Likert Scale Development: Construction and Evaluation of Home Environment Scale

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Abstract

This paper is based on the construction and evaluation of home environment scale for senior secondary school students. In this paper an attempt was made to evaluate validity, reliability and to determine the appropriate standards to interpret the results of home environment scale. The scale includes 71 items to measure ten dimensions of home environment. Content validity was evaluated by more than 20 experts and validity was calculated by correlation between the score of each dimension and total score of the scale. To know the discrimination validity for each dimension of the test, 't' test for two independent samples was used (high group and low group). The reliability of the scale was tested by calculating Alpha Coefficients. Overall it is concluded that the scale has good construct and discrimination validity. Moreover, all the values of reliability coefficient for each dimension are highly significant.

Keywords: Construction. Evaluation, Home Environment, Likert Scale, Reliability, Validity

Introduction (Need to develop the Home Environment scale):

Various instruments have been developed for assessing the home environment in foreign as well as in India. Some foreign scales are developed by Watson 1957, Williamson 1961, Moos 1974, Bradley 1981 and some Indian scales by Prerna Mohete, Beena Shah, Reena Sharma, K. S. Mishra etc. As we know the foreign tools are not culture fair and this makes them unsuitable for use in the particular context. Another issue with these foreign scales (Moos) is that they lack reliability with respect to adolescent sample (Boyd, C. P. et al, 1997). Other issue is their language of the items in which they have been originally developed and their lack of measuring all the major dimensions, that are universally acceptable on which home as a social institution is based. Similarly, Indian scales measuring home environment are not without the pitfalls like that of assessment of home environment for the age group of 20 to 50 years (Reena Sharma) and with only five areas of home environment and others only devised for measuring home environment for I-VIII class students (Prerna Mohete). While others for high school students (Beena Shah) and others assessing only the psychological nature of the home (Mishra). Hence a complete tool to assess the major parameters on which any institutions is based seems to be lacking in these scales and this demands a new scale to be developed, which measures broad three parameters of home environment which are interrelationship parameter, individual development parameter and system organization parameter.

Objectives:

1. To construct a Likert scale measuring the attitude of senior secondary school students towards their home environment.
2. To evaluate the validity of home environment scale.
3. To evaluate the reliability of home environment scale.
4. To determine the appropriate standards to interpret the results of home environment scale.

Methodology:

The method adopted for the present study can be categorized as descriptive statistical in nature. Descriptive research describes and interprets the current status, it is concerned with conditions or relationship that exist, practices, that prevail, beliefs, points of view or attitudes that are held, processes that are going on, effects that are being felt or trends that are developing. The process of description as employed in this research study goes beyond mere gathering and tabulation of data. It involves an element of interpretation of the meaning or significance of what is described. Thus, description is combined with comparison or contrast involving measurement, classification, interpretation and evaluation.

Sample:

The samples of the study is comprised of 106 senior secondary school students currently enrolled in class 11th of different (Govt./Private) schools of South Kashmir of Jammu and Kashmir during the year 2015. This study was delimited to students of class 11th. Secondly the age range of the members of the population is 16-17 years.

Stages of tool construction:

As with the tool construction, there is no total agreement of experts about the precise steps for tool construction. Nevertheless, when constructing a tool, it is necessary to go through a number of stages in order to ensure its good quality (Alderson, 1995). Although their needs a proper procedure for tool construction. The graphical representation for the stages of tool construction as depicts in figure 1.
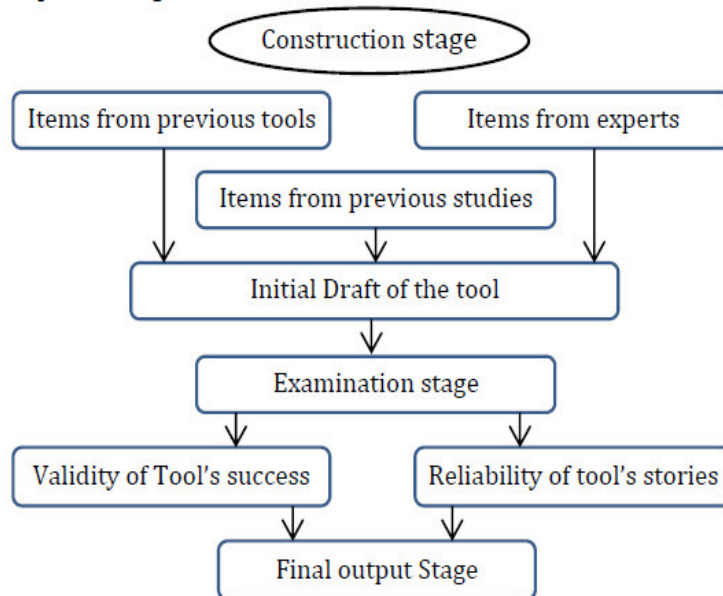
Fig. 1: Stages of tool construction

Preparation of preliminary draft:

Once going through the literature and previous tools as mentioned above in introduction, ten dimensions based on three mentioned broad parameters were selected which are related to the overall environment of home. Interrelation parameter includes dimension as Family integration, Conflict, Self-expression and Social climate of the family. Individual development parameter includes dimension as Guidance provided at home, Emotional support, Success orientation and Independence and System organization parameter includes dimensions like Organization and management of family and Control. Then the items associated with ten dimensions were selected and each item was selected according to the nature of the dimension. For the selection of the items, previous tools and studies related with home environment were consulted along with the available literature. While selecting items, the nature of item measured the desired dimension of home environment were taken into consideration. In this way the initial draft was prepared and 110 items (11 in each dimension) were included in the scale. Then, draft items were given to experts from different universities who were well versed in the field and scale construction with a request to review the statements and evaluate their content accuracy coverage, editorial quality and suggestions for additions, deletion and modification of items. On the basis of 80% of unanimously 30 items were deleted and 80 items were retained, which are reported below with the number of items:

Table 1: Dimensions with number items in HES

Dimension	No. of Items
A. Family integration	8
B. Social climate of the family	8
C. Guidance (Assistance) provided at home	8
D. Organization and management of the family	8
E. Conflict	8
F. Emotional Support	8
G. Success Orientation	8
H. Control	8
I. Self-expression	8
J. Independence	8

Try-out of the tool: The initial format with 80 items was administered on the sample of 106 higher secondary school students from Kashmir (J&K). This is an attitude scale measuring the children's attitude towards their family environment. The scale requires pupils to tell the favorableness or unfavorableness with which a particular behavior has been observed by them in their homes, i.e., he/she is requested to tell whether they are Strongly Agree, Agree, Undecided, Disagree and Strongly Disagree respectively with the items in the scale.

Scoring of the Responses to HES Items: There are five cells against every item of the scale; each cell indicates the degree of agreement or disagreement. The five cells belong to five options namely, 'Strongly Agree' 'Agree'

'Undecided' 'Disagree' and 'Strongly Disagree', the dimension to which a particular item belongs has been indicated by alphabets near the serial number of the items. 5 marks were assigned to 'Strongly Agree', 4 marks to 'Agree', 3 marks to 'Undecided', 2 mark to 'Disagree', and 1 marks to 'Strongly Disagree' responses and for negative items scoring is done in reverse order like 1,2,3,4,and 5 for Strongly Agree, Agree, Undecided, Disagree and Strongly Agree respectively. Then the marks were counted which were assigned to A, B, C, D, E, F, G, H, I and J dimension statements and then they were added to get the total composite score on the particular dimension. Ten composite scores for ten dimensions of the scale consists the children's attitude towards their home environment.

Item Analysis: For assessing the item analysis bi-serial correlation was used to sharpen the scale. The responses were collected and scored. Individual item score was correlated with the total score of the tool. Item analysis was done for the 106 response sheets by using Item Vs Whole correlation method. The sum of the scores on each dimension of value was calculated. Then 'r' was calculated by correlating the individual item and the corresponding component score. The correlation coefficient at the 5% level of significance is 0.196 when the degree of freedom is 100 (Best, J. W. 2006)[1]. So the items having 'r' values 0.196 and above were selected. It was found that out of the total 80 items, there are 71 items which are having significant correlations with the total score of the scale except 9 items which are having no significant correlation with the total score of the tool. The correlation table is given below:

Table 2: r Values for HES

Item No.	r value	Item	r value	item	r value
1	.323**	29	.298**	57	.410**
2	.510**	30	.258**	58	.302**
3	.200*	31	.219*	59	.380**
4	.590**	32	.214*	60	.543**
5	.527**	33	.349**	61	.262**
6	.574**	34	.218*	62	.431**
7	.493**	35	.106	63	.287**
8	.355**	36	.268**	64	.409**
9	.476**	37	.191*	65	.341**
10	.096	38	.289**	66	.281**
11	.372**	39	.119	67	.036
12	.559**	40	.235*	68	.436**
13	.465**	41	.331**	69	.260**
14	.629**	42	.365**	70	.315**
15	.327**	43	.230*	71	.423**
16	.299**	44	.389**	72	.309**
17	.412**	45	.334**	73	.301**
18	.238*	46	.130	74	.262**
19	.349**	47	.332**	75	.378**
20	.028	48	.226*	76	.249**
21	.487**	49	.377**	77	.343**
22	.407**	50	.435**	78	.153
23	.329**	51	.301**	79	.357**
24	.384**	52	.209*	80	.342**
25	.214*	53	.380**		
26	.212*	54	.322**		
27	.245*	55	.141	**Bold Italic items** not selected	
28	.181	56	.205*		

**Correlation is Significant at 0.01
*Correlation is Significant at 0.05

From the perusal of above table 2, it is clearly reflected that some of the item (bold and italics) were not having a significant correlation with the total scores of the scale and hence were deleted. After the rejection of 9 unsuitable items from the scale, 71 total items in ten dimensions of home environment scale were selected which are shown below table 3 along with the possible range of scores.

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[1] Best, J. W. & Kahn, J. V. (2010). *Research in Education,* 6th Edn., p. 482.

Table 3: No. of items and range of scores in each dimension of HES

	Dimension	No. of Items	Possible range of scores
A	Family integration	8	8-40
B	Social climate of the family	7	7-35
C	Guidance (Assistance) provided at home	7	7-35
D	Organization and management of the family	7	7-35
E	Conflict	6	6-30
F	Emotional Support	7	7-35
G	Success Orientation	7	7-35
H	Control	7	7-35
I	Self-expression	8	8-40
J	Independence	7	7-35
	Total	**71**	**1-355**

Evaluation of tool validity: A test is said to be valid if it measures what it has been to measure (Best, 2010). To determine the validity of the test, the researchers tested face validity, construct validity and discrimination validity.

Face validity or content validity: The content validity of the 'Home Environment Scale' was tested by more than 20 experts. It is evident from the assessment of experts that items of the test are directly related to the different dimensions of Home Environment.

Construct validity: In order to find out the construct validity, the researchers calculated correlation between the score of each dimension and total score of the test.

Table 4: Correlation between Each Dimension and Total Score

Dimension	'r' values	Dimension	'r' values
A	0.712**	F	0.519**
B	0.684**	G	0.513**
C	0.609**	H	0.616**
D	0.379**	I	0.550**
E	0.431**	J	0.515**

From the perusal of the above table 4, it can be concluded that the correlation coefficient of all dimensions (.712, .684, .609, .379, .431, .519, .513, .616, .550, and .515 respectively) are significant at .01. This indicates that all dimensions are related to home environment and the tool has good construct validity.

Factor Analysis: However the scale was also subjected to exploratory factor analysis as the minimum number of cases required for factor analysis is 100 (Kline, 1986). All the ten components were retained as the eigenvalues are above 1. From the exploratory factor analysis items loading .4 were selected and items below .4 were dropped from the scale. From the factor analysis it can be conclude that all the items are measuring the same construct.

Discrimination validity: To find out the discrimination validity of the items the researchers used item analysis (difficulty level value and discrimination value). For knowing the level of discrimination validity for each dimension of the scale, 't' test for two independent samples was used (high group and low group). Finally the discrimination validity of whole test was also determined by using 't' test. Discrimination validity for each domain and whole test is given in the table below. It indicates that all 't' values are significant at level 0.01 and the means of high group are also higher than low group which support the high validity of home environment scale.

Table 5: t values for each dimension of the HES

Dimensions	Group	N	Mean	Std. D	Df	t value
A	High	28	28.32	1.44	54	36.03**
	Low	28	14.71	1.38		
B	High	28	24.17	1.94	54	31.00**
	Low	28	11.57	0.92		
C	High	28	24.17	1.18	54	32.58**
	Low	28	12.50	1.47		
D	High	28	24.46	2.31	54	23.69**
	Low	28	12.46	1.34		
E	High	28	19.85	2.64	54	18.41**
	Low	28	9.32	1.46		
F	High	28	24.39	1.49	54	31.64**
	Low	28	12.57	1.28		
G	High	28	24.32	1.46	54	28.25**
	Low	28	13.21	1.47		
H	High	28	27.03	1.66	54	32.60**
	Low	28	14.39	1.19		
I	High	28	24.85	1.64	54	24.27**
	Low	28	13.53	1.83		
J	High	28	23.78	1.37	54	32.40**
	Low	28	12.67	1.18		
TOTAL	High	28	245.39	16.60	54	29.70**
	Low	28	126.64	12.93		

**Significant at 0.01 level

Reliability of the Home Environment Scale: The degree of consistency among test scores is called reliability. The reliability of the test was tested by calculating Cronbach alpha. The values of reliability coefficient for each dimension are shown below:

Table 6: Reliability coefficients of HES

Dimensions	Alpha	Dimensions	Alpha
A	.753	**G**	.747
B	.774	**H**	.736
C	.708	**I**	.706
D	.729	**J**	.725
E	.781	**Total Reliability of the Scale**	**.895**
F	.719		

Final form of the Scale: The final form of the scale along with no. of items is presented in the below table 7.

Table 7: Item Presentation in the final form of HES:

	Dimension	Affirmative items	Negative items
A	Family integration	1, 2, 3, 4, 5	6, 7, 8
B	Social climate of the family	10, 11, 12, 14, 15	9, 13
C	Guidance (Assistance) provided at home	16, 18, 20, 21, 22	17, 18
D	Organization and management of the family	23, 24, 26, 26, 29	27, 28
E	Conflict	30, 31, 32	33, 34, 35
F	Emotional Support	36, 37, 38, 39, 40	41, 42
G	Success Orientation	43, 44, 46, 46, 47	48, 49
H	Control	50, 51, 52, 54, 55	53, 56,
I	Self-expression	57, 58, 59, 60, 61, 62	63, 64
J	Independence	65, 66, 67, 69, 71	68, 70

Table 8: Scoring table for all dimensions of HES

Dimensions	A	B	C	D	E	F	G	H	I	J
Score										
Stanine										

The interpretation of the scores is done separately for each dimension based on the Z value. Then the nine levels based on Z values ranging from -1.75 to +1.75 are to be divided. The stanine procedure is the standardized technique for the categorization of the scores for meaningful interpretation.

RESULTS

After following these steps to construct the scale and after analyzing the data from the first and the last application by using adequate statistical methods, it has been concluded that:

➢ The study has produced a scale measuring the attitude of senior secondary school students towards their home environment. This scale includes 71 items which measures ten dimensions of home environment viz, Family integration, Social climate of the family, Guidance (Assistance) provided at home, Organization and management of the family, Conflict, Emotional Support, Success Orientation, Control, Self-expression and Independence.

➢ The scale has been validated through content, construct and discrimination validity. The content validity has been evaluated by experts, construct validity has been calculated by Pearson's correlation. The correlation coefficients of all dimensions are (.712, .684, .609, .379, .431, .519, .513, .616, .550, and .515 respectively) which are significant at .01 level. This indicates that all dimensions are related to home environment and the scale has good construct validity. The discrimination validity has been evaluated by 't' test for two independent samples (high group and low group). All 't' values are significant at level 0.01 and the means of high group are also higher than low group which support the high validity of HES.

➢ The reliability of the scale was tested by calculating Alpha Cronbach Coefficient. All the values of reliability coefficient for each dimension are highly significant. Thus home environment scale is a reliable scale whose reliability is 0.89 and the reliability for each dimension of HES is .75, .77, .70, .72, .78, .71, .74, .73, .70, & .72 respectively.

➢ To categorize the students into different categories with respect to their attitude towards home environment, the researchers used the stanine procedures.

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