ORIGINAL ARTICLE

The Examination of the Psychometric Properties of the Persian Version of the Self-Regulation Questionnaire among Iranian Students

Sajjad Bakhtiary Javan [1], Sadegh Bakhtiary Javan [2,*] iD , Hane Mafakheri Bashmagh [2]

[1] Department of Assessment and Measurement, Faculty of Psychology and Educational Science University of Allameh Tabataba'i, Tehran, Iran

[2] Department of Psychology, Faculty of Humanities and Social Sciences, University of Kurdistan, Sanandaj, Iran

Abstract

Purpose: Self-regulation can refer to a dimension of temperament (i.e., effortful control), to a set of cognitive processes involved in higher-order control (i.e., executive functions), or to the physiological regulation of the stress response. Effortful control describes the ability to voluntarily manage attention and inhibit or activate behavior as a need to adapt. The purpose of this study was to investigate the psychometric properties of the self-regulation questionnaire.

Materials and Methods: The statistical population of this research are the students who were living in Sanandaj city in 2019. The samples consisted of 231 students (92 females and 139 males) who were selected using cluster random sampling method and received a self-regulation questionnaire.

Results: The results of exploratory and confirmatory factor analysis confirmed the structure of the four self-regulating factors as one of the executive functions. Also, the convergent validity of the self-regulation questionnaire was assessed through the simultaneous implementation of the Bouffard questionnaire. The reliability coefficients of the self-adjusted questionnaire for planning, monitoring, controlling, reflection, and total questionnaires were obtained by Cronbach's alpha coefficient of 0/82, 0/61, 0/77, 0/78, and 0/90, respectively.

Conclusion: Finally, concerning desirable validity and reliability coefficients, ease of implementation, scoring, and interpretation, as well as short response time, it can be stated that this questionnaire is very important in cognitive assessments to examine self-regulation as one of the executive functions.

Keywords: Self-Regulation; Executive Function; Questionnaire; Self-Control.

1. Introduction

Self-regulation is a psychological construct that has gained research relevance due to its confirmed association with individuals' capacity to improve health, well-being, academic, personal, and professional advancement [1-3]. There are several conceptual and structural definitions of structure in each field, ranging from a broader perspective (general self-regulation) [4], to a specific concept, from academic learning (self-regulated learning) [5].

There are various theories about self-regulation; however, there is a consensus that it includes skills or actions such as planning and cognitive and metacognitive aspects such as self-tracking and motivational aspects goal setting. For example, self-regulation of the learning process can be defined as the degree to which individuals are behaviorally, metacognitively, and motivationally active participants in their learning process [6], which implies skill consciousness and will.

Despite the many approaches to self-regulated study, scientists such as Karoly *et al.* (2005) report the existence of common components, noting that "if we seek to further clarify the meanings and standardize our measurement, the integration of science and the practice of self-regulation is a big step and therapies".

Self-regulation is a complex, multi-component structure [7-10] that is performed at several levels of function (e.g., Motor, physiological, socio-emotional, cognitive, behavioral, and motivational), which is a broad sense and indicates the ability to voluntarily plan and if necessary, modify one's behavior (s) toward an adaptive goal [11, 12].

Self-regulation has been considered in recent years as a key predictor of a variety of outcomes, including obesity [13], school readiness [14-16], academic achievement in adulthood [17], long-term health and educational outcomes [18, 19].

Although researchers have focused on self-regulation from a variety of perspectives [20, 21], there is a consensus that self-regulation has important implications for individual health and well-being pathways throughout life. Indeed, more than a decade ago, it was told that "self-regulation is the most important goal in advancing the understanding of development" [22].

In teaching and learning, self-regulation refers to the active application of self-directed processes, cognitive behaviors, and emotions to achieve goals, learn skills, and manage emotional reactions [23-25]. Self-regulating students are "active in their own metacognitive, motivational, and behavioral learning process" [6, 25]. The process of self-regulation can be defined as preparing a program, monitoring that program, making changes to stay on track, and reflecting on performance and what can be improved again [26].

Because self-regulatory deficits as one of the executive dysfunctions can cause specific problems among students, measuring this function has been considered by many therapists and educators. Also, many neuropsychological tests alone are not suitable for assessing executive function; because they evaluate several executive functions in general; with tools that can be specific to a particular function, they can help educators and therapists determine what components of their students' self-regulatory function are targeted and how they learn through strengthening purposeful training. Therefore, such a tool is necessary to study the executive functions of students and can, in addition to aspects of evaluation, provide appropriate therapeutic and educational strategies to improve the deficits of executive functions by therapists and educators.

2. Materials and Methods

2.1. Self-Regulation Formative Questionnaire

This questionnaire is used to assess self-regulation among students. It includes 22 items and four factors, which is on the Likert scale from 1 (Not very like me) to 5 (Very like me). Cronbach's alpha coefficient for each of the plan, monitor, control, reflect and total factors is 0.896, 0.632, 0.704, 0.744, and 0.682, respectively. Self-Regulation Formative Questionnaire results can be used by both teachers and students. To facilitate interpretation, results are displayed on a 100-point scale. The bottom quartile ranged from 20 to 72 and the top quartile ranged from 81 to 100. Results by essential component support reflection on relative strengths and areas for improvement.

2.2. Bouffard Educational Self-Regulation Questionnaire

To assess self-regulation in students' learning, a 14-item questionnaire developed by Bouffard *et al.*

(1995), quoting Kadivar (2001), was used. In this test, the answer was prepared as a 5-point Likert scale. Each person can be between 14-70. This test measures both cognitive and metacognitive components. The higher score in each component indicates the individual's tendency to use that component.

Kadivar (2001), reporting the validity coefficient using Cronbach's alpha method of 0.71, reported the validity coefficient of this test as 0.67. To determine the validity of the structure, the results of factor analysis showed that the correlation coefficient was half a distinction between the questions is appropriate and this test can explain 0.52 of the self-regulatory variance and its construct validity is also desirable [27]. In this study, Cronbach's alpha coefficient was used to calculate the reliability coefficient of the questionnaire. The data collected from 204 students for the self-regulatory scale is 0.72.

A descriptive correlational research design was used to conduct this study. The statistical population included students of a school in Sanandaj in the 2019 academic year. The questionnaires were distributed among students in the school, and all the potential questions were responded by the researcher. The participants were selected using the convenience sampling method. The statistical analyses were performed in AMOS 24 and SPSS 25. After the items were translated and approved by expert, the other expert back-translated items to English. Then, the two texts were compared and because of no significant differences between them, the inventory was prepared for administration. For the assessment of the convergent validity of the questionnaire Bouffard, and the confirmatory factor analysis was also used for assessing the construct validity of the inventory.

3. Results

The target population, 231 students were selected as the study sample, including 139 (60.2%) males, 92 (39.8%) females, with the mean age of 13 years old

ranging from 12-16 years old. The IQ of 48 students was 85-95, 92 students was 96-105, 79 students was 106-115 and 12 students was 116 and above. The parents' education level of 8 students was junior high, of 87 students was a high school diploma, of 32 students was college degree, of 79 students was bachelor's, of 19 students was master's, of 6 students was PhD; also the parents of 33 students had public jobs and the parents of 198 students had private jobs. Also, the economic level and welfare of these students were based on the location of the schools and was categorized in three levels: weak, medium and prosperous. The confirmatory factor analysis was used to examine construct validity. Table 1 presents the factor loading of each item, and Table 2 presents the goodness of fit indices.

Table 1. Load of each item in the four factors

Self-Regulation Formative Questionnaire

Items	Planning	Monitoring	Control	Reflection
4	0.823			
1	0.801			
5	0.796			
3	0.755			
2	0.642			
8		0.811		
6		0.806		
7		0.798		
10		0.730		
9		0.671		
11		0.552		
15			0.826	
14			0.799	
13			0.643	
12			0.502	
16			0.443	
17			0.391	
19				0.762
20				0.652
18				0.526
22				0.423
21				0.368

Table 2. The goodness of fit indices for Self-Regulation among students

Chi-square	P	Df	RMSEA	SRMR	GFI	CFI	NFI	NNFI
427.80	0.001	98	0.05	0.06	0.80	0.96	0.92	0.96

The KMO coefficient was 0.82, which indicates the validity of the obtained operating structure and also indicates the adequacy of the sample size. As presented in Table 1, factor loadings for most items of the factors of Self-Regulation are more than 0.40. However, items 17 and 21 have factor loadings less than 0.30. In the next step, the goodness of fit of the model was assessed, using the following indices: Chi-squared test (χ^2), Comparative Fit Index (CFI), Named Fit Index (NFI), Standardized Root Mean Square Residual (SRMR), Root Mean Square Error of Approximation (RMSEA), and Goodness of Fit Index (GFI). The more the values of the CFI, NFI, Non-Normed Fit Index (NNFI), and GFI closer, the better the goodness of fit of the model. The χ^2 is often used to assess goodness of fit, but it increases as sample size and degrees of freedom increase. Therefore, the two indices of SRMR and RMSEA should be used for this purpose [28]. According to Engel *et al.*, SRMR values ranging from 0-0.05 indicate a good fit, and values ranging from 0.05-0.1 indicate an acceptable fit [29]. Besides, RMSEA values ranging from 0-0.05 indicate a good fit, and values ranging from 0.05-0.08 indicate an acceptable fit [30]. Therefore, the model has a good fit to the data among the students (Table 2).

In the next step, to examine convergent validity, the correlation Self-Regulation between the scores of the Self-Regulation Questionnaire and the scores of Bouffard Questionnaire were calculated (Table 3).

The internal consistency (Cronbach's alpha coefficient) was used to examine reliability (Table 5) to examine the validity of the Self-Regulation Questionnaire, the correlations between the subscales scores were calculated (Table 4).

There are significant positive correlations among the Self-Regulation Questionnaire and Bouffard dimensions (Table 3). Also, there is a significant negative relationship between the Self-Regulation and the Bouffard dimensions.

Self-Regulation Questionnaire and Bouffard dimensions (Table 5). Also, there is a significant negative relationship between the Self-Regulation and the Bouffard dimensions.

The internal consistency (Cronbach's alpha coefficient) was used to examine the reliability and internal consistency coefficients for the subscales of the Self-Regulation are in Table 5.

Table 3. Matrix of correlations between the scores of the Self-Regulation dimensions, including Self-Regulation Formative Questionnaire and Bouffard Questionnaire

Factor	Cognition	Metacognition
Planning	0.008	0.557**
Monitoring	0.021	0.432*
Control	0.332*	0.041
Reflection	0.371*	0.012

*P=0.05

**P=0.01

Table 4. Correlation between Self-Regulation factors

Factor	Planning	Monitoring	Control	Reflection
Planning	1			
Monitoring	0.598**	1		
Control	-0.067	0.156*	1	
Reflection	-0.305*	0.138*	0.412*	1

*P=0.05

**P=0.01

The Cronbach's alpha coefficient was calculated to examine internal consistency. The alpha coefficients for Self-Regulation and each of its subscales, except for monitoring, are higher than the recommended value (0.7) [31] and can be regarded as acceptable.

Table 5. Internal consistency coefficients for the subscales of the Self-Regulation

Subscale	Correlation Coefficient
Planning	0.82
Monitoring	0.61
Control	0.77
Reflection	0.78

4. Discussion

The findings of this study, in line with the findings of Gaumer Erickson and Noonan (2018), confirmed the four factors of this questionnaire. Although these factors consisted of a combination of different items than the proposed samples for self-regulation, they were consistent with the factors of the Beaufort questionnaire in terms of self-regulation and cognitive and metacognitive factors. The validity of this questionnaire due to the assessment of cognitive factors such as Planning, Monitoring, Controlling, and Reflection provides the basis for further research in different groups for the purpose of clinical assessment and intervention, as well as the small number of questions on this scale without removing the component assessment. This feature saves time and money on studies with a wider scope. According to the research background, this scale is self-control as a function that is involved among students and adolescents. Deficiencies in this function cause special problems in the educational, personal, and social spheres among adolescents. Assessing and evaluating this function by therapists and educators provides the basis for the growth and improvement of this function.

Some limitations should be considered in the present study as they may provide fruitful directions for future research. As the self-regulation questionnaire is a self-report questionnaire, it is vulnerable to various distortions in self-perception. Future studies should include teacher and parent reports, which might provide more comprehensive insight into student regulatory styles. Also, the small number of statistical samples in this study and age

groups with less variety than previous statistical studies can be considered as other limitations of this study compared to other studies.

5. Conclusion

Our study, that is the Iranian version of this scale, has good psychometric properties due to its good validity and reliability coefficients, ease of implementation, scoring, and also short response time and it can be a useful tool for research and educational interventions at the student level. This scale is also used to evaluate the effectiveness of various intervention programs to improve self-regulation and can have scientific implications and allow more focused interventions on self-regulation.

References

1- P. Karoly, M. Boekaerts, and S. Maes, "Toward consensus in the psychology of self-regulation: How far have we come? How far do we have yet to travel?" *Appl. Psychol.*, vol. 54, no. 2, pp. 300–311, Apr. 2005.

2- G. A. Cañadas-De La Fuente, C. S. Luis, L. M. Lozano, C. Vargas, I. García, and E. I. De La Fuente, "Evidencia de validez factorial del Maslach Burnout Inventory y estudio de los niveles de burnout en profesionales sanitarios," *Rev. Latinoam. Psicol*, vol. 46, no. 1, pp. 44–52, 2014.

3- N. M. Clark, M. Gong, and N. Kaciroti, "A Model of Self-Regulation for Control of Chronic Disease*," *Heal. Educ. Behav.*, vol. 41, no. 5, pp. 499–508, Oct. 2014.

4- A. J. Howell and K. Buro, "Relations among Mindfulness, Achievement-Related Self-Regulation, and Achievement Emotions," *J. Happiness Stud.*, vol. 12, no. 6, pp. 1007–1022, Dec. 2011.

5- Paulino, I. S., and Da Silva, A. L. (2016). Contributing to students' motivation to learn in middle school – a self-regulation approach. *Electron. J. Res. Educ. Psychol*. Vol. 14, no. 2, pp193-225, 2016.

6- B. J. Zimmerman, "Enhancing student academic and health functioning: A self-regulatory perspective," *School Psychology Quarterly*, vol. 11, no. 1. Guilford Publications, pp. 47–66, 1996.

7- C. Blair and C. C. Raver, "Child development in the context of adversity; Experiential canalization of brain and behavior," *Am. Psychol.*, vol. 67, no. 4, pp. 309–318, 2012.

8- M. M. McClelland, C. C. Ponitz, E. E. Messersmith, and S. Tominey, "Self-regulation: Integration of cognition and

emotion," *The handbook of life-span development*, Vol. 1: Cognition, biology, and methods. pp. 509–553, 2010.

9- D. Schunk and B. J. Zimmerman, "Social origin of self-regulatory competence," *Taylor Fr.*, vol. 32, no. 4, pp. 195–208, 1997.

10- K. D. Vohs and R. F. Baumeister, Handbook of Self-Regulation, Second Edition: *Research, Theory, and Applications*. Guilford Press, 2011.

11- R. Barkley, "Attention-deficit/hyperactivity disorder, self-regulation, and executive functioning," 2011.11

12- J. J. Gross and R. A. Thompson, "Emotion regulation: Conceptual foundations." pp. 3–24, 2007.

13- G. W. Evans, T. E. Fuller-Rowell, and S. N. Doan, "Childhood Cumulative Risk and Obesity: The Mediating Role of Self-Regulatory Ability: e68-e73," *Pediatrics*, vol. 129, 2012.

14- R. A. Razza, "Relating Effortful Control, Executive Function, and False Belief Understanding to Emerging Math and Literacy Ability in Kindergarten Mindful yoga for at-risk preschoolers View project," *Wiley Online Libr.*, vol. 78, no. 2, pp. 647–663, Mar. 2007.

15- M. M. McClelland, C. E. Cameron, C. M. Connor, and F. J. Morrison, "Links between behavioral regulation and preschoolers' literacy, vocabulary, and math skills.," *psycnet.apa.org*, vol. 43, no. 4, pp. 947–959, Jul. 2007.

16- F. J. Morrison, C. C. Ponitz, and M. M. McClelland, "1 SELF-REGULATION AND ACADEMIC ACHIEVEMENT IN THE TRANSITION TO SCHOOL," 2010.

17- A. Lee Duckworth, E. Tsukayama, and H. May, "Establishing Causality Using Longitudinal Hierarchical Linear Modeling: An Illustration Predicting Achievement From Self-Control," *Soc. Psychol. Personal. Sci.*, vol. 1, no. 4, pp. 311–317, 2010.

18- M. M. McClelland, A. C. Acock, A. Piccinin, S. A. Rhea, and M. C. Stallings, "Relations between preschool attention span-persistence and age 25 educational outcomes," *Early Child. Res. Q.*, vol. 28, no. 2, pp. 314–324, 2013.

19- T. E. Moffitt *et al.*, "A gradient of childhood self-control predicts health, wealth, and public safety," *Proc. Natl. Acad. Sci. U. S. A.*, vol. 108, no. 7, pp. 2693–2698, Feb. 2011.

20- G. J. Geldhof, T. D. Little, and J. Colombo, "Self-Regulation across the Life Span," in the Handbook of Life-Span Development, Hoboken, *NJ, USA: John Wiley & Sons, Inc.*, 2010.

21- M. M. McClelland, C. C. Ponitz, E. E. Messersmith, and S. Tominey, "Self-regulation: Integration of cognition and

emotion," *The handbook of life-span development*, vol. 1: Cognition, biology, and methods. pp. 509–553, 2010.

22- M. I. Posner and M. K. Rothbart, "Developing mechanisms of self-regulation," *Dev. Psychopath.*, vol. 12, no. 3, pp. 427–441, 2000.

23- B. Abar and E. Loken, "Self-regulated learning and self-directed study in a pre-college sample," *Learn. Individual. Differ*, vol. 20, no. 1, pp. 25–29, Feb. 2010.

24- M. A. Southam-Gerow and P. C. Kendall, "Emotion regulation and understanding: Implications for child psychopathology and therapy," *Clin. Psychol. Rev.*, vol. 22, no. 2, pp. 189–222, 2002.

25- B. J. Zimmerman, "Enhancing student academic and health functioning: A self-regulatory perspective," *School Psychology Quarterly*, vol. 11, no. 1. Guilford Publications, pp. 47–66, 1996.

26- E. U. Immanuel, "INITIAL DEVELOPMENT OF ASSERTIVE BEHAVIOR INVENTORY," *Pract. Psychol.*, vol. 9, no. 2, pp. 322–338, 2019.

27- P. Kadivar, "study of the contribution of self-efficacy, self-regulation, intelligence and student's academic achievement for presenting a pattern for optimal learning," *Tehran: Education Faculty*. vol. 2, no. 6, pp. 30–42, 2001. [Persian].

28- L. T. Hu and P. M. Bentler, "Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives," *Struct. Equ. Model*, vol. 6, no. 1, pp. 1–55, 1999.

29- K. Schermelleh-Engel, H. M.-M. Of psychological, and undefined, "Evaluating the fit of structural equation models: Tests of significance and descriptive goodness-of-fit measures," *Cite seer* 2003.

30- R. Kline, "Structural equation modeling Rex B Kline Concordia QICSS Set D CFA models," 2015.

31- R. M. Thorndike, "Book Review : Psychometric Theory (3rd ed.) by Jum Nunnally and Ira Bernstein New York: McGraw-Hill, 1994, xxiv + 752 pp.," *Appl. Psychol. Meas.*, vol. 19, no. 3, pp. 303–305, Sep. 1995.