FACTORIAL CONSTRUCTION OF A LIKERT SCALE

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Abstract: The purpose of the present study is to investigate the effect of items direction, affirmative and negative on the factorial construction and reliability coefficients of an attitude scale. The Likert scale was administered on the sample of 705 senior secondary school students selected through multistage sampling technique. Likert scale developed by the investigator was used to access attitude of students towards their home environment. The finding of the study revealed that, there are differences in the number of factors calculated by factor analysis and showed that there is effect of items direction, affirmative and negative on the factorial construction in a Likert scale and there exists differences in reliability coefficients of affirmative, negative and combined together them in a scale. This can be concluded that having affirmative and negative items in a Likert scale increase its internal consistency.

Keywords: *Factorial construction, Likert scale, Reliability.*

Introduction:

In the words of Allport (1950), "the interest of American social psychologist in fact-collecting and statistical methods has resulted in a rapid advance in the empirical study of attitudes , with the result that attitudes today are measured more successfully than they are defined". Since Thomas and Znaniecki (1918), who gave systematic priority to the concept of attitude in their study of Polish peasants, many scientists have developed different techniques for attitude measurement but none could devise any universally acceptable scale for the measurement of attitude. The most prevalent means of measuring attitudes is providing individuals with a list of sentences or adjectives and asking them to respond to sentence or adjective in accordance with their true feelings. These lists are called 'Scales'. Various scaling techniques have led to the development of different types of attitudes scales and the most frequently used attitude scales is Likert scale developed by Rensis Likert (1932). The Likert Rating Scale (Likert, 1932; Likert, Roslow & Murphy 1934) is a simple procedure to generate measurement instruments which is widely used by social scientists to measure a variety of latent constructs, therefore, meticulous statistical procedures have been developed to design and validate these scales, however, most of them ignore the ordinal nature of observed responses and assume the presence of continuous observed variables measured at interval level. Since Rensis Likert suggested the scaling procedure which now bears his name, a strong debate have been placed with regard to the optimal number of categories to present to the subjects responding the questionnaire. Interestingly, the evidence found in literature support highly contrasting positions: some researchers suggest that larger numbers of response

categories enable reaching higher levels of reliability (Garner, 1960) and validity (Hancock & Klockars, 1991); while others suggest that the number of response categories is not related to the reliability of the scale (Boote, 1981) and its validity (Chang, 1994). Overall, the evidence tend to indicate that the researchers should avoid presenting few response categories, two or three to the subjects as it could decrease the validity of the scale and the subjects may feel they are not able to express their true opinion when responding the questionnaire.

For those reasons, most of the Likert scales employ 4 up to 7 response categories and, five or seven-points are the most common format used in applied research .The preference for an odd number of response categories reflects a tendency to choose items that allow subjects to define their position as 'neutral' with respect to the construct intended to measure.

Another case with Likert scales is the nature of items or statements. Likert suggested that in order to avoid any biased response from the subjects the items must be such to employ possibilities of thoughtful reading. For such a scale items should be the mixture of affirmative and negative wordings about the psychological construct to be assessed. The question, do affirmative and negative items in a Likert scale yields validity and reliability? This paper tries to answer this basic question.

Objectives:
- To investigate the effect of items direction, affirmative and negative on the factorial construction of Likert scale.
- To investigate the effect of items direction, affirmative and negative on the reliability of Likert scale.

Hypotheses:
- There will be no effect of items direction, positive and negative on the factorial construction of Likert scale
- There will be no effect of items direction positive and negative on the reliability coefficients of Likert scale

Sample: 705 senior secondary school students were selected through multistage sampling technique from Anantnag and Kulgam Districts of Jammu & Kashmir state.

Tool used: Attitude scale towards home environment was used to assess the attitude of senior secondary school students towards their home environment which was developed by the investigator.

Statistics applied: Factor and Reliability analysis

Results: To answer the first objective, the researcher used factor analysis for each form affirmative and negative and the result were as following:

Table 1: Factorial Construction of the Likert scale

Item Direction	No. of factors	Cumulative percentage
Affirmative	17	74.83%
Negative	8	64.54%

Table 1, reflects that there are differences in the number of factors calculated and cumulative percentage by factor analysis and the 17 factors representing 49

positive/affirmative items and 8 factors representing 22 negative items have cumulative percentage 74.83% and 64.54% respectively. Further separate factor analysis for positive and negative forms was done and is represented in below tables.

Table 2: Adequacy of the sample for factor analysis

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.712
Bartlett's Test of Sphericity	Approx. Chi-Square	2566.701
	df	1176
	Sig.	.000

Above table 2 shows several very important parts of the output: the Kaiser–Meyer–Olkin measure of sampling adequacy and Bartlett's test of sphericity. These tables are obtained using the KMO and Bartlett's test of sphericity. We came across the KMO statistic in section and saw that Kaiser (1974) recommends a bare minimum of 0.5 and that values between 0.5 and 0.7 are mediocre, values between 0.7 and 0.8 are good, values between 0.8 and 0.9 are great and values above 0.9 are superb (Hutcheson & Sofroniou, 1999). For these data the value is 0.71, which falls into the range of being good, so we should be confident that the sample size is adequate for factor analysis.

Table 3: Positive Form Factor Analysis of items with Eigenvalues above 1

Items	Total/Eigenvalues	% of Variance	Cumulative %
1	6.487	13.240	13.240
2	3.376	6.890	20.129
3	2.933	5.985	26.114
4	2.835	5.786	31.900
5	2.539	5.181	37.082
6	2.268	4.628	41.710
7	2.058	4.199	45.909
8	2.023	4.128	50.037
9	1.724	3.518	53.555
10	1.641	3.350	56.905
11	1.490	3.041	59.946
12	1.436	2.931	62.877
13	1.331	2.716	65.593
14	1.299	2.652	68.244
15	1.120	2.285	70.530
16	1.108	2.260	72.790
17	1.001	2.043	74.833

The table above shows that there are 17 factors of positive form of items and they contributed 74.83% of cumulative percentage.

Table 3: Adequacy of the sample for factor analysis

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.645
Bartlett's Test of Sphericity	Approx. Chi-Square	518.139
	Df	231
	Sig.	.000

Above table 3 shows several very important parts of the output: the Kaiser–Meyer–Olkin measure of sampling adequacy and Bartlett's test of sphericity. These tables are obtained using the KMO and Bartlett's test of sphericity. For above data the value is 0.64, which falls into the range of being mediocre, so we should be confident that the sample size is adequate for factor analysis.

Table 4: Negative Form Factor Analysis of items with Eigenvalues above 1

Items	Total/Eigenvalues	% of Variance	Cumulative %
1	3.861	17.548	17.548
2	2.017	9.166	26.715
3	1.775	8.067	34.781
4	1.642	7.464	42.246
5	1.523	6.925	49.171
6	1.259	5.721	54.891
7	1.099	4.994	59.886
8	1.025	4.658	64.543

The table above shows that there are 8 factors of negative form of items and they contributed 64.54% of cumulative percentage.

Therefore the null hypothesis, "there will be no effect of items direction, positive and negative on the factorial construction of Likert scale" was rejected.

To achieve the second objective Cronbach's Alpha was calculated separately for positive, negative and for both combine together. The results of the same are presented in the below table 5.

Table 5: Reliability coefficients

Item Direction	Alpha
Positive items	.87
Negative items	.81
Both Positive & Negative	.89

Above table 5, reflects the reliability coefficients for positive, negative and for both combined together. For positive items alpha is .87, for negative items it is .81 and alpha for both combined together is .89 which is a very good indication of reliability coefficient for a scale. Therefore the null hypothesis, "there will be no effect of items direction positive and negative on the reliability coefficients of Likert scale" was

rejected. As reflected by analysis having affirmative and negative items in a scale increases to its internal consistency.

Conclusion:

In conclusion analysis reflects that the selected items direction, affirmative and negative are having its influence on the factorial construction and reliability of a Likert scale. The investigator has drawn some conclusions which are being presented below:-

- It can be concluded that there are difference in the number of factors calculated from factor analysis and showed that there is effect of items direction (positive or negative) on the factorial construction of a Likert scale.
- It can be concluded that the reliability of the Likert scale is influenced by the affirmative, negative and combined together them in a scale. This indicates that having affirmative and negative items in a scale increases to its internal consistency.

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