

## VALIDITY ISSUES OF A LIKERT TYPE SCALE (A CASE STUDY)

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**ABSTRACT:** This study is related to psychometric properties of a Likert type scale. This investigation is especially related to frequently used validation procedure. "Is it possible to obtain a final scale with one dimension (factor) using traditional unidimensional item selection procedures?" Results were discussed and some comments were made.

**KEY WORDS:** attitudes, Likert scales, validity, construct validity, factor analysis.

### Introduction

Likert type scales have widespread and frequent usage because it is much easier to construct them than the other rating scales in behavioural sciences in order to measure personality traits and especially attitudes (Judd, Eliot and Kidder, 1991). Likert type scales are constructed by means of respondents' responses. The procedures of constructing scale focus on responses (Torgerson, 1958). In this case, responds are scaled, but not the items. The all systematic variations among responds to the items represent the individual differences.

There are two main stages when constructing Likert type scales. Tryout scale is prepared and administered at the first stage. This procedure may be summarised as follows:

- a) defining attitude towards a subject matter or psychological object;
- b) specifying the statements which represent (indicants of) specific attitude;
- c) getting together these statements in a tryout scale and gathering responds.

Detailed information can be found in Likert (1932); Edwards (1957); Torgerson (1958); Oppenheim (1979); Dunn-Rankin (1988); Judd and others (1991); Turgut and Baykul (1992). These responds are analysed and item selection procedure is performed at the second stage.

Psychometric properties of scale must be examined after selection of items for the final scale. The basic psychometric properties of a scale are reliability and validity at least. Each of stimuli is accepted as iterative

stimulus of each other according to summated ratings technique. So that each of items in a Likert type scale must measure the same psychological construct. This means that all items have high intercorrelations or item - total correlations. In other words, homogeneous items are gathered together in the final scale. This is the way of unidimensional scaling. The main purpose of this procedure is to obtain an internally consistent scale (McIver and Carmines 1982). If the final scale is internally consistent, it is a reliable scale. The reliability of a Likert type scale is estimated with Cronbach Alpha Coefficient (Cronbach, 1951). The second and main psychometric property of a scale is validity. The main interest must be construct validity for Likert type scales in this case. The frequent way of examining construct validity is factor analysis. Construct validation takes place when an investigator is interested in whether a particular measure relates to the other measures consistent with theoretically derived hypotheses concerning the relationship among the dimensions or not. The establishing construct validity involves the following steps:

- a) construction of a theory by defining concepts and anticipating relationships among them;
- b) selecting indicants that represent each concept contained within the theory;
- c) establishing the dimensional nature of these indicants;
- d) constructing scales for each of respective sets of indicants;
- e) calculating the correlations among these scales; and
- f) comparing these empirical correlations with the theoretically anticipated relationships among the concepts (Zeller 1988, p. 326).

There is no more than one main concept or dimension in the unidimensional scaling approach. In this case, there must be a theoretically expectation: All items must be gathered together in one factor. The focus of this study is: Is it possible to obtain a scale with one dimension using traditional unidimensional item selection procedures?

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## Procedure

The "Tryout Attitude Scale for Marriage Via Mediators (TASMM)" was developed for some investigative purposes. TASMM contains sixty attitude statements towards marriage via mediators. These statements were derived from written compositions. TASMM was randomly administered one hundred respondents above fifteen years of age. Any data about sex, identity and demographic were not collected when administering TASMM. All calculations depend on data which were collected from first administration of TASMM.

The data were analysed with ClarisWorks-Spreadsheet (1991) and StatView (Abacus Concepts, Inc. 1992). After administering TASMM, twenty items were selected for the final version of this scale (Attitude Scale for Marriage Via Mediators - ASMM) depending on item - total correlations. Items in TASMM were sorted by descending order depending on item - total correlations and than first twenty of sixty items were selected for ASMM. Reliability coefficients of TASMM and ASMM were calculated by using Cronbach Alpha coefficient. Factor analyses were applied to the same data of the final scale by using StatView. First factor analysis was applied by using principle components with method default of StatView. Second factor analysis was applied by using principle components with forced 3 factors of StatView. Third factor analysis was applied by using principle components with forced 2 factors of StatView. Orthogonal / varimax transformations were used in all factor analyses.

## Results and Comments

The tryout version of this attitude scale contains sixty items and has Cronbach alpha reliability coefficient of 0,75. The final version has twenty selected items from sixty and has Cronbach alpha reliability coefficient of 0,88. The reliability coefficient of final scale was significantly higher ( $p = 0,01$ ) than the tryout version's. The final version's reliability coefficient seems to be acceptable and to be a internally consistent scale. This final scale scores interpret the 77 percent of total variance (square of reliability coefficient). If this final scale is accepted as a reliable one, then the validity of this final version may be examined.

The aim of this scale is to measure a psychological construct (concept): attitudes towards marriage via mediators. It is important to estimate construct validity in this case. Construct validity refers to the degree to which inferences can legitimately be made from the operationalizations in a study to the theoretical constructs on which those operationalizations were based. Construct validation is a

matter of establishing relationship between observations and theory. Construct validity is a well translated ideas or theories into actual measures. Briefly, construct validity can be viewed as a "truth in labelling" kind of issue. There are two broad ways of looking at the idea of construct validity. The first one is the "definitionalist" perspective because it essentially holds that the way to assure construct validity is to define the construct so precisely that we can operationalize it in a straightforward manner. In the definitionalist view, we have either operationalized the construct correctly or we haven't -- it's an either/or type of thinking. The other perspective is "relationalist." To the relationalist, things are not either/or black-and-white -- concepts are more or less related to each other. The meaning of terms or constructs differs relatively, not absolutely. The measures of final scale might be capturing a lot of the construct of attitude towards marriage via mediators, but it may not capture all of it. There may be another measure that is closer to the construct of attitude than yours is. Relationalism suggests that meaning changes gradually. The notion of construct validity assumes the development of some sort of theoretical framework or network of concepts (dimensions).

Factor analysis can be useful in defining and specifying fundamental variables. Essentially, factor analysis provides a formal and well structured mathematical and statistical basis for specifying the minimum number of concepts required to describe observed phenomena with a specified degree of accuracy (Horst 1966, p. 147). In the construction of a attitude scale, we try to include only those items within a tryout scale which yield maximum intercorrelation among the item scores. In this study, items for final scale were selected item - total correlations from the tryout scale. In this case, each of the items in the final scale can be thought as a variable and there is no prior theoretical expectations or hypothesis. Summary information of the first factor analysis is shown at Table 1.

Table 1: Summary Information For The First Factor Analysis (Statview II)

Factor Procedure	Principal Component Analysis
Extraction Rule	Method Default
Transformation Method	Orthotran/Varimax
Number of Factors	9

The first factor analysis was performed with the procedure of principal component analysis with the default method of StatView by using orthogonal transformation and varimax rotation. Nine factors

were obtained by using this kind of analysis. Proportions of variance contributions of these factors are shown at Table 2.

Table 2. Proportionate Variance Contributions in the first factor Analysis

	Orthogonal	Oblique		
	Direct	Direct	Joint	Total
Factor 1	.24	.23	-1.31E-3	.23
Factor 2	.17	.16	2.77E-3	.16
Factor 3	.12	.12	-9.02E-4	.12
Factor 4	.11	.1	1.79E-3	.1
Factor 5	.09	.08	7.61E-4	.08
Factor 6	.07	.08	1.52E-4	.08
Factor 7	.09	.08	1.79E-3	.08
Factor 8	.07	.07	.01	.08
Factor 9	.06	.06	8.86E-6	.06

As shown at Table 2, the first three factors have variance proportions above ten percent. Because of this, the second factor analysis was performed by using the same procedures with the first, but forced to three factors. The summary information about the second factor analysis is shown at Table 3.

Table 3. Summary Information for The Second Factor Analysis

Factor Procedure	Principal Component Analysis
Extraction Rule	User Specified
Transformation Method	Orthotran/Varimax
Number of Factors	3

Eigenvalues and Proportion of Original Variance of three factors are shown at Table 4. All three factors are interpreting 51 percent of total original variance on scale scores.

Table 4: Eigenvalues And Proportion Of Original Variance Obtained From The Second Factor Analysis

	Magnitude	Variance Prop.
Value 1	6.4	.32
Value 2	2.58	.13
Value 3	1.28	.06

At the Table 5, Proportions of variance contributions of three factors are shown. The first two factors have more amount of variance than the third one. The first factor has 24 percent of total, the second factor has 57 percent of total but the third factor has 19 percent of total. An inspection of items in the factors doesn't allow theoretically labelling these factors. For example, cognitive, affective and actionable components of an attitude might be expected to find out theoretically.

Table 5: Proportionate Variance Contributions in the Second Factor Analysis

	Orthogonal	Oblique		
	Direct	Direct	Joint	Total
Factor 1	.32	.24	2.11E-4	.24
Factor 2	.41	.33	.24	.57
Factor 3	.26	.19	-4.80E-4	.19

In order to find out meaningful set of items, the third factor analysis was performed by using the same procedures with the first, but forced to two factors. The summary information about the second factor analysis is shown at Table 6.

Table 6: Summary Information for Third Factor Analysis

Factor Procedure	Principal Component Analysis
Extraction Rule	User Specified
Transformation Method	Orthotran/Varimax
Number of Factors	2

Eigenvalues and Proportion of Original Variance of two factors are shown at Table 7. Two factors are interpreting 43 percent of total original variance on scale scores.

Table 7: Eigenvalues And Proportion Of Original Variance Obtained From The Third Factor Analysis

	Magnitude	Variance Prop.
Value 1	6.4	.32
Value 2	2.58	.13

At Table 8, Proportions of variance contributions of two factors are shown. The first factor contributes 51 percent of total interpretable variance, the second factor contributes 49 percent. The items in the factors doesn't allow theoretically labelling these factors. But It seems that there is a similarity: similar items takes place in one factor. This similarity is: eleven negative attitude statements of twenty are taking place in first factor and eight positive attitude statements of twenty are taking place in second factor except one negative statement. These statements with factor score weights are shown at Table 9. Primary correlation coefficient is 0.37 between two factors. This means first and second factors have common variance, not exactly independent.

In this case ASMM seems as a test battery which has had two subscales. One of the subscale consists of negative attitude statements and the other consists of positive attitude statements. This conclusion seems an artificial comment because in the definition of Likert type scales, there are equivalent negative and positive statements. It can be seen that all the sta-

tements are related to same concept by means of logical investigation of these negative and positive statements.

Table 8 Proportionate Variance Contributions in the Third Factor Analysis

	Orthogonal		Oblique		
	Direct		Direct	Joint	Total
Factor 1	.51		.43	-7.79E-4	.43
Factor 2	.49		.41	.17	.57

This study can support the idea of "if a scale has highly internal consistency, it possibly has one dimension". Sometimes making factor analytical studies on some scales may lead the researcher to misinterpretations.

Table 9: Attitude Statements and Their Factor Score Weights for Orthogonal Transformation / Solution-Varimax of ASMM

Item Number	Statement	+/-	F	Factor 1	Factor 2
1	Görücü usulü ile evlenen çiftler sonradan pişman olurlar.	-	F1	0.12	- 0.01
2	Görücü usulü ile evlenme yuva kurmak için uygundur.	+	F2	- 0.05	0.19
3	Görücü usulü ile evlilik daha gerçekçidir.	+	F2	- 0.05	0.18
4	Görücü usulü ile evlenmede ahlak çöküntüsü olmaz.	+	F2	- 0.08	0.18
5	Görücü usulü ile evlenmede sorunlar şiddete dayalı olarak çözülür.	-	F1	0.16	- 0.03
6	Görücü usulü ile evlilikte eşlerin uyumu zaman alır.	-	F1	0.11	0.04
7	Görücü usulü ile evlenmede sevgi bağı zayıf olur.	-	F1	0.18	- 0.07
8	Görücü usulü ile evlenmede en küçük sorunlar çok büyük olumsuzluklara yol açar.	-	F1	0.19	- 0.09
9	Görücü usulü ile evlenmede erkek kadına bir cinsel meta olarak bakar.	-	F1	0.17	- 0.07
10	Görücü usulü ile evlilik sağlam temellere dayanır.	+	F2	- 0.06	0.22
11	Görücü usulü ile evlenmede aşk yoktur.	-	F1	0.13	- 0.03
12	Görücü usulü ile evlenmede çiftler birbirlerine daha bağlıdır.	-	F1	- 0.04	0.16
13	Görücü usulü ile evlilik daha iyi yürür.	+	F2	0.01	0.13
14	Görücü usulü ile evlenenler daha geçimsiz olur.	-	F1	0.16	- 0.03
15	Görücü usulü ile evlenmede taraflar birbirlerini tanımadan evlenirler.	-	F1	0.12	- 0.01
16	Görücü usulü ile evlenmede adaylar evlilik öncesinde özgürce birlikte olamazlar.	-	F1	0.11	0.02
17	Görücü usulü ile evlenmede, daha önce arkadaşlık devresi olmadığından bu duygular evlilikten sonra daha iyi yaşanır.	+	F2	0.01	0.13
18	Görücü usulü ile evlilikte erkek kadına daha fazla değer verir.	+	F2	- 0.05	0.19
19	Görücü usulü ile evlenme kişilerin özgürlüğünü kısıtlar.	-	F1	0.14	- 0.04
20	Görücü usulü ile evlenme çağdaş yaşama aykırıdır.	-	F2	0.05	0.10

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