

ASSESSING PSYCHOMETRIC PROPERTIES OF FAMILY ENVIRONMENT SCALE IN BANGLADESHI CULTURE

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Abstract

The study of family environment of children or adolescent is crucial for many culture. Thus there is no valid scientific tool found in Bangladeshi culture. Considering the necessity of the tool, the purpose of the present study was to taken translate the instrument into Bangla and to validate in Bangladeshi culture. 1000 participants were (491 males and 509 females) participated in the study. Exploratory Factor Analysis (EFA) was applied on sample 1 ($n_1 = 500$) identified a two-factor of the Family Environment Scale (FES) with 36 items. The two factors namely 'Achievement-, Order-, and Culture Orientation' and 'Emotional Atmosphere' together explained 35.41 % of the total variance. When analyzed the data for sample 2 ($n_2 = 500$) in Confirmatory Factor Analysis (CFA), it was revealed that the two-factor model with 36 items is a good fit [$\chi^2_{(589)} = 2.25$, RMSEA = .05; RMR = .03; CFI = .86, GFI = .87] model to the data. Moreover, the FES showed good internal consistency (Cronbach's $\alpha = .92$), strong convergent, and discriminant validity. Thus, the Bangla version FES appears to be valid and reliable and therefore may be used in further research on family environment in the country.

Key words: *Family environment, scale, factor analysis, exploratory, confirmatory*

Introduction

Family can be defined as a group of people related by blood or marriage or a strong common bond, such as those descended from a common ancestor, or a husband, wife, and their children (Rahman, 2013). According to Roy and Biswas (1997) family atmosphere is a directional force or tendency resulting from interactions of interpersonal relationships among the family members, direction of the personal growth emphasized within the family, and basic organizational structure of the family. From the practical point of view, consensus of individuals (students) characterizing this directional force or tendency constitutes a measure of perceived social climate of family and this climate gets manifested in the family in terms of cohesion, expressiveness, conflict, independence etc. (Moos & Moos, 1981).

Adolescence marks a rapid change in one's role within a family. In this time adolescents move towards independent manner physically, emotionally, and cognitively. A shift from a dependence on parents to increase involvement with peers and others occurs during this period, with the

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timing of such changes being dependent on the cultural expectations of the environment (Christie & Viner, 2005). In this sense, adolescents relationships with parents move to inter-dependence, resulting in reciprocally supportive and connected networks not just with family members, but also friends, partners, colleagues, and others (Daniel, Wassell & Gilligan, 1999).

Family environment provides a stable and secure emotional environment from which an adolescent can explore and experience the world. Previous research has documented the link between aggressive behaviour in adolescent with their family and school environment (Musitu & Garcia, 2004). Different experts (Costa & McCrae, 1992; Felsten & Hill, 1999) reported that neurotic hostility is positively associated with stress vulnerability, poor coping, and depression. Prior studies also examined the link between individual variables and aggressiveness behaviour in adolescents have demonstrated that adolescents who are aggressive normally unable to anticipate the negative consequences of their behaviour for the victims, showing lower level of empathy (Evans, Heriot & Friedman, 2002; Olweus, 2005). But recent studies suggest that sometimes adolescents show aggressive or hostility behaviour for gaining social recognition, recognized as powerful, socially accepted, rebellious by their classmates (Rodriguez, 2004), popularity, leadership, and power exercise (Kerpelman & Smith-Adcock, 2005). Even some studies found that hostile adolescents show their negative attitudes to institutional authority such as the police, the law, and also the school and teachers (Adair, Dixon, Moore, & Sutherland, 2000).

Considering the above definition, rationale, and literature review, it is assumed that though the family environment of adolescents is important for their sound mental development and academic achievement but there is no valid scientifically developed psychometric tool for measuring the same in Bangladesh. So, considering the importance of this topic a scientifically reliable and adapted instrument is inevitable for measuring the family environment status of adolescents in Bangladeshi culture.

Material and Methods

Participants

A total of 1064 eleventh-grade adolescent students (524 males and 540 females, session: 2012-2013) of Dhaka Metropolitan City (DMC) were participated in this study. Because of incomplete responses 64 participants were dropped. Participants' age ranged from 14 to 19 years with a mean of 16.43 and standard deviation of 0.89. Among the participants 49.25% were boys and 50.75% were girls. Of them 23.12 % were from lower socioeconomic class, 62.69% from middle class, and 14.19 % were from upper class.

Measures

Family Environment Scale (FES)

The FES was originally developed by Moos (1974). It was then translated into Bangla language and adapted within the socio-cultural context of India by Dasgupta and Bose (1985). The scale focuses on the measurement and description of the inter-personal relationships among family members (Moos, 1974). It contains 90 items under three broad dimensions such as relationship subscales (cohesion, expressiveness, and conflict), personal growth subscales (independence, achievement orientation, intellectual cultural orientation, active recreational orientation, and moral religious emphasis) and 'system maintenance and system change' subscales (organization and control). Each subscale has 9 items and each item has 2 response alternatives such as 'True' and 'False'. 'True' responses are assigned a score of 1 while 'False' responses are assigned a score of 0 (Zero). Individual subscales scores are obtained by summing the scores belonging to a particular subscale while total score is obtained by summing all the items under the scale. Higher score indicates higher level of family environment while lower score indicates lower level of family environment.

The original FES has good internal consistency with Cronbach's α 's ranging from 0.74 to 0.87 for three dimensions and the overall stability is very good with two-week test-retest reliabilities ranging from 0.77 to 0.92 (Hill, 1995). It has good predictive and construct validity (Moos & Moos, 1981). The adapted Bangla version has high reliability and validity (Dasgupta & Bose, 1985). Each dimension of the scale had sufficient internal consistency (ranges from 0.50 to 0.70) except two dimensions such as independence and expressiveness. The scale has been reported to have factorial validity and discriminant validity (Dasgupta & Bose, 1985).

Procedure

Translating the scales into Bangla At first, written permission was taken from the authors of the respective scale for translating, polishing and using them in Bangladeshi culture. The present investigators felt that it is necessary to develop new and fresh adapted versions of the FES in Bangladeshi culture because there are a lot of differences in socio-cultural aspects of Bangladesh and India. For this reason TT (Team Translation) approach was used in the present study which contains the following stages

Stage 1: Translation. The researcher sits together with the supervisor to check, modify, and polish the existing Bangla version FES. Thus, the first drafts of the scales were prepared.

Stage 2: Review. Six reviewers (experts in Bangla & Psychology) independently reviewed, corrected, and refined the polishing of some of the items (where needed). Each expert independently rated the language using 2-point scale (0 = Not correct, 1 = Correct) and the relevancy of each item using another 2-point scale (0 = Not relevant, 1 = Relevant).

Stage 3: Adjudication. Two adjudicators (the researcher and supervisor) decided whether the translation is ready to move to detailed pretesting. Following the reviewer's evaluation in stage 2,

accuracy of translation or language was examined by calculating for each item the Accuracy Index (AI = Number of rating at 1/Number of experts). The item yielding an AI of 1 (AI = 6/6) was considered to be correctly and reliably translated (Karim & Nigar, 2014). The adjudicators refined or modified 12 FES items as these items had AI values < 1. The experts in stage 2 suggested some corrections to the clarity, wording, and organization of these items. The adjudicators ensured the accuracy of translation by reviewing those items (AI < 1) in the light of their comments and suggestions.

They also examined the relevance/suitability of the items in Bangladeshi culture by calculating for each item the Relevance Index (RI = Number of rating at 1/Number of experts). They considered an item yielding an RI of 1 or 0.83 (RI = 6/6 or RI = 5/6) to be relevant or suitable (Karim & Nigar, 2014). Because of their RI values <0.83, 3 FES items were dropped. Thus, the second draft of the Bangla version FES was finalized for piloting/pretesting on a small representative group of participants.

Stage 4: Pretesting/pilot study. Pilot study was carried out on eleventh grade students of 'Uttara United School and College' ($n = 100$). Participants were requested to provide information by taking comments about the readability, feasibility, clarity, comprehensiveness, easily answerable, and 'style and formatting' of all scales' items. It is seen that the percentages of participants responded 'Yes' on the readability, logicity, clarity, comprehensiveness, easily answerable and 'style and formatting' ranged from 87 % to 97 % for FES which ensured good face validity of the measure. However, no item was reported to be seriously erroneous or ambiguous to be discarded. Thus, the third draft was prepared for final fielding.

Data acquisition

Standard data collection procedures were followed in this study. At the beginning, participants were briefed about the general purpose of the study and good rapport was established with them. They were informed both verbally and in writing that the investigation is purely academic and their responses to the questionnaires would be kept confidential. Sixty four participants were excluded from final analyses as they provided incomplete responses to the questionnaires. Thus, the complete response rate was 93.98%.

Data analyses

Each participant's responses were scored according to the scoring principles of the FES. The data analysis was done in three phase. At first, item analysis was done followed by Exploratory Factor Analyses (EFA) and Confirmatory Factor Analyses (CFA). Data for the 500 odd numbered participants were subjected to EFA whereas data for the 500 even numbered participants were subjected to CFA. It was checked whether the data were suitable for factor analysis or not.

Results and Discussion

Factor structure of FES

Item analysis. The item analysis was carried out for the 87 items of the FES (three items were eliminated in the adjudication stage of translation). The correlation- matrix (data not shown) contained 733 negative values leading us to exclude 36 items (Item no. 01, 06, 07, 10, 16, 18, 20, 23, 24, 31, 32, 34, 37, 38, 42, 44, 46, 48, 49, 51, 55, 56, 61, 67, 69, 71, 72, 73, 75, 76, 80, 81, 82, 84, 85, and 87). The inter-item correlations of 51 items indicate that out of 1275 correlation coefficients 1204 (94.43%) were significant, the average inter-item coefficients being .22. All the item-total correlations were significant and ranged from 0.28 to 0.67 with a mean of 0.48.

Exploratory factor analysis. In order to examine whether data were suitable for factor analysis measures of sampling adequacy were carried out on the 51-item FES. Inspection of the *R*-matrix revealed a good number of coefficients 0.30 and above (17.65%). The KMO measure of sampling adequacy for these set of variables was 0.94 which falls in the range of being superb ($0.94 > 0.90$; Kaiser, 1970). Bartlett's test of sphericity indicated a χ^2 value of 6125.85 ($p < .001$). All together supports the factorability of the *R*-matrix. Data for the 51-item FES were therefore subjected to EFA. Method of PC with varimax rotation was used. The initial analysis with Eigen value > 1.00 (Kaiser-Guttman criterion) extracted 13-factorsolution, accounting for 54.3% of the total variance. An inspection of the scree plot indicates a clear break after the 2nd component (Figure 1a) leading us to retain 2 components.

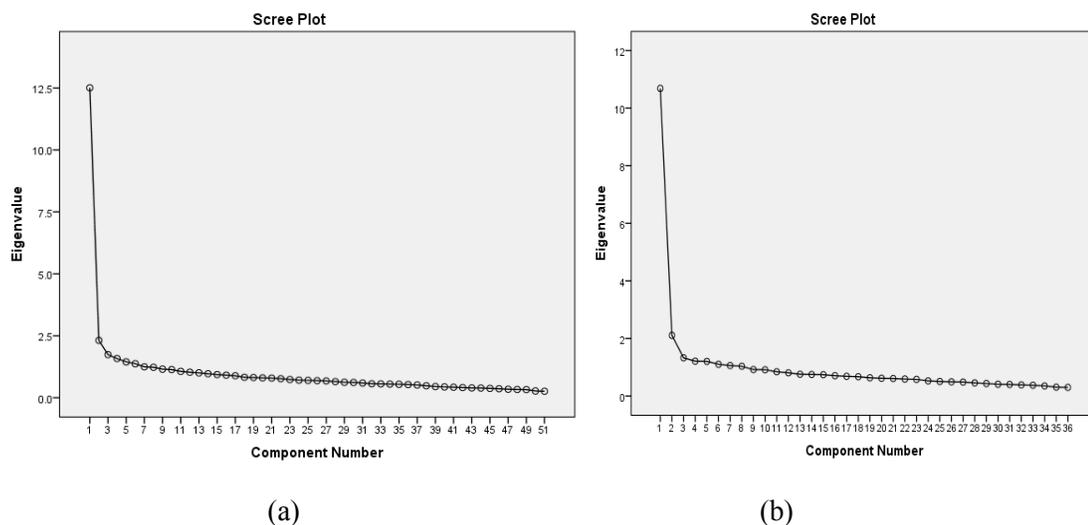


Figure 1. The scree plots generated in EFA: (a) for 51 items, and (b) for 36 items.

Considering Cattle's view, data were subjected to another EFA limiting the number of factors to 2 with all factor loadings $< .40$ suppressed. The two factors together accounted for 29.059% of the total variance (data not shown), but item no. 02, 11, 12, 13, 17, 25, 27, 35, 36, 57, 60, 62, 64, 78, and 86 loaded at $< .40$. The low factor loadings indicate that perhaps these items cannot measure family environment in Bangladeshi culture. After discarding these items data were further subjected to EFA limiting the number of factors to 2, with all factor loadings $< .40$ suppressed (Figure 1b). Now, the variance explained by the factors increased from 29.06% to 35.41% (6.35%). This two-factor solution which was rotated to position of maximum orthogonality in 3 iterations explained together 35.41% of the total variance (Table 1) which was deemed to be the most statistically and conceptually appropriate and more interpretable to FES.

Table 1. Rotated factor matrix for a reduced set of FES items (Items 02, 11, 12, 13, 17, 25, 27, 35, 36, 57, 60, 62, 64, 78, and 86 discarded)

Item numbers	Factor loadings		Item numbers	Factor loadings	
	F1	F2		F1	F2
Item 04	.41		Item 66	.52	
Item 05	.55		Item 68	.50	
Item 08	.45		Item 74	.52	
Item 09	.49		Item 77	.50	
Item 14	.54		Item 79	.49	
Item 15	.59		Item 83	.59	
Item 19	.60		Item 03		.65
Item 21	.65		Item 22		.54
Item 26	.61		Item 29		.50
Item 28	.49		Item 30	(.49)	.45
Item 33	.46		Item 41		.51
Item 39	.63		Item 43		.53
Item 40	.65		Item 52		.76
Item 45	.64		Item 53		.73
Item 47	.44		Item 70	(.48)	.44
Item 50	.56		Eigen value	8.54	4.23
Item 54	.45		Variance explained	23.72	11.83
Item 58	.63				
Item 59	.59				
Item 63	.43		Cronbach's	.92	.80
Item 65	.50		(standardized) α		

Note. $n = 500$.

Factor loadings $< .40$ were suppressed.

Items corresponding to the parenthesized loadings did not conceptually fit with the corresponding factors.

Extraction method: varimax with Kaiser Normalization.

Rotation converged in 3 iterations.

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Factor 1 account for 23.7% of the variance and Factor 2 accounts for 11.83% of the variance. Before labelling the factors we identified two pairs of cross-loadings between the factors. Specifically, item 30 was cross loaded on Factor 1 and Factor 2 with the loadings of 0.49 and 0.45 respectively; item 70 was cross loaded on Factor 1 and Factor 2 with the loadings of 0.48 and 0.44 respectively. We grouped both the item 30 and item 70 under Factor 2, the factor of their smaller loadings but best conceptual fit. Thus, Factor 1 comprises item no. 4, 5, 8, 9, 14, 15, 19, 21, 26, 28, 33, 39, 40,45, 47, 50, 54, 58, 59, 63, 65, 66, 68, 74, 77, 79, and 83 which we termed as ‘Achievement-, Order-, and Culture Orientation’; Factor 2 comprises item no. 3, 22, 29, 30, 41, 43, 52, 53, and 70 which we termed as ‘Emotional Atmosphere’.

Confirmatory factor analysis of FES. The CFA in the present study revealed that the two-factor model identified for the FES in EFA is a good fit to the data (Table 2).

Table 2. Model fit indices for 36-item FES obtained in CFA

	χ^2	df	χ^2/df	RMSEA	RMR	CFI	GFI
Unmodified fit indices	1525.5*	593	2.57	.06	.03	.83	.85
Modified fit indices	1326.3*	589	2.25	.05	.03	.86	.87

$n = 500$. * $p < .05$

The above Table 2 indicates that the value of χ^2 was significant ($p < .05$). The normalized χ^2 value is 2.25 (< 5). The values of RMSEA, RMR, and CFI fit well the reference values (Table 2). However, the values of RMSEA and GFI (Unmodified) lay below the criterion values. So, MIs were examined which identified similar theoretical content between some of the items. Parameters with high MIs > 24 have been noted as potential areas for structure misfit leading to poor fit the model. Four modification index values greater than 24 were identified which indicated four correlated measurement errors, one between items 52 and 53, one between items 43 and 52, one between items 14 and 15 and a fourth one between items 65 and 66. So, when the CFA was run allowing the items in each pair to covary the model was quite improved. The modified fit indices indicated an acceptable model fit to the data [$\chi^2_{(589)} = 1326.3$, RMSEA = .05, RMR = .03, CFI = .86, GFI = .87]. The factor structure of the four-factor solution is given in Figure 2.

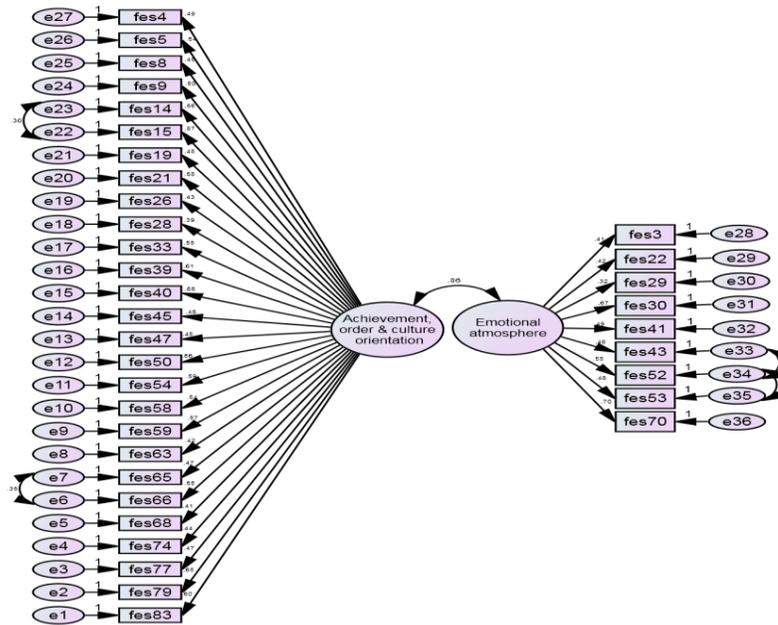


Figure 2. Factor structure of the two-factor solution for the family environment scale (Standardized Parameter)

Note. Items 52 and 53 were allowed to covary due to their similar content (quarreling) and high modification indices. This was also done for items 43 and 52 (criticism), items 14 and 15 (development), and items 65 and 66 (study) (Lowe, Ang., & Loke, 2011; Walker, 2010).

The above figure displays standardized parameters. As we see, factor loadings of the four factors varied from 0.32 to 0.70. Particularly good at assessing their latent variables were items which have the largest factor loadings. These are fes70 (0.70) for the latent variable ‘Emotional Atmosphere’ and fes45 (0.68) for ‘Achievement-, Order- and Culture Orientation’. The lowest factor loading was for fes29 (0.32) under the latent variable ‘Emotional Atmosphere’. The correlation between two latent variables (‘Achievement-, Order- and Culture Orientation’ and ‘Emotional Atmosphere’) is 0.86.

Validity

As reported by the judges the Bangla version FES has good content and face validity (See method). Both the face and content validity ensured translation validity of the scale. The convergent validity of the Bangla version FES was examined by correlating with ACERQ (Adaptive Cognitive Emotion Regulation) and EIS (Emotional Intelligence Scale). Results indicate that FES has positive and significant correlation with above mentioned scales, such as between FES and ACERQ ($r = .13, p < .01$), between FES and EIS ($r = .27, p < .01$). On the other hand, the discriminant validity was checked by correlating between FES and CHS (Children

Hopelessness Scale), between FES and HS (Hostility Scale). Results further indicate that the FES has negative and significant correlation with CHS ($r = -.23, p < .01$) and HS ($r = -.19, p < .01$) which indicates that the scale has good discriminant validity.

Reliability

The inter-item correlation matrix of the scale contained no negative values, indicating that the items were measuring the characteristics that the respective scale was supposed to measure. The reliability of the Bangla version of the scale was further examined by estimating internal consistency. The coefficient of the Cronbach's α was calculated. Cronbach's α (unstandardized) for the Bangla version FES was 0.93 for the 1st sample (n_1), 0.92 for the 2nd sample (n_2), and 0.92 for the combined sample.

Analysis of the data in EFA identified a two-factor model for the FES which comprising 36 items (54 items dropped). Factor 1 (27 items) measures 'Achievement-, Order-, and Culture Orientation', and Factor 2 (9 items) measures 'Emotional Atmosphere'. These factors together accounted for 35.41% of the total variance, their individual contributions ranging from 11.83 % to 23.72 %. Among ten components of the original scale only two components ('Achievement Orientation' and 'Culture Orientation') finally exists in the adapted scale with their partial items. The newly adapted scale has also two components combining the above mentioned two components. The items of removed components also exist partially under various new components in the adapted scale. All items of any components of the original scale didn't exclude fully in the adapted scale. Finally, 36 items out of 90 items of the original scale were retained in the adapted scale. This massive difference regarding FES between American and Bangladeshi culture might be socio-cultural characteristics, cultural norms, socio-economic condition, social competition and unrest, individualism pattern of western countries and collectivistic pattern of Bangladesh, response style etc.

So, the finding is inconsistent with the original scale which comprises ten factors (Moos, 1974; Dasgupta & Bose, 1985). Results of the CFA demonstrated good model fit to the data [$\chi^2_{(589)} = 1326.3$, RMSEA = .05, RMR = .03, CFI = .86, GFI = .87] and also a factor solution which is consistent with the EFA factor solution. The factors of the Bangla version FES shows good to high internal consistency (Cronbach's $\alpha = .79$ to .92), the first factor being most reliable as indicated by its highest coefficient (Cronbach's $\alpha = .92$). All the factors had significantly good correlation ($r = .80$ to .97) with the whole FES. In order to examine the convergent and discriminant validity, inter-scale correlations were calculated. It was hypothesized that FES should be positively correlated with EIS and ACERQ in order for its convergent validity, and negatively correlated with CHS and HS. As hypothesized, FES has significantly positive correlations with EIS and ACERQ ($r = .13$ to .27) and significantly negative correlations with

CHS and HS ($r = -.19$ to $-.23$). All together indicate that the FES has good convergent and discriminant validity. Thus the adapted FES can be considered as a valid and reliable instrument for measuring hostility in Bangladeshi culture.

Acknowledgement: Ministry of Science and Technology, Government of the People's Republic of Bangladesh.

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