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Indonesian emotion regulation scale for students based on reappraisal and suppression factor: The Rasch analysis

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ABSTRACT

Every human being has emotional turmoil, which will be a serious problem if they cannot control it. The importance of emotion regulation has become one of the bases for developing a measure of emotion regulation for students, the Indonesian emotion regulation scale (IERS). No research yet describes an instrument that measures students' level of emotion regulation in Indonesia. IERS consists of nine items in two aspects: reappraisal and suppression factor. The content validity test involves two experts in the field of psychometrics. In comparison, the construct validity test involved 354 high school students in Yogyakarta, Indonesia. Data analysis using inter-rater reliability (IRR) coefficient of Cohen's kappa and Rasch analysis. Based on the study of the IRR coefficient of Cohen's kappa, two experts agree on the acceptability of the IERS statement items. Besides that, the results of the application of Rasch analysis show that IERS is good, precise, and conforms with the model. IERS is a reliable and valid tool to measure students' level of emotion regulation accurately. This paper discusses the implications and recommendations for further research for the implementation of guidance and counseling containing the value of emotion regulation as a follow-up to the performance of IERS.

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1. INTRODUCTION

Students need a safe and comfortable situation to study at school. Several research results indicate that the level of feeling safe and comfortable at school correlates with student performance in the academic field [1], [2]. Various feelings of discomfort, insecurity and even fear of students in academic activities at school appear due to high student violence [3], [4]. The school situation is one of the essential factors that can support achieving educational goals. However, the reality on the ground shows different dynamics. Student violence is a problem that often arises in schools, for example, aggressive behavior [5], [6] and bullying [7], [8], both traditional and online. One of the causes of students causing violence is the inability of students to optimize emotion regulation [9], [10]. This absence of emotion regulation triggers the lack of students' efforts to suppress the violent impulses that exist in them.

A measuring tool to identify the level of emotion regulation is one of the options for determining student emotion regulation portraits. The measurement results with these measuring instruments are the basis for preparing guidance and counseling programs to improve emotion regulation [11], [12]. Several studies

have made efforts to develop the self-regulation of emotion scale, but not many data analysis techniques have used methods that provide accurate data. An example is research that uses the Pearson correlation, namely emotion regulation strategies for artistic creative activities scale [13]. Another example is research that uses factor analysis, namely the state difficulties in emotion regulation scale [14] and Turkish version of difficulties in emotion regulation scale-brief form [15]. Furthermore, other studies have also formulated a scale of emotion regulation, namely the Hindi version of the difficulties in emotion regulation scale [16] and modified versions of the difficulties in emotion regulation scale [17]. These weaknesses are the trigger to developing a more accurate measuring tool to identify self-regulation of emotion. The Rasch model is an alternative to provide a more precise estimate of the reliability of measuring instruments [18]–[20].

This study aims to develop and validate an emotion regulation scale using Rasch analysis, and we named it Indonesian emotion regulation scale (IERS). The IERS development process considers the Indonesian people's cultural aspects. Instruments that pay attention to cultural elements can accurately measure the human condition [21], [22]. The measuring instrument that measures the level of emotion regulation involves two aspects: reappraisal and suppression factor [23]–[25]. Reappraisal factor refers to changes in how people think when interpreting situations with the potential for specific emotional reactions. At the same time, the suppression factor emphasizes the form of emotional regulation by suppressing ongoing expressive behavior. IERS is one of the alternative instruments to measure students' level of emotion regulation in Indonesia. By paying attention to analytical techniques using the Rasch model and aspects of Indonesian culture, IERS can present more accurate data about the level of student peace.

2. RESEARCH METHOD

2.1. Research design

This study aims to validate a psychological measuring tool, namely the Indonesian emotion regulation scale. The psychological measuring tool uses two main aspects to measure the level of student emotion regulation: reappraisal and suppression factor. Indonesian emotion regulation scale validation uses Rasch analysis, considering that Rasch analysis provides information on several criteria, namely item fit, difficulty level, Rasch discrimination power, and item information function [26]. The advantage of using Rasch analysis is that it can provide statistical analysis that is more accurate than conventional data analysis techniques. Rasch analysis also includes holistic information about the instrument and can meet the criteria for the definition of an instrument [18].

2.2. Participants

This study involved 354 high school students in the city of Yogyakarta, Indonesia. The researchers used a cluster random sampling technique to determine study participants in five schools. Table 1 describes the research participants as test subjects in conducting IERS validation.

Table 1. Distribution of participants

No	School name	Number of participants
1	Muhammadiyah Vocational High School 1 Yogyakarta	88
2	Muhammadiyah Vocational High School 2 Yogyakarta	28
3	Muhammadiyah Vocational High School 4 Yogyakarta	86
4	State Vocational High School 6 Yogyakarta	102
5	State Senior High School 8 Yogyakarta	50
	Total	354

2.3. Data collection tools

The researchers validated the IERS instrument. The research instrument that measures the level of emotion regulation consists of two aspects: reappraisal and suppression factor. Table 2 describes the draft of the instrument before we validated the instrument using Rasch analysis.

2.4. Data collection

The development of the IERS instrument through many scientific procedures so that this instrument can accurately measure students' emotional regulation levels. In the first step, we planned research by formulating research materials, conducting a literature review, and compiling an instrument grid. Then, in the second step, we carried out a content validation process by experts to identify language acceptability and the suitability of instrument items with operational definitions. The third step is implementation, which is compiling a google form to accommodate research participants filling out the IERS instrument. Next, the last

step is to analyze the data using the Rasch model for validating the instrument so that the instrument could be ready to measure students' emotion regulation levels. Data analysis with Rasch analysis is a form of construct validity that can present the results of item suitability analysis in measuring students' emotional regulation.

2.5. Data analysis

Data analysis in this study uses the inter-rater reliability (IRR) coefficient of Cohen's kappa and Rasch models. The first analysis, namely the IRR coefficient of Cohen's kappa, describes a description of the agreement between two experts in psychometry for the acceptability of the emotional regulation scale instrument item. Analysis of the IRR coefficient of Cohen's kappa using SPSS software. The second analysis is the Rasch model with the help of Winstep software [27]. By using the Rasch model, it can describe the interaction between items and respondents at once. Rasch's analysis uses two fundamental theorems: the level of individual ability/agreement and the difficulty of the agreed items [27]. The psychometric tools that are the basis for analyzing the research data include summary statistics (quality of respondents, quality of instruments, and interactions between person and item). This study also provides item measure (items that are most difficult to agree on and the easiest to agree with by respondents), item fit order (items fit and misfit), and unidimensionality (ability to measure what should be measured).

Table 2. Indonesian emotion regulation scale instrument grid

Indicator	Statement	No item
Reappraisal factor	I control my emotions by changing the way I think about the situation I'm in	5
	When I want to reduce negative feelings, I change the way I think about the situation at hand	6
	When I want to feel more positive emotions, I change how I think about my situation	4
	When I want to feel more positive (like happy or happy), I change what I think	1
	When I want to reduce negative feelings (such as sadness or anger), I change what I think about	2
	When I am faced with a stressful situation, I think of ways to help me stay calm	3
Suppression factor	I control my emotions by being silent	9
	When I feel negative emotions, I do not express them	10
	I keep emotions in my heart	7
	When I feel positive emotions, I am careful not to express them	8

3. RESULTS AND DISCUSSION

The results of the first study indicate that two experts in the field of psychometrics have a good agreement on the acceptability of the IERS items. The results of this study are based on data analysis using the IRR coefficient of Cohen's kappa using SPSS software. Table 3 describes the summary results of the expert assessment of the IERS instrument. Based on the table, we analyzed the IRR coefficient of Cohen's kappa to determine the level of agreement between the two experts in assessing IERS. The analysis results show that both experts agree on the acceptability of IERS. Table 4 shows a summary of the results of the data analysis.

Table 3. Summary of expert evaluation of IERS

Participant's answer		Expert 1			
		1	2	3	4
Expert 2	1	0	0	0	0
	2	0	0	0	0
	3	0	0	1	1
	4	0	0	1	21

Analysis of IRR coefficient of Cohen's kappa shows IRR, namely K=0.583 with good category. Asymptotic standard error indicates standardized measurement error. The smaller the magnitude of this coefficient, the more reliable the measurement results are. In Table 4, the asymptotic standard error shows a coefficient of 0.262. Based on data analysis, we conclude that both experts agree on the acceptability of the IERS statement items.

Table 4. Description of the data processing of the IRR coefficient of Cohen's kappa

		Value	Asymptotic standard error[a]
Measure of agreement	kappa	.583	.262
N of valid cases		10	

In addition to content validity, this study tested construct validity using Rasch analysis. The results of the study will describe a description of: i) The quality of the respondents, the quality of the instrument, and the interaction between the person and the item; ii) The items that are the most difficult to agree on, and the easiest to agree with by the respondents; iii) The items that are fit and misfit; iv) The ability of the instrument to measure what it is supposed to measure; and v) Person-item map distribution. Figure 1 shows the results of the analysis in the form of summary statistics. The summary statistics section describes the quality of respondents, instruments, and interactions between people and instrument statement items.

SUMMARY OF 354 MEASURED (EXTREME AND NON-EXTREME) PERSON

	TOTAL SCORE	COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	28.7	10.0	.68	.55				
SEM	.3	.0	.08	.01				
P.SD	5.0	.0	1.43	.18				
S.SD	5.0	.0	1.43	.18				
MAX.	40.0	10.0	5.94	1.85				
MIN.	10.0	10.0	-5.04	.40				

REAL RMSE .65 TRUE SD 1.27 SEPARATION 1.95 PERSON RELIABILITY .79
MODEL RMSE .58 TRUE SD 1.31 SEPARATION 2.27 PERSON RELIABILITY .84
S.E. OF PERSON MEAN = .08

PERSON RAW SCORE-TO-MEASURE CORRELATION = .97
CRONBACH ALPHA (KR-20) PERSON RAW SCORE "TEST" RELIABILITY = .83 SEM = 2.05

SUMMARY OF 10 MEASURED (NON-EXTREME) ITEM

	TOTAL SCORE	COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	1014.5	354.0	.00	.09	1.00	-.12	1.00	-.24
SEM	12.1	.0	.09	.00	.07	.81	.08	1.00
P.SD	36.2	.0	.27	.00	.20	2.42	.25	2.99
S.SD	38.1	.0	.28	.00	.21	2.55	.27	3.15
MAX.	1075.0	354.0	.54	.09	1.34	3.76	1.41	4.65
MIN.	939.0	354.0	-.47	.08	.75	-3.26	.68	-4.13

REAL RMSE .09 TRUE SD .25 SEPARATION 2.80 ITEM RELIABILITY .89
MODEL RMSE .09 TRUE SD .25 SEPARATION 2.93 ITEM RELIABILITY .90
S.E. OF ITEM MEAN = .09

ITEM RAW SCORE-TO-MEASURE CORRELATION = -1.00
Global statistics: please see Table 44.
UMEAN=.0000 USCALE=1.0000

Figure 1. Summary statistics

Based on Figure 1, the research describes the meaning of each result of the research analysis. The Person measure coefficient is +0.68, which means that the respondents tend to agree on various statement items. Cronbach's alpha coefficient on IERS is 0.83, which means that the level of reliability is excellent. The coefficient of person reliability is 0.79, which has a pretty good meaning, while for item reliability, it is 0.89, which has a good definition. The following analysis as presented in Figure 2, focuses on describing item measure. This analysis determines which statement items are the easiest and the most difficult to get approval from the response.

As presented in Figure 2, item number 7 has a logit coefficient of +0.54. This coefficient indicates that item number 7 is the most difficult item to get approval from the response. While item number 5 has a logit coefficient of -0.47. This coefficient means that item number 3 is the item that is the easiest to get approval from the respondents. Rasch analysis also describes the item fit order. This analysis explains the fit and misfit items. Then, Figure 3 shows the analysis output on the item fit order aspect.

ITEM STATISTICS: MEASURE ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PTMEASUR-AL CORR.	PTMEASUR-AL EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
7	939	354	.54	.08	1.31	3.76	1.41	4.65	.54	.63	51.0	56.3	7
8	988	354	.20	.08	1.00	.00	1.06	.75	.54	.62	63.3	60.3	8
10	993	354	.17	.08	1.07	.92	1.05	.65	.63	.62	57.6	60.4	10
1	1005	354	.08	.09	1.12	1.47	1.18	2.09	.58	.61	61.3	60.7	1
4	1009	354	.05	.09	.83	-2.14	.80	-2.55	.62	.61	65.6	60.8	4
6	1012	354	.03	.09	.78	-2.95	.71	-3.82	.67	.61	70.5	60.8	6
5	1029	354	-.10	.09	.75	-3.26	.68	-4.13	.66	.61	74.8	62.5	5
2	1043	354	-.21	.09	.84	-2.00	.78	-2.71	.68	.60	71.1	63.6	2
9	1052	354	-.28	.09	1.34	3.64	1.38	3.99	.54	.60	57.0	63.7	9
3	1075	354	-.47	.09	.94	-.65	.89	-1.31	.67	.59	69.6	64.6	3
MEAN	1014.5	354.0	.00	.09	1.00	-.1	1.00	-.2			64.2	61.4	
P.SD	36.2	.0	.27	.00	.20	2.4	.25	3.0			7.1	2.3	

Figure 2. Item measure

ITEM STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PTMEASUR-AL CORR.	PTMEASUR-AL EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	ITEM
7	939	354	.54	.08	1.31	3.76	1.41	4.65	A .54	.63	51.0	56.3	7
9	1052	354	-.28	.09	1.34	3.64	1.38	3.99	B .54	.60	57.0	63.7	9
1	1005	354	.08	.09	1.12	1.47	1.18	2.09	C .58	.61	61.3	60.7	1
10	993	354	.17	.08	1.07	.92	1.05	.65	D .63	.62	57.6	60.4	10
8	988	354	.20	.08	1.00	.00	1.06	.75	E .54	.62	63.3	60.3	8
3	1075	354	-.47	.09	.94	-.65	.89	-1.31	e .67	.59	69.6	64.6	3
2	1043	354	-.21	.09	.84	-2.00	.78	-2.71	d .68	.60	71.1	63.6	2
4	1009	354	.05	.09	.83	-2.14	.80	-2.55	c .62	.61	65.6	60.8	4
6	1012	354	.03	.09	.78	-2.95	.71	-3.82	b .67	.61	70.5	60.8	6
5	1029	354	-.10	.09	.75	-3.26	.68	-4.13	a .66	.61	74.8	62.5	5
MEAN	1014.5	354.0	.00	.09	1.00	-.1	1.00	-.2			64.2	61.4	
P.SD	36.2	.0	.27	.00	.20	2.4	.25	3.0			7.1	2.3	

Figure 3. Item fit order

In Figure 3, the way to determine fit and misfit items is to combine the INFIT MNSQ value of each item with the sum of the standard deviations and the average. If the summation coefficient between the standard deviation and the average is greater than the INFIT MNSQ of each item, it is included in the category of misfit items. The standard deviations and mean sum are 1+0.20=1.20. As presented in Figure 3, items 7 and 9 fall into the misfit category, and we decided to revise the form of the statement items. The revision form for items 7 and 9 is described in Table 5. In Figure 4, we present the output of the Rasch analysis with the aspect of unidimensionality. This aspect describes a vital measure to evaluate whether the instrument can measure what it should count, in this case, the IERS.

Table 5. Revised IERS statement

No. Item	Old statement	New statement
7	I keep emotions in my heart	I keep angry feelings in my heart
9	I control my emotions by being silent	I control my anger by being silent

Figure 4 shows the results of the raw data variance measurement of 38.2%. This coefficient indicates that we can meet the minimum 20% unidimensionality requirement. Another thing is that the variance that the instrument cannot explain should ideally not exceed 15%. In the unidimensionality analysis, nothing exceeds 15%. Based on the meaning of the output of the unidimensionality analysis, it shows that the IERS instrument can measure the actual conditions of students' emotional regulation.

Finally, Figure 5 shows the variable map. Analysis of the variable map describes the distribution of emotion regulation ability and the distribution of item difficulty level with the same scale. The area on the left is the distribution of the subject's abilities, while the area on the right is the item's difficulty level.

```
    Table of STANDARDIZED RESIDUAL variance in Eigenvalue units = ITEM information units
                                      Eigenvalue   Observed   Expected
Total raw variance in observations     =      16.1866 100.0%          100.0%
  Raw variance explained by measures   =       6.1867  38.2%           38.5%
    Raw variance explained by persons  =       3.7068  22.9%           23.0%
    Raw Variance explained by items    =       2.4798  15.3%           15.4%
  Raw unexplained variance (total)     =      10.0000  61.8% 100.0%    61.5%
    Unexplned variance in 1st contrast =       2.1001  13.0%  21.0%
    Unexplned variance in 2nd contrast =       1.7445  10.8%  17.4%
    Unexplned variance in 3rd contrast =       1.1891   7.3%  11.9%
    Unexplned variance in 4th contrast =       1.1183   6.9%  11.2%
    Unexplned variance in 5th contrast =       1.0121   6.3%  10.1%
```

Figure 4. Unidimensionality

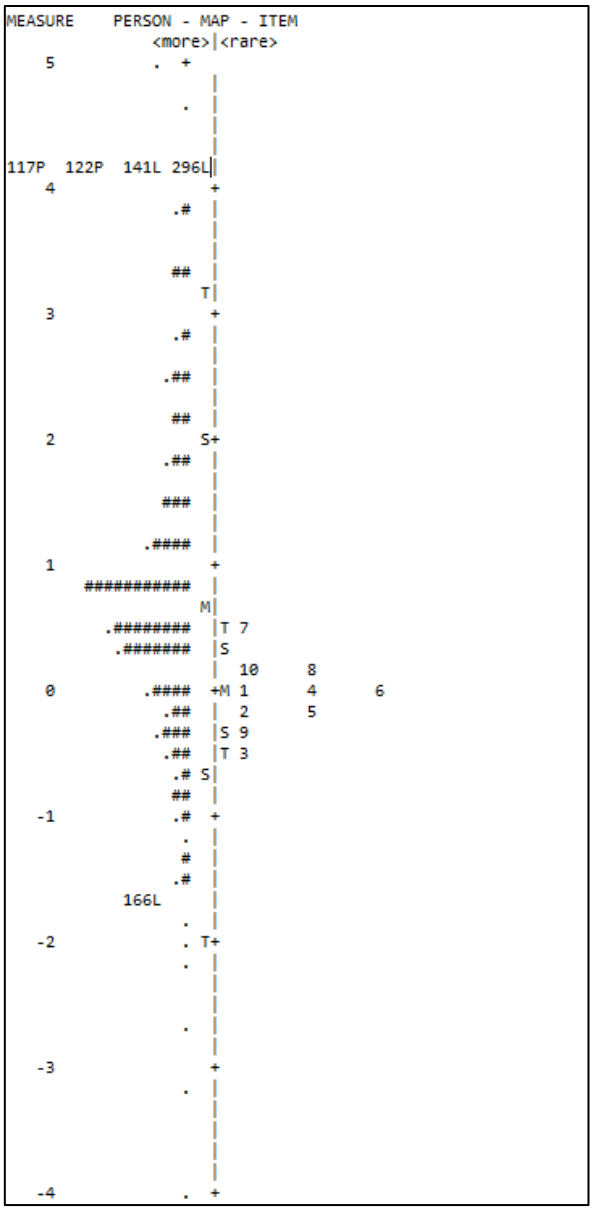

Figure 5. Person-item map distribution

The analysis results in Figure 5 show that item number 7 is the most challenging question for respondents to agree on. On the other hand, item number 3 is the most accessible item for respondents to agree on. In addition, Figure 5 also shows that person numbers 117, 122, 141, and 296 are the people who most easily agree with the IERS statement items. While person number 166 is the most challenging person to agree with the IERS statement item.

The results of research data analysis using the Rasch model show that IERS is one of the measuring tools that can measure the level of student emotion regulation. The accuracy of the measuring instrument to measure a determining variable is one of the requirements for photographing the actual condition of human behavior [28]. This measuring tool can help several parties in schools, mainly school counselors, identify the basis for the preparation of Guidance and Counseling programs that lead to the comfort and safety of students at school. A sense of psychological security and convenience for students at school can encourage students' self-actualization in academics and academic achievement [29]–[31].

Previous studies have attempted to formulate a measuring instrument for student emotion regulation. An example is emotion regulation strategies for artistic, creative activities scale [13]. A number of weaknesses in the existing instruments became the trigger for the development of this new instrument. It becomes a risk if the data as the basis for policy-making is not data that embodies the actual situation [32]. The study used Pearson's correlation to identify the validity of the instrument. Unlike the Rasch analysis, validity with Pearson correlation cannot provide comprehensive data analysis results [20], [33].

Other studies have also formulated a measuring instrument as an emotion regulation scale. An example is the state difficulties in the emotion regulation scale [14]. However, the data analysis to validate the emotion regulation instrument is factor analysis. Unlike the Rasch analysis, factor analysis cannot provide comprehensive descriptions such as respondents' quality, instruments' quality, and interactions between person and item [34]. Using Rasch analysis, it can provide a comprehensive description of the instrument's reliability and measure the actual conditions of human behavior.

Based on several studies, the weakness lies not only in data analysis but also in the cultural aspect. Thus, the data collection tools are still general and not yet specific to the target user. Several studies show that cultural factors influence respondents' understanding of instrument statement items [35], [36]. Some examples of instruments that pay attention to cultural aspects include the Turkish adaptation of behavioral regulations in sports questionnaires [37] and the Turkish adaptation of the caring climate scale. Another research is the Turkish adaptation of the caring climate scale in physical activity settings [38].

Previous studies have produced a culture-based emotional regulation scale. Some examples of these studies are the Turkish version of difficulties in emotion regulation scale-brief form [15], the Hindi version of the difficulties in emotion regulation scale [16], and modified versions of the difficulties in emotion regulation scale [17]. However, the instrument does not yet have specifications for students in Indonesia. In addition, data analysis still uses factor analysis which does not yet have accurate and comprehensive information, such as the Rasch analysis [39]. The Rasch model is an alternative to provide a more precise estimate of the reliability of measuring instruments [18]–[20].

It becomes interesting when some studies compare instrument validity analysis with conventional methods such as factor analysis with the Rasch model. Although traditional analytical techniques provide diverse information, measurements using the Rasch model reveal more about the data set and the instrument's construct [40]. In addition, the Rasch model also provides an alternative scaling method that allows the examination of an instrument's hierarchical structure and unidimensionality [41]. Rasch analysis has better effectiveness than factor analysis in removing instrument statement items and the percentage of variance [42]. Based on the explanation, we conclude that many studies recommend analyzing the instrument's validity using the Rasch model. Rasch is one of the modern data analyzers that is useful in determining the validity and reliability of an instrument and providing more specific information about a psychological measuring instrument.

No research explicitly develops an instrument for emotion regulation scale based on Indonesian culture. Therefore, this study seeks to include elements of Indonesian culture so that students can clearly understand the intent and meaning of the instrument statement items. Students' understanding of the content of the statement items provides support for the ease of students choosing the instrument statement items that best suit them. For example, this instrument is the Indonesian version of the depression anxiety stress scale [43] and Indonesian version subjective well-being scale [44].

Indonesian emotion regulation scale is one of the instruments that can be used as the basis for policymakers, especially in building a non-violent environment. Moreover, counselors have the role and capacity to develop programs to improve emotion regulation, and emotion regulation is one of the variables that influence reducing student violence [45]–[47]. A school environment that promotes non-violence can trigger good student perceptions of the school climate. Students' perception of school climate is one of the variables that determine academic performance [48] and academic achievement [49]. The situation of a safe,

comfortable, and minimally violent school environment is one of the dreams of students to be able to support their self-actualization in learning at school.

This study has limitations in determining the level of instrument validity. One of this research's weaknesses is the respondents' involvement, which focuses on high school students in Yogyakarta. Indonesia is an archipelagic country consisting of 37 provinces. In addition, another limitation of this research is that the instrument can only measure emotion regulation variables in general and does not lead to specific aspects of student emotion regulation in Indonesia. Therefore, the recommendation for further research is to conduct a trial of the IERS instrument by involving more regions in Indonesia. In addition, further analysis can also develop IERS instruments on specific aspects, such as aspects of school, community, or even family.

4. CONCLUSION

Counselors need a measuring tool that can specifically reveal students' emotional regulation levels in Indonesia. The Indonesian emotion regulation scale is the answer for counselors to their need for a measuring instrument to determine the level of regulation of high school students in Indonesia. This instrument for measuring student emotion regulation consists of two major aspects: reappraisal and suppression factor. The reappraisal factor aspect consists of six statement items. In contrast, the suppression factor aspect consists of four statement items. Research data analysis using Rasch analysis shows that Indonesian emotion regulation scale is an instrument capable of measuring emotion regulation, although the researchers did some revisions to the statement items. The research product in the form of IERS has contributed to the formation of a non-violent environment that supports the learning process through the steps of developing emotional regulation in each student.

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