Original Article

The Factor Structure of the Revised Cheek and Buss Shyness Scale in an Undergraduate University Sample

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Objective: The present study examined the psychometric properties of the Persian version of the Revised Cheek and Buss Shyness Scale (RCBS) using confirmatory factor analysis among (n = 300) college students.
Method: A total of 300 undergraduate students participated in this study And completed the Revised Cheek and Buss Shyness Scale (RCBS). A confirmatory factor analysis was performed to test diagnosis as a unitary construct and to test an earlier-reported two-factor model .
Results: Results indicated that unidimensional measurement model of the RCBS did not provide the best fit for the data. Then three measurement models were tested, and the results showed that a two-factor model taking into account differences in the direction of item wording provided a satisfactory and parsimonious fit to the data. Multi-group confirmatory factor analysis was used to better understand the factorial invariance of the scale across genders, and indicated that two-factor structure of the RCBS was equivalent across genders. Supplementary t-tests revealed no other gender differences on shyness.
Conclusions: The results provide initial support for the construct validity of the self- report version of the RCBS in college students.

Keywords: *Factor analysis, PsychologicalTests, Psychometrics, Shyness, Students*

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Entering university is a life transition that is particularly suited for the study of shyness in adults. The new social world of universities offers the freshmen many opportunities for socializing with peers, making friends, dating, falling in love, and finding a partner (1). Therefore, establishing peer relationships during the transition to college may be more difficult for shy students due to their propensity for social withdrawal. Consequently, without adequate social support, shy students may suffer during the transition in terms of psychological well-being and adaptive functioning. Shyness is a personality trait that has been empirically shown over the past several decades to be a reliable predictor of both poor physical and mental health among young adults (2-4). In fact, shyness is an affective–behavioral syndrome characterized by social anxiety and interpersonal inhibition that results from the prospect or presence of interpersonal evaluation (5) Prevalence estimates of shyness are much higher than those of social phobia, ranging from 20 to 48% (6).

Shyness has a conceptual similarity with other constructs as social anxiety disorder. Social anxiety exists on a continuum from very mild, nonclinical social anxiety (i.e., shyness) to severe, clinical levels of social phobia.

Shyness is associated with a number of negative outcomes, including fear of negative evaluation by others (7), low self-esteem (8), difficulty initiating new relationships (9), problems establishing and maintaining close and satisfying relationships (9, 10),¬ depression, loneliness, fearfulness, social anxiety, neuroticism, and low self-esteem, as well as psychosomatic difficulties such as allergies and gastrointestinal problems (11).

Jones et al. (12) found that five self-report questionnaire measures of shyness, including an 11-item version of the Cheek–Buss scale (13), were substantially inter-correlated (mean r = 0.77, range 0.70–0.86; all Ns > 1135). Compared with the other measures of shyness, the Revised Cheek and Buss Shyness Scale (RCBS) is widely used in psychology research (13).

A large body of research has also examined the psychometric properties of the self-report questionnaire (12-14). For instance, item analysis shows that the RCBS has sound psychometric properties and that all the 14 items contribute effectively to the scale. The value of coefficient alpha is consistent with the values reported in previous research for all the versions of the scale. Cheek and Buss (12) reported 90-day test–retest reliability coefficient for the 9-item version to be 0.74 (n = 96). Melchior and Cheek (15) reported the 45-day retest reliability of the 20-item version as 0.91 (13). There is extensive evidence of the validity of the various versions of the scale in terms of predicting self- and other-ratings of shyness, self-and other-rated anxiety during social interactions, negative self-appraisals, attributions for social outcomes, and observational measures of verbal and non-verbal behaviors (16, 17).

By contrast, studies that have examined the factor structure of the RCBS have perhaps been more equivocal. Cheek and Buss (12) reported that exploratory factor analysis of the 9-item Cheek and Buss scale yielded a single factor. Bruch et al. (13) applied confirmatory factor analysis to the items that comprise the 13-item version of the Cheek–Buss scale and the Cheek and Buss Sociability (five items) Scale and obtained support for a model that specified two oblique factors corresponding to the two Cheek Buss factors. This provided a better fit than a three-factor oblique model involving sociability and the social avoidance and distress¬ and ¬social facility¬ factors identified by Jones et al. (12). The correlation between the shyness and sociability factors in the two-factor model was ¬0.56 (it should be noted that the Cheek¬ Buss scales include one item that loaded on both factors in their initial exploratory factor analysis of the items and this item was not constrained to load on either factor in the confirmatory analysis).In addition, using CFA, Crozier (13) proposed that a two¬ factor model taking into account the differences in the direction of item wording provided a satisfactory and parsimonious fit to the data. The direction of wording does influence the results of factor analysis even though all the items are coded in the same direction prior to analysis. For example, Russell (18) has reported that a two-factor model related to the direction of wording provided a better fit to the data on the UCLA Loneliness Scale than did a single loneliness factor. The present study aimed at extending previous findings regarding the unidimensionality of RCBS by explicitly taking into account two stage of analysis: factor structure of the RCBS , and its equivalence across genders by using multi-group confirmatory factor analysis . It investigates gender differences in responses to the scale, as there has been inconsistent evidence of gender differences in shyness, with men scoring somewhat higher on the RCBS in one study (15) and lower in another study (19). An additional aim of this study was to examine factorial invariance of the RCBS across genders using CFA within a single cultural Milieu. A drawback of the previous work is that, to date, the psychometric properties of the RCBS have not been examined in a non-Western culture, which is important because of issues concerning the equivalence of measurement across cultures.

In the present study, therefore, we prepared a new translation of the RCBS in Iran, retaining its original statement-format. The main objective of this study was to evaluate unidimensionality or multidimensionality factor structure of the RCBS based on the literature on shyness in a sample of Persian undergraduate students using confirmatory factor analysis (CFA).

Materials and Method

Participants

The sample includes 300 undergraduate students, 82 % female and 18%male. The sampling procedure included a random selection of three universities (Peyam Noor, Islamic Azad and Tabriz University) at the undergraduate level in the city Tabriz. Within the three universities, a total sample size of 300 freshman students with a mean age of 23.6 years (SD = 3.2 years, range = 21 to 29 were selected. Sample demographics are presented in Table 1.Regarding test administration, researchers first provided instructions to the students to answer the questions. Then, all the participants completed a paper-and-pencil version of the single-page questionnaire. Data using this Persian version were then gathered from the sample in Tabriz. All the participants took part in the study voluntarily and were not remunerated for participation .

Instruments

In the present study, therefore, we prepared a new translation of the Revised Cheek and Buss Shyness Scale (RCBS 14-item) in Iran, retaining its original statement-format. Of the 14 items, items 3, 6, 9, and 12 are reversely keyed. The participants completed the 14-item version of the RCBS (16). The participants are requested to respond to each item on a 5-point scale. The instructions are as follows: to read each item carefully and decide to what extent it is characteristic of your feelings and behavior, and to fill in the blank next to each item by choosing a number from the scale printed below. The numbers are: 1¬=¬very uncharacteristic or untrue, strongly disagree,¬ 2¬= uncharacteristic, 3 = neutral, 4 = characteristic, 5 = very characteristic or true, strongly agree. Internal reliability of the subscales in the present study were very good (Shyness, α = .88; Sociability, α = .88).

Data analysis

The analyses addressed two main questions. First, which existing factor structure (one-, two, or hierarchical-factor structures) provides an acceptable measurement model for the 14-item RCBS? To address this question, CFA was used to impose each of the three factor structures on two data sets to evaluate each model's goodness-of-fit. Second, is there factorial invariance with respect to gender? To address this question, multi group CFA was used to test hypotheses about the invariance of the 14-item RCBS across males and females. T-tests were also used to compare gender differences on the RCBS.

The data were analyzed using PASW Statistic18 and AMOS 16 (20). PASW was used to analyze descriptive statistics and the reliability of the RCBS. AMOS was used to perform the CFAs of the RCBS analyzing the fit of models and its respective parameter estimates in two distinct stages.

In stage 1, the three models were subjected to a maximum-likelihood CFA using AMOS. First, the fourteen items of the RCBS were expected to load onto a single latent factor (model A.). Second, run for the two-factor model suggested by Russell (18) and Crozier (13), who reported that a two-factor model related to the direction of item wording provided a better fit to the data on the UCLA Loneliness Scale and

Revised Cheek and Buss Shyness Scale than did a single factor. In order to rule out the possibility that this model is superior because any two-factor model would fit the data better than the one-factor model, an alternative two-factor model was tested, with one factor corresponding to the first 7 items and the second factor corresponding to items 8–14 (model B) .The ten items (1, 2, 4, 5, 7, 8, 10, 11, 13, 14) of the shyness subscale of the RCBS were assigned to the first factor, and one factor corresponding to the four items where the responses are reversely coded (items 3, 6, 9, 12) (Model C).

In stage 2, multiple group CFA was used to test whether the two-factor structure of the RCBS operate equivalently across both male and female youth. This involved comparing the goodness-of-fit $\chi 2$ of two nested CFA models: one constraining the magnitudes of the factor loadings to be equal for male and female students, and the other omitting this invariance constraint .

In addition, t-tests were used to compare gender differences on the total score. Several fit indices were examined to evaluate the overall fit of each model: $\chi 2$; tests the hypothesis that an unconstrained model fits the covariance or correlation matrix as well as the given model; ideally values should not be significant); Comparative Fit Index (CFI; comparison of the hypothesized model with a model in which all correlations among variables are zero, and where values around .90 indicate very good fit); Root-Mean-Square Error of Approximation (RMSEA; 21; values of .08 or below indicate reasonable fit for the model; Tucker-Lewis index (TLI) and the incremental fit index (IFI), with values close to .95 being indicative of good fit (20).

Results

Scale reliability

Regarding internal consistency, coefficient alpha was computed. These findings are presented in Table 2. Observed alphas were as follows: total shyness (α = .82), first factor (α= .83), second factor (α= .62). In addition, for each of the two groups, we calculated Cronbach's alpha (α) for reliabilities. The results showed high reliability for groups: For the male group, Cronbach's α was .83; and for the female group it was .82. Furthermore, validity coefficients were calculated using the Pearson product–moment correlation coefficient (*r*) statistic. The correlation of the items with the total scale was adequate, with the lowest correlation occurring in item 3 (*r*= .35).

Between-group differences in RCBS **Scores**

Results of independent samples t-tests showed no significant differences between the male and female participants: General shyness (male M=13.63, SD=6.92; female M=15.19, SD=6.82), t (1.51) =1.51, p>.05.

Stage 1: Assessing measurement models

To evaluate the goodness-of-fit of three alternative measurement models for the RCBS, CFA was first run for a one-factor solution in which all the 14 items were loaded on to a single general strengths factor (Model A) and subsequently run for the two-factor model (B and C) suggested by Crozier (13).

The results of the CFAs for each model are shown in Table 3. In all the analyses, the chi-square goodness of fit statistic is large and significant beyond the 0.001 level, rather than being small and associated with a high probability, which would indicate a close fit between model and data. However, this statistic is sensitive to sample size and does not provide a realistic test of the fit of models (20). The results of the initial estimation of the one factor model did not provide a satisfactory result with a chi-square value of 132.65 (df =71), which was significant at the P < .001 level. Other fit indices revealed a moderate fit (RMSEA= .072; TLI= .84; CFI= .86; NFI= .80). According to the suggestions of modification indices, covariances were set on the error variances of Items 2 and 4, 2 and 6-9, 9 and 11-12, 13 and 14, in the internality model based on the reason that items were loaded on one unique factor, shyness. These modifications improved the fit (X^2=132.65; p= .001; RMSEA= .054; TLI= .91; CFI= .93; NFI = .86).

Table1. Demographic characteristics of participants

Variables	Number	%
Gender		
Male	246	82.0
Female	54	18.0
Age range, mean	21-29 yr, 23.6 yr	
Parent education:		
Less than High school	127	42.3
More than high school	115	38.3
English language speaking ability:		
Turkish	165	.55
Persian	48	.16
Kurdish	87	.29

Table 2.RCBS item statistics

Item number	Mean	SD	Item-total correlation	Alpha if item deleted
1	1.02	.83	.53	.81
2	.71	.73	58	.80
3	1.29	.94	35	.82
4	.65	.74	.60	80
5	1.06	.90	.51	.81
6	1.32	.92	.48	.81
7	.97	.88	.62	.80
8	1.10	.85	.63	.80
9	1.33	1.03	.53	.81
10	1.05	1.01	.59	.80
11	.56	.73	.61	.80
12	1.42	1.02	.51	.81
13	1.07	.95	.65	.80
14	1.36	1.01	.55	.81

N=300

Table 3. Goodness-of-fit statistics for three alternative measurement models for the 14-item RCBS

Model	χ2	df	χ2/df	CFI	TLI	IFI	RMSEA
One factor model (Model A)	197.62***	77	2.57	.93	.84	.87	.07
Two factor split half (Model B)	196.06***	76	2.58	.86	.84	.87	.07
Multidimensional (2 first-order factors) model (Model C)	128.44***	76	1.69	.95	.94	.95	.04

Note: RCBS. Revised Cheek and Buss Shyness scale; CFI. Comparative fit index; TLI. Tucker-Lewis index; IFI. Incremental Index of Fit; RMSEA. Root mean-square error of approximation. *** P < 0.001.

Table 4. Results of multigroup confirmatory factor analyses across gender

Model	CMIN	DF	P	CMIN/DF	GFI	IFI	RMSEA	Δdf	Δχ2	P
Unconstrained	201.05	15	.003	1.34	.92	.95	.03			
Female	105.72	74	.009	1.429		.96	.04			
Male	45	88.25	74	.124	1.19	.93	.06			
Equal factor loadings	220.21	162	.002	1.36	.91	.94	.04	12	19.16	.09
Structural covariances	231.51	17	.000	1.40	.90	.93	.04	15	30.46	.01

The two-factor model (model B) where the items are split arbitrarily into two sets to form the factors, fits the data no better than the one-factor model (also, the correlation between factors is 0.96). However, the new two-factor RCBS Model (model C) had superior fit values across all indices. (X2 =128.44; p= .001; RMSEA = .04; TLI=.94; CFI=.95; IFI = .95). For the two-factor model, the correlation between the factors is 0.51. Thus, although the two factors were interrelated, the overlap between them was only about 17%, indicating that these should indeed be conceptualized as distinct factors.

Stage 2: Testing gender invariance

To test for the invariance of the model with respect to gender, we performed multi-group analyses comparing the two-factor structure of the RCBS among male and female students. From the analyses in stage 1, among the three measurement models evaluated, overall fit indexes revealed the multidimensional RCBS model to be the best fitting model available (Model C). Hence, on this basis, the multidimensional RCBS model consisting of two interrelated first-order factors was tested on both groups to see if this measurement model was invariant across genders.

A prerequisite for assessing the invariant structure is to first stipulate and test a baseline model for each group individually. Such a model, which does not include cross-group constrains, should fit the data well in terms of both parsimony and theoretical relevance (19).

As can be seen in table 4, baseline models explained the data well: for men fit indexes were x2 (df = 74, n = 54) = 88.25, p=.\124, CFI = .93, RMSEA =.06 (low = .05, high = .09), TLI = .91, AIC = 378.45. For female, fit indexes were x2 (df = 74, n = 246) = 105.72, p\.009, CFI =. 96, RMSEA =.04 (low = .05, high = .09), TLI = .94, AIC =178.249.

The unconstrained model (configural model), where factor loadings are allowed to vary between men and women, provided a good fit (χ2 [df =15]= 201.05, CFI= .94, RMSEA = .03). In the second model tested (measurement weights), all factor loadings of the indicator variables were constrained equally across groups. Analyses here reveal a χ2 value of 220.21with 162 degrees of freedom. Computation of the Δχ2 value between this model and the configural model yields a difference of 19.164 with 12 degrees of freedom (because the 12 factor loadings for the validation group were constrained equal to those of the calibration group). This χ2 difference value is not statistically significant (p>.05). Based on these results, it was concluded that factor loadings are constrained to be equal for both men and women, and they also provide a good fit (CFI =.94, GFI=.91, RMSEA= .04). Moreover, χ^2 value in the third model (structural covariances) was significant but the fit indices indicated a satisfactory fit for each subgroup and for each of the constraints in the multi-group analysis.

Discussion

The purpose of the present study was to further examine the factor structure of Revised Cheek and Buss Shyness scale (RCBS) in an undergraduate university sample. The internal consistency (Cronbach's a) as an estimate of reliability has been shown to be consistently high in this Iranian sample, which is consistent with the results of the previous findings (12, 17, 14, 19, 15, 16).

When comparing the scores of men and women, the results are partially congruent with Crozier, (13) and others (22, 23) who reported there was no gender difference in the total shyness score. Studies of gender differences in shyness and other forms of inhibited temperament have not been as consistent. While some studies have reported higher levels of shyness and inhibition in females than in males, others have reported relatively similar gender ratios. It is likely,

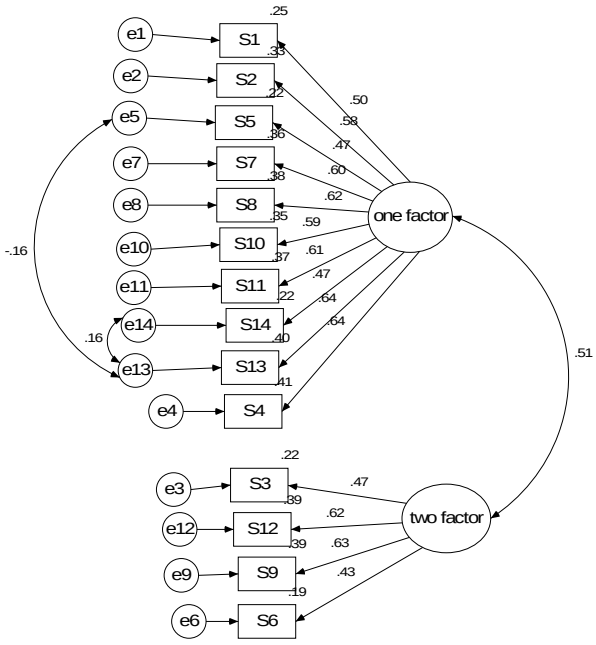

Fig. 1 Baseline model of the RCBS

however, that some of this confusion may be a result of confounding with age.

Given that similarity in age of the subjects in this study, this difference may disappear once groups are matched on age (24). On the other hand, our results may be affected by the small men/women ratio. More and more, the relationship between shyness and gender requires further investigation. Research has shown that even when there are no main effects of gender, the correlations between shyness and other measures are moderated by gender: shyness might have different implications for males and females (25, 26) but this issue has been hardly examined (13).

Furthermore, the factor structure revealed, confirms the structure detected in the English version of the RCBS (13). The fit indices of the unidimensional model (model A) and two factor split half model (B) indicate that the models do not fit the data. Finally, the two-factor provide a somewhat better fit. These findings are consistent with the previous results for the original version of the RCBS (e.g., 13). Thus, the items are grouped into the factors according to their original wording as positive or negative items. The grouping of the items was done according to their wording. Thus, one half of the items are written positively and the other half negatively, they frequently split up into two clear factors. One factor gathers all the positive items and the other all the negative ones. Therefore, the format of the items may carry more weight than their conceptual meaning.

Because multi-group confirmatory factor analysis (MGCFA) across gender has generally not been conducted in previous researches for Revised Cheek and Buss Shyness scale (RCBS), in the present study, MGCFA was performed, specifying a two-factor model across genders. Raju, Laffitte, and Byrne (27) briefly described the importance of factorial invariance by stating: "when measurement equivalence is present, the relationship between the latent variable and the observed variable remains invariant across groups. In this case, the observed mean difference may be viewed as reflecting only the true difference between the populations" (p. 517). Factorial invariance is an essential component of the iterative process of demonstrating the measurement equivalence of latent constructs across groups, including female/male subpopulations.

The tests for factorial invariance across genders indicate that invariance exists across genders. Although it can be argued that there were only equal factor loadings across genders considering that the $\chi 2$ difference was significant when the intercepts were set to be equal. However, the additional fit indices did not increase compared to the comparison model ; therefore, supporting metric invariance with respect to gender. The RCBS thus appears to be invariant across genders.

Overall, notwithstanding the need for additional research, it is hoped that the RCBS will become a useful tool for researchers and psychotherapists. However, the present study has several limitations. First, analyses relied on self-report data, which can result in numerous biases, such as social desirability bias, unwillingness to be truthful, and/or misunderstanding. Second, the subgroup sample sizes for gender were not adequate to conduct a multi group CFA, limiting invariance tests to equality of indicator loadings and Structural covariances. Lastly, the male student subgroup was considerably small and may not be representative of the larger population.

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