). Zimmerman and Schunk (2008) define the concept of self-regulation as the control of motivation-based behavior related to the next goal or ideal that a person sets of the individual.

The concept of self-regulation is grounded in the context of the Social Cognitive Theory (Bandura, 2001). According to the principle of mutual determination in this theory, external and internal factors are in constant interaction. Therefore, the individual regulates the processes of noticing, monitoring, and directing his behavior individually and environmentally. Environmental self-regulation involves regulating behavior in an environmental context. Internal self-regulation is the individual's awareness, monitoring, evaluation, and regulation of self-performance.

From a learning perspective, self-regulation is a motivational process in which students manage their emotions, thoughts, and behaviors in a planned manner in the context of learning goals and make adaptations when needed (Pintrich, 2000; Zimmerman, 2000). According to Zimmerman (1989), self-regulation is a process in which learners manage their own learning. This process consists of three cyclical phases. These phases are pre-thought, performance, and self-reflection. Pre-thought phase, pre-performance preparation; performance phase, operational processes; and self-reflection phase includes post-performance processes.

In learning environments, more important outcomes can be achieved, especially in the interaction of students with their peers. Especially successful cooperative group work requires self-regulation of students, both individually and, this provides a rich context for learning (Lai, 2021). Therefore, for group learning to be successful, students need to regulate their own learning as well as the learning of other members of the group as a group. As a matter of fact, according to Chan (2012), the work of group members is also reflected in their individual performances.

On the other hand, according to Kwon, Liu, and Johnson (2014), a group must coordinate its efforts and resources effectively to achieve common goals. According to Saab (2012), the concept of self and group regulation has common features in terms of task definition, process tracking, strategy development and evaluation. However, according to self-regulation, students who work collaborative with group members need extra group regulation behaviors. In addition, if group regulation behaviors are not coordinated in a planned way, positive results may not be obtained from the group-based learning process.

In order to design effective practices that will support students' collaborative behavior in a learning environment, it is necessary to define group regulation behaviors. As a matter of fact, the recently used learning environments (e.g. flipped learning, blended learning, social networking) allow group work as they offer various interaction opportunities (Durak, 2019; Durak, 2020; Sarıtepeci & Yıldız, 2014). To understand group regulation behaviors of university students, this study focuses on adapting a data collection tool to Turkish, which aims to measure these behaviors.

Aim of the Study

The purpose of this study is to examine if Group Regulation Scale reflects a single dimension of group regulation that can yield a single summary score according to Rasch Model. The dimensional structure of the scale was analyzed using Classical Test Theory (CTT) framework before (Lai, 2021). This study adds on the existing literature by utilizing advantages of Rasch framework which is theoretically more robust and feasible than CTT (Humphrey et al., 2011).

Method

Participants

The research data were obtained from 170 university students studying in different departments. Participants formed in accordance with the convenience sampling (Fraenkel, Wallen & Hyun, 2012) technique. 50 (29.4%) of the participants were female and 120 (70.6%) were male students. The mean age of the participants was 21.31 (SD=4.72). Most of the students were in their first years in university.

Research Instruments and Processes

For the adaptation of the scale, firstly, permission was requested from Chiu-Lin Lai via e-mail from the correspondence address in the scale article. After obtaining permission, two field experts who knew both Turkish and English were determined. One of these experts translated the scale items into Turkish. Other experts translated the scale items back into English. In this process, the meaning and comprehensibility of the items of the scale were examined and the consistency of the three item lists was examined. Necessary arrangements have been made. Then, the scale form was examined by two field experts in terms of meaning and comprehensibility and the final form was created.

Group Regulation Scale: This scale was originally developed by Papamitsiou and Economides (2019). Lai (2021), on the other hand, created an adapted form using this form. In the scope of the research, this scale was adapted to Turkish language. The original scale consists of 12 items and 4 sub-dimensions. The sub-dimensions are as follows: effort regulation, goal expectancy, help seeking and time management. The scale follows a 5-point Likert-type rating scale structure. In the original scale, the Cronbach's alpha values of this dimension were 0.78, 0.87, 0.80 and 0.85, respectively. In the study conducted by Lai (2021), it was concluded that the scale is a data collection tool with a high degree of validity and reliability. Within the scope of this study, the validity and reliability were re-investigated using a different methodology; Rasch Model.

Data Analysis

The analyses were conducted by employing Rasch Rating Scale Model (RSM, Andrich, 1978). The original instruments' dimensional structure was investigated by using Classical Test Theory (CTT) approach and exploratory factor analysis results yielded four factor structure (Lai, 2021). Rasch model is a member of Item Response Theory (IRT) Models that is frequently used to evaluate validity of the instruments by transforming ordinal data to an interval scale. The advantages of IRT models over CTT have repeatedly been cited in instrument development

literature. The most important benefits of IRT approach over CTT can be summarized as follows: (1) CTT uses sum scores which are ordinal in nature and threats them as interval level measures to make inferences. Yet, IRT models transform raw scores to logit scores using a logistic equation to estimate item difficulty and person ability measures. (2) In IRT models, each item and person can be analyzed individually via fit statistics to detect any aberrant person-level response behaviors or misfitting item (Hambleton, Swaminathan and Rogers, 1991). The logistic equation to estimate person and item parameters using Rasch RSM is presented and explained below:

$$ln\left(\frac{P_{nix}}{P_{ni\,x-1}}\right) \equiv B_n - D_i - T_k.$$

In this formula, the probability of selecting category x over selecting category x-1 depends on the threshold parameter *T*k which represents the transition point between two rating scale categories, *Bn*, which represents person's group regulation level and *Di* represents the difficulty of endorsing an item (Andrich, 1978). Parameter estimation for the RSM was conducted on Winsteps software (Linacre, 2021).

Messick's (1995) validity framework was utilized to assess construct validity of the scale. Under the framework content, structural, substantive and generalizability aspects of the validity were examined. The statistical indices that were used to evaluate each aspect of the construct validity using Rasch Model estimates are presented on Table 1.

Table 1

Statistical indices for validity inquiry

Statistical index	Type of validity	Cut score-Decision rule	Interpretation
Item fit	Content	Standardized unweighted mean-squared item fit (MNSQ) indices >2.00	If the indices are greater than 2.00,it may indicate lack of predictability in the responses.
Item fit	Content	Point-measure correlation values for items < .40	If the point measure correlation values are smaller than .40, this may indicate inconsistent scores on particular item with the scores of rest of items
Unidimensionality	Structural	Eigenvalues of the residuals >2.00	If the eigenvalues of the contrasts exceed 2.00, the contrast may imply a dimension in the data

Rating scale category thresholds (*Tk*)	Substantive	Category thresholds should increase at least 1.4 logits	Monotonic increase of category thresholds from one category to another implies consistency between observed responses and theoretical construct being measured.
Person separation reliability	Generalizability	A reliability value >.80	The value indicates how precise and replicable are the measures across different settings and applications within the same population

Content validity refers to the degree of items' representativeness of the construct being measured. For this, two types of item fit indicators were checked: point-measure correlation values and standardized unweighted mean-squared fit values. The point-measure correlation values quantify the relation between responses to a particular item and total score of the respondents on the instrument (Wolfe & Smith, 2007). Standardized unweighted mean-squared fit values display degree of fit between theoretical measurement model and response set to each item. For each item on the instrument, a fit value is calculated and expected to be between 0.6 and 1.4 logits (Linacre, 2002).

Another important validity aspect that was investigated in the study is structural validity which refers to the dimensional structure of the data. Winsteps program provides analysis of residuals via principal component analysis (PCA). We expected to obtain a unidimensional structure to proceed with Rating scale model (Andrich, 1978). The decision criteria was to obtain eigenvalue smaller than 2.00 for assuming unidimensionality (Linacre, 2002). After checking unidimensionality assumption for applying Rating Scale Model, we proceed to the analyses of rating scale categories as an evidence for substantive validity. The functionality of the rating scale for capturing the group regulation behavior supports if the observed responses and theoretical rationale that the instrument was grounded on is consistent (Messick, 1995). For this, we examined if the category thresholds advanced monotonically (at least by 1.4 logits, Linacre, 2002) as the values of rating scale categories increase. Lastly, we examined generalizability aspect of validity by checking the person separation reliability values which indicates if the responses are replicable and consistent across settings.

Results

Summary statistics for 12 items were outlined in Table 2. As seen in the Table, mean item difficulty measure was .00 while mean person measure was 1.81. It is promising to see that the range of item fit statistics ranged within the expected value for this statistics (min=. 82 logits and max=1.39 logits). The mean value of the standardized unweighted mean-squared fit statistics was 1.02. The fit values obtained from the data supported content validity aspect of the instrument. In addition, point measure correlation values were found substantially high, ranging

between .77 and .85, indicating instrument items functioned in accordance with each other and with the instrument as a whole. The item fit and correlation values indicated that content validity of the adapted group regulation scale has been established.

Table 2

Summary Statistics for 12 Items

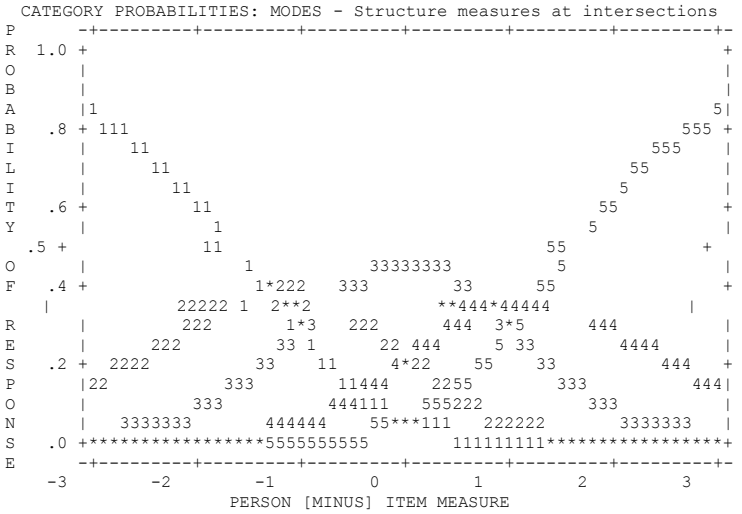
	Logit value	**Point-measure correlation**	**Standardized unweighted mean-squared fit index**
Mean	.00	.72	1.02
Standard Deviation	.44	.12	.16
Maximum value	.92	.85	1.39
Minimum value	-.63	.77	.82

Structural validity evidence was obtained based on PCA of the residuals results. The first contrast had an eigenvalue of 2.00 which means that it does not indicate a secondary dimension. Rasch measures explained 57% of the variance in the data. Overall findings supported that the instrument reflects a single measure of group regulation behavior. The instrument was unidimensional based on Rasch Rating Scale Analysis results.

The degree of effective functioning of rating scale provided evidence for substantive validity. Following Linacre's (2002) guidelines for rating scale effectiveness, category threshold measures were examined. The results suggested that category thresholds which advance monotonically and larger than 1.4 from one category to another. The visual inspection of rating scale category curves on Figure 1 also suggest that respondents were distinguished by the rating scale categories effectively

Figure 1

Category Probability Curves for the Full Scale



As seen on the above figure, each category point has a unique peak although category 4 was utilized as effective as other medium categories.

Lastly, the person separation reliability value was found as .87. This value was above the cut value for the reliability coefficient which indicates the person measures are replicable over different instrument administrations.

Discussion, Conclusion & Suggestions

In this study, it is aimed to adapt to Turkish language the "Group Regulation Scale" developed by Lai (2021). It is thought that the results obtained will contribute significantly to the studies on explaining and improving the group regulation performance of students. In addition, it is expected that studies on this topic will make significant contributions to the improvement of group-based learning activities and will support effective outcomes in higher education.

The psychometric properties of the Group Regulation Scale, which aims to measure group regulation for students for group work, were tested on a Turkish sample. Differently, Rasch model was used to investigate psychometric properties of the adapted scale. Summary of findings from Rasch analysis displayed satisfactory level of reliability and evidence of construct validity.

As a result of this study, it has been determined that the unidimensional and 12-item version of the Group Regulation Scale can be used as a valid and reliable measurement tool in Turkish culture. However, there are some limitations of the study. In this study, it was not examined whether the students participating in the research experienced participating in group work or whether they took an active role in group work. Due to this situation, the effects of experience and active performance on students' self-regulation activities in group work cannot be determined. On the other hand, in studies examining regulation in the literature (e.g. Lin & Tsai, 2016), it is seen that self-regulation behaviors are generally measured. Again, in the literature, beyond self-regulation, regulation behaviors within the group have been discussed in the context of co- and socially shared regulation (e.g. Quackenbush & Bol, 2020; Ito & Umometo, 2021; Hadwin, Järvelä, & Miller, 2011; Uslu, & Yildiz Durak, 2022). This study, unlike previous studies, focused on the term group regulation. In future studies, taking into account the risk factors in the selection of the sample, the students who are active and experienced in group work and those who are not can be compared. In addition, this scale was adapted for university students in the context of group work.

Ethic

In this study, all scientific ethical rules were followed.

Author Contributions

All stages of the study were organized and conducted by the authors.

Conflict of Interest

In addition, the authors declare that they have no conflict of interest.

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