

SCALING OF THE LIKERT TYPE SUMMATED RATING METHOD FOR MEASURING STUDENTS' INTEREST INSTRUMENTS IN PHYSICS

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ABSTRACT

Measuring the attitude instrument is one of the identical things done using a Likert scale with ordinal or interval models. The Likert scale is a type of scale that can be used for summated rating scaling. This study aims to analyze the instrument of student interest in physics lessons through the scaling method of the summated rating which is of the Likert scale type. The method used in this study is quantitative, then the instrument is scaled using the summated rating scale method. Data collection techniques through survey data taken from research data that has been carried out by previous researchers. The data analysis technique in this study was by analyzing the validity, reliability and SEM tests. The results showed that the Standard Deviation (SD) and Reliability values were higher before scaling than after scaling or summated rating, but conversely the SEM results were higher after scaling than before scaling with a difference of 0.075. Based on the results obtained, it proves that before and after scaling are not much different.

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INTRODUCTION

The measurement of an instrument has various methods of identifying and measuring the accuracy of its use. One of them is a measurement instrument on non-cognitive aspects. Psychological attributes that are not cognitive abilities are sometimes referred to as personality attributes and as affective attributes. Regarding the method of constructing the instrument, the ability attribute is known (following Cronbach's definition, 1970) as typical performance (Azwar, 2010). In this case the non-cognitive aspects can be measured by the accuracy of the instrument as a measuring tool.

Measurement of non-cognitive aspects is measured through scores or numbers. There are four scales or levels in measurement including; nominal, ordinal, interval, and

ratio (Aini et al., 2018; Allanson & Notar, 2020; Williams, 2021). One of the measurement models in the measurement aspect is a Likert scale. The Likert scale indicates the degree of agreement and disagreement with various statements about some attitudes, objects, people or events. The Likert scale measures attitudes using five points (anchors) where the third point in the middle represents neutrality (Taherdoost, 2019). Whether the Likert scale is an ordinal scale or an interval scale has been an ongoing debate among researchers (Chyung et al., 2017). The Likert scale is a psychometric scale that is commonly used in questionnaires, and is the most widely used scale in survey research (Taluke et al., 2019). This proves that the Likert scale is included in the quantitative analysis.

As it is known that in quantitative surveys, surveys can use one of a number of types of response scales. The types of scale include: (0,1,2,3), (1,2,3,4,5), (1,2,3,4,5,6,7), and (1,2,3,4,5,6,7,8,9,10). Scales in the form (0,1,2,3) can be called non-Likert scales. These scales: (1,2,3,4,5), (1,2,3,4,5,6,7), and (1,2,3,4,5,6,7,8,9,10), can be called a Likert scale or the accuracy of a Likert scale and non-Likert in quantitative surveys. (Louangrath & Sutanapong, 2018) The use of a Likert scale is a response-centered scaling method. The grouping of scaling methods consists of three things including; (1) stimulus-centered scaling method; (2) response-centered scaling method; and (3) subject-centered scaling methods (Setiawati et al., 2013).

The response-centered scaling method on the Likert scale can be carried out by the summated rating scaling method. When individuals indicate their agreement or disagreement with each item and their scores are determined by adding the given subscores to their responses for all separate items, then such a scale is called a summated scale (Shukla & Sharma, 2017). In addition, the suggested summated rating method is used for the construction of the current attitude scale to measure attitudes. One of the attitudes that can be measured through the Likert scale and the summated rating scaling method is in the form of students' perceptions of interest in learning physics (Waling & Jha, 2020).

Interest can be interpreted as a permanent behavior to pay attention to and enjoy an activity accompanied by pleasure. Interest in learning can be interpreted as a tendency of the heart to learn with the aim of obtaining information, knowledge, skills, teaching and experience (Setiawan & Istiqomah, 2021) Interest is an intrinsic factor in one's learning outcomes. Interest is closely related to feelings of like or dislike, pleasure or displeasure, interest or disinterest (Sulistiyani et al., 2016). Interest is a preference, a sense of interest, attention, focus, persistence, effort, knowledge, skill, motivation, behavior regulator, and the results of a person's or individual's interaction with certain content or

activities.(Nurhasanah & Sobandi, 2016) Interest is acceptance of a relationship between oneself and something outside oneself can be a person, an object, a situation, an activity and so on (Siagian, 2022). Interest is a focus of attention that contains elements of feelings, pleasure, inclinations, involuntary desires that are active in nature to receive something from the outside or the environment.(Andi, 2019).

Interest in learning includes feelings of interest and pleasure in learning, active participation, a tendency to pay attention and great concentration, positive feelings and an increasing willingness to learn, comfort in learning, and capacity to make decisions related to the learning process (Ricardo & Meilani, 2017).There are four indicators of interest, namely feelings of pleasure, student interest, student attention, and student involvement/student participation (Septiani et al., 2020). Based on some of the previous explanations, the indicators of interest in learning used in this study consisted of five of them namely feelings of pleasure, attention, interest, willingness to learn, and student involvement.

This interest in learning questionnaire is included in the Likert scale which includes scaling the type of response using the summated rating method. In the process of scaling the summated rating method aims to find out the results of the analysis of validity, reliability and SEM tests. The instrument to be used is a Likert scale model questionnaire, then scaling will be carried out.

RESEARCH METHODOLOGY

The type of research used is a quantitative approach, quantitative research is structured research and quantifies data to be generalized, so generalization is carried out on the population studied (Anshori & Hajah, 2019). Data collection techniques in this study used data from questionnaires on students' learning interest taken from previous research data. The type of questionnaire used uses a Likert scale with a rating scale consisting of four answer choices provided (Sugiyono, 2018). Each answer choice in the statement has a different score, namely always, often, sometimes, and never. Data analysis techniques in this study used validity, reliability, and SEM tests.

RESULT AND DISCUSSION

This study used the Likert-type summated rating method to measure students' learning interest in physics as an instrument. Based on the results of data analysis using the help of the Microsoft Excel application, the results of analysis of the frequency, proportion,

cumulative proportion, middle proportion, Z-value, and Z+ levels were obtained. Data analysis was carried out on 50 (fifty) samples of high school level students and consisted of 20 statement items, with the aim of knowing interest in learning physics. The results of the analysis of frequency, proportion, cumulative proportion, middle proportion, Z-value, and Z+ in more detail can be seen as follows.

		P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17	P18	P19	P20
Frekuensi (f)	1(TP)	1	1	2	1	1	1	1	1	1	2	1	1	1	1	2	2	2	2	2	1
	2(K)	11	9	19	10	10	22	15	11	11	7	7	10	1	10	4	5	9	20	10	5
	3(S)	23	20	9	18	19	5	14	19	18	21	20	28	27	27	24	25	23	7	15	24
	4(S)	15	20	20	21	20	22	20	19	20	20	22	11	21	12	20	18	16	21	23	20
	N	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
Proporsi (p)	1(TP)	0,02	0,02	0,04	0,02	0,02	0,02	0,02	0,02	0,02	0,04	0,02	0,02	0,02	0,02	0,04	0,04	0,04	0,04	0,04	0,02
	2(K)	0,22	0,18	0,38	0,20	0,20	0,44	0,30	0,22	0,22	0,14	0,14	0,20	0,02	0,20	0,08	0,10	0,18	0,40	0,20	0,10
	3(S)	0,46	0,40	0,18	0,36	0,38	0,10	0,28	0,38	0,36	0,42	0,40	0,56	0,54	0,54	0,48	0,50	0,46	0,14	0,30	0,48
Proporsi Kumulatif (pk)	4(S)	0,30	0,40	0,40	0,42	0,40	0,44	0,40	0,38	0,40	0,40	0,44	0,22	0,42	0,24	0,40	0,36	0,32	0,42	0,46	0,40
	1(TP)	0,02	0,02	0,04	0,02	0,02	0,02	0,02	0,02	0,02	0,04	0,02	0,02	0,02	0,02	0,04	0,04	0,04	0,04	0,04	0,02
	2(K)	0,24	0,20	0,42	0,22	0,22	0,46	0,32	0,24	0,24	0,18	0,16	0,22	0,04	0,22	0,12	0,14	0,22	0,44	0,24	0,12
Proporsi tengah (pk-t)	3(S)	0,70	0,60	0,60	0,58	0,60	0,56	0,60	0,62	0,60	0,60	0,56	0,78	0,58	0,76	0,60	0,64	0,68	0,58	0,54	0,60
	4(S)	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
	1(TP)	0,01	0,01	0,02	0,01	0,01	0,01	0,01	0,01	0,01	0,02	0,01	0,01	0,01	0,01	0,02	0,02	0,02	0,02	0,02	0,01
	2(K)	0,13	0,11	0,23	0,12	0,12	0,24	0,17	0,13	0,13	0,11	0,09	0,12	0,03	0,12	0,08	0,09	0,13	0,24	0,14	0,07
z-value	3(S)	0,47	0,40	0,51	0,40	0,41	0,51	0,46	0,43	0,42	0,39	0,36	0,50	0,31	0,49	0,36	0,39	0,45	0,51	0,39	0,36
	4(S)	0,85	0,80	0,80	0,79	0,80	0,78	0,80	0,81	0,80	0,80	0,78	0,89	0,79	0,88	0,80	0,82	0,84	0,79	0,77	0,80
	1(TP)	-2,33	-2,33	-2,05	-2,33	-2,33	-2,33	-2,33	-2,33	-2,33	-2,05	-2,33	-2,33	-2,33	-2,33	-2,05	-2,05	-2,05	-2,05	-2,05	-2,33
2(K)	-1,13	-1,23	-0,74	-1,17	-1,17	-0,71	-0,95	-1,13	-1,13	-1,23	-1,34	-1,17	-1,88	-1,17	-1,41	-1,34	-1,13	-0,71	-1,08	-1,48	
3(S)	-0,08	-0,25	0,03	-0,25	-0,23	0,03	-0,10	-0,18	-0,20	-0,28	-0,36	0,00	-0,50	-0,03	-0,36	-0,28	-0,13	0,03	-0,28	-0,36	
4(S)	1,04	0,84	0,84	0,81	0,84	0,77	0,84	0,88	0,84	0,84	0,77	1,23	0,81	1,17	0,84	0,92	0,99	0,81	0,74	0,84	
z+	1(TP)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	2(K)	1	1	1	1	1	2	1	1	1	1	1	1	0	1	1	1	1	1	1	
	3(S)	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
	4(S)	3	3	3	3	3	3	3	3	3	3	3	4	3	4	3	3	3	3	3	

The results of the data analysis above show that the Z+ value is obtained by scores of 0, 1, 2, 3, and 4. The results obtained from the Z+ value then the data scaling process is carried out. Data that has been scaled (summated rating) is in the form of an interval scale, where previously the data was in ordinal form. Then perform data analysis to determine the value of the standard deviation (SD), reliability, and standard error mean (SEM) on the original data and the data resulting from scaling (summated rating). As in previous studies said that every measurement made will have an error. (Priowuntato et al., 2015) In this case the errors that occur in measurements in the natural sciences are simpler than in the social sciences. The results of the analysis on both data can be seen in table 1.

Table 1. Results of SD, Reliability, and SEM analysis

Data	Standard Deviation	Reliability	SEM	SEM difference
Original data	9,194	0,883	3,145	0,075
Scaling data	9,180	0,877	3,220	

Table 1 shows the results of the analysis of the attitude scale in the form of students' interest in learning physics. Based on the results of the analysis, it was obtained an increase in the standard deviation value in the scaling result data (summated rating), but there was a decrease in the reliability test results. While the results of the SEM analysis obtained an increase in data scaling (summated rating) with a difference value of 0.075. This proves that the scaling result data (summated rating) is valid to be used as an instrument to measure students' interest in learning physics.

In addition, to find out the analysis of the standard deviation (SD), reliability, and standard error mean (SEM) for each indicator of student learning interest, both on the original data and scaling data, more details can be seen in table 2.

Table 2. Results of SD, Reliability, and SEM analysis for each indicator

Indikator	Original Data			Scaling Data		
	Standard Deviation	Standard Deviation		Standard Deviation		SEM
		Reliability	SEM	Reliability	SEM	
Feeling happy	1,822	0,503	1,285	1,776	0,503	1,252
Attention	2,521	0,679	1,429	2,317	0,656	1,359
Interest	2,314	0,684	1,301	2,810	0,694	1,555
Will	1,045	0,299	0,875	1,257	0,323	1,035
Student Engagement	3,239	0,721	1,711	3,223	0,721	1,702

Table 2 shows the results of the analysis of the standard deviation (SD), reliability and standard error mean (SEM) for each indicator. The results of scores that have been analyzed by Sumated Rating or Standardized and the original data or without scaling have Standard Deviation, reliability and SEM values that are almost the same or stable. This proves that there is no significant difference between before and after scaling the indicator item analysis.

CONCLUSIONS AND SUGGESTIONS

Based on the results of previous data analysis, it can be concluded that the Standard Deviation (SD) and Reliability values are higher before scaling than after scaling or summated rating, but on the contrary the SEM results are higher after scaling than before scaling with a difference of 0.075. Furthermore, the results of the reliability analysis of all items, both before and after scaling, have a Cronbach's Alpha value > 0.70 , meaning that all items are reliable. Based on the results obtained, it proves that before and after scaling the results obtained are not much different.

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