The Development and Validation of Short Self-Regulation Scale (SSR) on Indonesian College Students

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Abstract. The measurement of self-regulation aspects in the simpler context of Indonesian college students is still limited. This study aims to develop and extract the scale on a shorter version in the context of Indonesian college students. The analysis of short version self-regulation scale (SSRQ), begins with 17 items representing four conceptual dimensions. Meanwhile, this version analyzes 265 active college students, using exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). The finding of EFA suggest the measurement model with nine items of first order factor. While the result of CFA shows that overall model of self-regulation scale is fit and consistent with the collected data based on three categories of measure which are absolute fit indices, incremental fit indices and parsimoni fit indices. This research concludes that the scale has been met validity and reliability criteria in measuring the component of self-regulation in the context of Indonesian college students.

Keywords: self-regulation scale, (EFA), CFA), (SEM).

1 Introduction

Self-regulation is a complex systematic process [1] involving abilities of individual including thought, emotion, attention, and concentration [2]. This ability becomes a determining factor for the development, personality, and social behavior of individual decisions [3] to achieve the desired goals and standards of behavior [4]. As suggested by Manab [5], a process of an individual managing and improving their own ability to achieve goals or targets, accompanied by an evaluation process of achievement resulting in satisfaction is called self-regulation. The development of good self-regulation includes the ability to understand how to evaluate self-abilities, monitor progress, make strategic efforts, and take advantage of opportunities in the environment to help achieving their goals [6]. Thus, in order to achieve better welfare and reduce psychosomatic problems, having a high self-regulation ability is required [7].

In general, self-regulation refers to self-control and evaluation behavior. As stated by Hude [8] that self-regulation refers to control of emotion in certain situation in order to stop or manage the emerged emotion before reacting on certain events. While differences in experience, environment and ideas of individuals can influence the behavior they do. Self-regulation is influenced by several factors such as individual characteristics and personality, believed

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culture and religion, motivation, confidence and triggering situation that causes the emergence of regulation process [9]. Moreover, as it results in the different implementation of abilities in the social field in terms of explaining and understanding self-regulation ability, it certainly requires a tool that is able to measure these abilities.

A lot of studies have been conducted by researchers regarding the development of a measuring instrument related to self-regulation. Reference [3] was the first developed of the Self-Regulatory Questionnaire (SRQ). Miller & Brown [10] then grouped 63 items into seven dimensions of self-regulation including (1) Receiving relevant information, (2) Evaluating and comparing information with norms, (3) triggering change, (4) Finding options, (5) Formulating a plan, (6) Implementing a plan, and (7) Assessing the effectiveness of the plan. Later, various new versions of self-regulation questionnaires were developed by several researchers based on different contexts [11, 12, 13], such as psychological well-being [13] and also academics [14].

There have been indeed many self-regulation instruments developed through conventional methods with quite large number of question items. However, items with large numbers are sometimes multidimensional since there are many similarities with other items, so that it will greatly affect the quality of the reported self-ability [15]. Also, researchers in Indonesia developing a self-regulation measuring instrument using EFA analysis and CFA using structural equation models are still limited. Rather, this method provides better and accurate result in measuring the validity and reliability of an instrument [16]. Thus, this analysis can generate a new or simpler version of self-regulation measurement model with better quality result for Indonesian students.

Therefore, this study aims to redevelop building a simplified version and examine the validity and reliability of the scale developed on [11] in Spain, consisting of 17 question items by measuring four dimensions of self-regulation which are perseverance, goal setting, decision making and learning from mistakes. This research is focused on population of students ages 19 to 24. Given the significance of having the ability of self-regulation to manage life and self-control in accordance with what will be done, so that self-report through simpler, effective and efficient measurement of self-regulation scale can provide convenience in understanding the quality of self-ability as an evaluation material to be responsible and being on the right track of their life goals.

2 Methods

2.1 Samples

The population in this study are students ages 19 to 24 from several universities in West Java. Data are collected using a cross-sectional survey design, which is collecting data one at a time [17]. Sampling based on certain considerations in accordance with research criteria or referred as purposive sampling techniques [18, 19]. The number of samples obtained for the first analysis is 120 students, while the second sample obtained is 145 students.

2.2 Instrument

The self-regulation scale was adapted from an article on self-regulation scale development [11] entitled "Factor Structure of the Self-Regulation Questionnaire (SRQ) at Spanish Universities". The analysis result stated that the Short Self-Regulation Questionnaire (SSRQ)

in Spain is consistent by measuring four dimensions of self-regulation namely perseverance, goal setting, decision making and learning from mistakes, consisting of 17 question items.

The development process of self-regulation scale is started by translating the question items into Indonesian, done by Language Institute of UPI Bandung. The short self-regulation scale is distributed by changing the entire item number starting from number 1 to 17 without randomizing or changing the order position of the items. This is conducted to simplify the process of analyzing items on new instruments.

The development of self-regulation scale instruments is measured based on perceptions about their behaviors with alternative answers to each statement giving a score of 1 (strongly disagree), 2 (disagree), 3 (doubtful), 4 (agree), 5 (strongly agree). This model is considered as a Likert scale model that is used to measure non-cognitive variables such as attitudes, opinions, and perceptions of an individual or group of people about social phenomena [18]. The five alternative answer choices aim to clarify the rejection and acceptance of the measured variable.

2.3 Statistical Analysis

The analysis process uses exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) methods through structural equation models (SEM) with the help of AMOS 22 software. According to Gunarto [20], EFA analysis must meet several assumption tests, as follows:

1) Requirement criteria of the KMO value > 0.5 and Bartlett's Test with the significance value obtained <0.05. This aims to determine whether or not the correlation between variables and the sample has met the requirements, so that the data can be continued for analysis.
2) The requirement of MSA (Measure of Sampling Adequacy) value, as follow:
   a) MSA = 1, variables can be predicted without errors by other variables.
   b) MSA > 0.5, variables can still be predicted and can be further analyzed
   c) MSA < 0.5, variables cannot be predicted and cannot be further analyzed or excluded from other variables.
3) Seeing the number of factors extracted from the total variance explained.
4) Seeing the rotation method through the varimax value with Kaiser Normalization. This method will show which items are included in the group of factors formed through the extraction method.

Meanwhile, according to Coskun, Oksuz, & Yilmaz [21] and Ghozali [22] argued that the analysis process of CFA must go through the following stages:

1) Assessing the identification of structural models by calculating the amount of covariance and variance data compared to the number of parameters to be estimated.
2) Evaluating the goodness of fit or suitability of the model to find out how far the model fits into the sample data based on three categories of goodness of fit, i.e.:
   a) Absolute fit measures for overall measurement including CMIN, probability values, GFI, RMSEA.
   b) Incremental fit measures that compare the proposed model with other models specified by researchers including TLI and CFI
   c) Parsimony fit indices for fit measurement to be compared between models with different number of coefficients through PNFI.

3) Construct validity includes convergent validity, variance extracted (AVE) and construct reliability (CR).

3 Results and discussions

3.1 Findings

Based on data analysis, the findings are described in accordance with the stages of analysis used in this study, which are as follows:

3.2 Exploratory Factor Analysis (EFA)

The first stage uses exploratory factor analysis (EFA) with the help of SPSS 21 software. Respondents used are 120 students. KMO and Bartlett's Test results are presented in table 1, as follows:

Table 1. KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.822
Bartlett's Test of Sphericity	*Approx. Chi-Square*	900.194
	df	136
	Sig.	0.000

Note: df = Degree of Fredom

As seen in table 1 above, the KMO value is 0.822 (> 0.5) and Bartlett's Test with a significance value obtained 0.000 (<0.05) then the assumptions on this criterion have been fulfilled. Also, looking at the value of all items with the value of MSA (Measure of Sampling Adequacy) > 0.50, the item can still be predicted and can be analyzed further. A total of 17 items show values > 0.50 on the output anti-image correlation value, meaning all items can be predicted further and can be analyzed to the next analysis stage if selected.

Next, the total output of variance explained produces four factors extracted from the 17 items. These four factors form a group of items that have a high proportion of variants. However, only one factor is chosen that adequately explains the proposed measurement theory, namely the factor which had the largest total variance (32.4%), so it is sufficient to identify a strong construct from the data. The items selected in this factor have been grouped through the varimax rotation method and nine items have been obtained, while other items are excluded or not included in the further analysis process.

The items selected in this stage are grouped into three constructs namely goal setting, decision making and perseverance with three question items in each construct. This is done so as the value of one construct remains stable. In addition, the similarity of meaning of each item has represented or explained in each of these constructs, thus using only three items is sufficient to explain the conceptual model of self-regulation constructs [15].

The scale then distributed to the respondents according to the characteristics or criteria in the study (students aged 19-24). Table 2 below is the item of self-regulation scale as a result of selection at the EFA stage, as follows:

Table 2. Question items of self-regulation scale

Dimension	Item Number	Question Item
Goal setting	X4	I have difficulty setting goals for myself.
	X6	I have difficulty making plans to achieve my goals.
	X8	I am easily distracted from the plan
Decision making	X10	I have trouble focusing on something
	X11	I postponed decision making
	X12	When I have to decide to change something, I feel overwhelmed by the choices.
Perseverance	X13	Small problems or distractions can get me off track.
	X14	I have many plans so it is difficult for me to focus on one of them
	X15	It seems I did not learn from my mistakes

Note: X = Question Number

3.3 Confirmatory Factor Analysis (CFA)

In the next stage, nine items are analyzed using the CFA method for 145 students. The analysis shows that goodness of fit is quite good. However, the chi-square value is not significant with the p-values ≥ 0.05. If the chi-square result is significant, it states that the model is not yet fit [22].

A good model must have a chi-square value that is not statistically significant. Therefore, the model is modified to reduce the chi-square value and increase the probability value. Modifications are made twice in the covariance between e18 and e14, e11 and e13 to correlate each other. The result of the analysis after being modified is shown in Figure 1. [1] below.

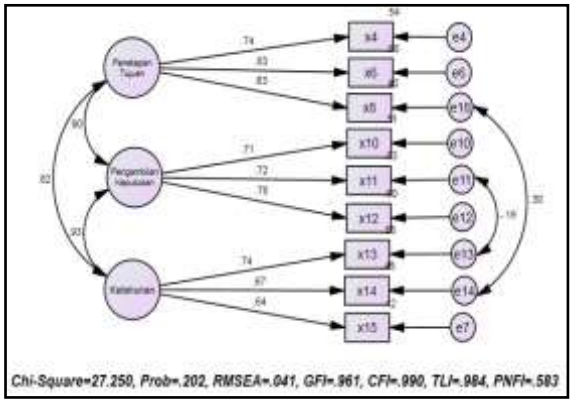

Fig. 1. Standardized estimates measurement of self-regulation model

After modification, the suitability of the model on the chi-square value and p-values results in an acceptable value based on a measure of goodness of fit. However, to be clearer, table 3 below shows the overall model suitability of the various fit model assessment criteria

recommended on [22, 20], including the absolut fit indices[1], incremental fit indices[2] and parsimony fit indicess[3], as follows:

Table 3. Result of *goodness of fit (GoF)* self-regulation model

Criteria	Limit Value	Initial Model	Final Model	Conclusion
Absolut Fit Indices				
X^2-Chi square, Significance probability	p-values ≥ 0.05	0.018	0.212	Fit
CMIN/DF	≤ 2.00	1.695	1.239	Fit
GFI	> 0.90	0.940	0.961	Fit
RMSEA	≤ 0.08	0.069	0.041	Fit
Incremental Fit Indices				
CFI	> 0.90	0.969	0.990	Fit
TLI	> 0.90	0.954	0.984	Fit
Parsimony Fit Indices				
PNFI	> 0.90	0.620	0.583	Not Fit

Note: df = Degree of Fredom

On the analysis on the final measurement model, the overall assessment shows that the model is acceptable and considered to be fit according to empirical data. Further is separately evaluating related to (i) the significance of the loading indicator (ii) assessing construct reliability and (iii) variance-extracted.

Based on the CFA analysis, valid criteria is when the minimum standardized loading estimate for the initial stage of research is > 0.50 or more ideally > 0.07 [22]. Table 4 below is the output showing the value of loading factor or convergent validity in AMOS software:

Table 4. Result of convergent validity of self-regulation

Indicator			Estimate
x4	<---	Goal setting	0.738
x6	<---	Goal setting	0.826
x8	<---	Goal setting	0.634
x15	<---	Perseverance	0.644
x14	<---	Perseverance	0.671
x13	<---	Perseverance	0.744
x11	<---	Decision making	0.725
x12	<---	Decision making	0.777
x10	<---	Decision making	0.713

All items of modification stage in the CFA analysis show a convergence value of validity > 0.6 which means the indicators that make up the three constructs have a good validity value. In addition, assessing construct reliability (CR) and variance extracted (AVE) is also conducted. Reliability measures extracted from values 0 to 1, with values greater than 0.5 are ac-

[1] Absolut fit indices measures the overall models

[2] To compare the proposed model with other by reseachers classification

[3] Parsimony fit indices to be compare between models and a different number of coefficient, include PNFI and PGFI

ceptable and AVE ≥ 0.5 indicates a good convergence [22, 23]. Table 5 below is the result of construct reliability and AVE calculations for each construct:

Table 5. Reliability and *v*ariance extracted

Construct	∑λ	$\sum\lambda^2$	∑Errorvar*	CR	AVE
Goal setting	2.198	1.629	1.371	**0.779**	**0.543**
Persistence	2.059	1.419	1.581	**0.728**	**0.473**
Decision making	2.215	1.638	1.362	**0.783**	**0.546**

Note: CR = Construct Reliability; AVE = variance extracted

Based on table 5 above, the reliability of the self-regulation construct shows a value > 0.70, so it can be concluded that the reliability of each construct is considered good, while there is one construct of the variance value obtained a value of 0.475, namely the perseverance construct. This construct only measures the amount of variance that can be captured by 47.5%. Based on the loading factor values in the perseverance construct, there are two items that show values < 0.70. This is assumed to reduce the convergent value of the construct [22].

3.4 Discussion

A research exploring the validity of the self-regulation scale was conducted by Chen & Lin [24] on students in Taiwan using confirmatory factor analysis (CFA). While, as on [13] revised a shorter scale than the scale development conducted by Brown, Miller & Lewandowski [3]. The scale was redeveloped in the context of South African students by using factor analysis and it generated seven factors of self-regulation. The scale redeveloped to a simpler and shorter version by several researchers indicates that the lighter burden of response on self-measuring instrument can affect the level of accuracy, commitment and compliance to be lower [13, 15]. Thus, this study is also conducted to extract the scale on a shorter version in the context of Indonesian students by revising the scale developed previously by Pichardo, Justicia, Fuente, & Martínez-vicente [11] on the sample of Education and Psychology students in Spain. The finding of the analysis generated 17 question items with four factors namely perseverance, goal setting, learning from mistakes and decision making.

The result of this study shows a difference between the proposed model and several short self-regulation scales developed by researchers [11, 12, 13]. As this research is conducted through two stages of analysis of student respondents in Indonesia, it generated three constructs with nine statement items. The three constructs include goal setting, perseverance, and decision making. The constructs are chosen because there are items that have content that dominates the meaning of each construct [25]. Based on an analysis of the remaining item content, one example of the contents that says "I have difficulty setting goals for myself" explains an individual who lacks commitment in achieving his or her goals. The statement has a negative meaning, but it contained another meaning that explains about how a person is motivated to achieve these goals, so it is committed to take some action. This can be called a goal setting [26].

In addition, another item says "I postpone decision making", although it has a negative meaning, the statement describes a process undertaken to determine the decisions of several alternatives from the process of discussion with the process of exchanging ideas, resulting in a wider diversity of views. [25, 27]. Other example of the items in the perseverance construct says, "Small problem or distraction can get me off track ". The item describes a measure of

how long an individual who is motivated to stay doing a task in a long time to achieve their goals [28].

Although the combination of proposed items differs with the original self-regulation scale, validity of this scale is in different cultural groups in the context of students in Indonesia, especially West Java and it covers various fields such as sports, health, education, and others. Therefore, the overall measurement of the construct validity of the self-regulation shows a fairly good value. This can be seen from the suitability index value of the model and the convergent validity that is sufficient in accordance with the estimated parameters determined as a psychological construct measurement tool. The estimates generated in this analysis do not show values that are too far so the scale can be used in further studies, supported by the result of this shorter scale which would be suitable for large epidemiological studies as it reduces the burden on respondents, without sacrificing the original strength to assess different components of the construct of self-regulation [13].

4 Conclusion

The shorter version of self-regulation scale on a sample of students in West Java, Indonesia, has become an internally consistent measurement alternative based on aspects of self-regulation relating to academic variables [11]. This version of the scale includes aspects of perseverance, goal setting and decision making. The result of model size suitability index and convergent validity indicates an acceptable value, so this scale can be used in evaluating and examining the level of self-regulation of Indonesian students. For further studies, it can be used to investigate the correlation or impact of the construct of self-regulation with various other variables.

Future research is recommended to examine the model in a larger population of students to test the stability of the model and confirm the validity and utility of the shorter version of the self-regulation scale in group of students with diverse cultures in Indonesia.

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