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Psychometric properties of social phobia inventory among Iranian students

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Abstract

Developing a simple and effective tool is necessary in epidemiological studies and clinical screening to assess the individuals suffering from social phobia. This study was conducted for validity and reliabity of social phobia inventory (SPIN) in Iranian students. The 581 uneversity students (245 men and 346 women) were selected randomly using multi-stage cluster sampling method. The exploratory factor analysis results indicate the three factor structure of SPIN including fear of the situation, physiological arousal of the situation and avoidance of the situation. The results obtained from confirmatory factor analysis fit indices also indicated the desired compliance of presented model and therefore it expresses the desired validity of research tool. The results obtained from multi-group analyses also indicate that parameters of standardized solution were related to observed variables of constituting factors of SPIN. The correlation values among the factors present was equal in two of the female and male student groups. Meanwhile, the results indicate the high reliability of research tool for female students in comparison with male students. Also, the Internal consistency (Cronbach's α=0.91) and test–retest reliability(r=0.93) were both good. The witnesses related to structural validity study of SPIN have approved the desirability of psychometric properties of this tool and recommends its use as an appropriate tool for social phobia assessment in Iranian sample of it.

Keywords: Reliability, Phobia, Validity, Social, Student

Introduction

As a major obstacle in basic research in psychology, lack of standardized tests has always concerned mental health clinicians and researchers. Overcoming this obstacle will pave the way for advancement of research. Tools with good psychometric properties enable early diagnosis (when necessary) and screening of patients. Furthermore, using standardized tools is one of the ways to measure changes in therapy and assess effectiveness of psychotherapy programs. In addition, such studies provide the context for epidemiological studies across the country, optimal planning to prevent psychological disorders, efficient treatment programs, training, and ultimately necessary measures and decisions for growth and development of mental health according to particular culture of the country. Growing interest in social phobia or social anxiety

disorder has led to design of numerous tools for evaluation of common symptoms of this disorder. They include balanced clinical scales such as: Brief Social Phobia Scale [1], Liebowitz Social Anxiety Scale [2], as well as self-report scales such as: Fear of Negative Evaluation Scale, Social Alienation and Disturbance Inventory[3], Self-Disclosure in Normal Conversation Scale [4], Social Interaction Anxiety Scale[5], Social Phobia and Anxiety Questionnaire [6], and Social Thoughts and Beliefs Scale [7]. These and other scales for measurement of symptoms of social phobia are also found in many other places [8, 9]. One of the latest self-report scales that uniquely measure symptoms of social phobia is Social Phobia Inventory (SPIN) [10]. This scale appears to be an appropriate screening tool for identifying people with social phobia among populations. This tool contains 17 items that distinguish 79% of people with social phobia from control group and with the cut-off score of 19, and distinguish 8% of these people with the cut-off point of 17. Extensive studies by Connor et al. [10] express that 3 specific properties of this test are suitable for the purposes of social phobia screening, which include: "Fear of embarrassment makes me avoid things or talking with people" (Fear), "I avoid activities that put me in the center of attention" (Avoidance), and "Amid fears, I panic, or seem confused" (physiological distress). Psychometrics of SPIN have been assessed and confirmed in foreign studies, which include internal consistency by Connor et al. [10], Oliver et al. [11], Violet et al. [12], Johnson et al. [13], and Nagata et al. [14], test-retest reliability by Connor et al. [10], Oliver et al. [11], Violet et al. [12], and Nagata et al. [14], construct validity by Connor et al. [10], Oliver et al. [11], Violet et al. [12], Johnson et al. [13], and Nagata et al. [14], and sensitivity about clinical changes in the process of psychotherapy by Johnson et al. [13] and Nagata et al. [14].

Construct validity and other psychometric properties of SPIN have been confirmed in translations of this scale into Spanish [9], Japanese [14], Brazilian [18], Chinese (Taiwanese) [19], Fin [20]. Results of a study by Carlton et al. [17] in relation to construct validity of SPIN, using exploratory factor analysis and conformity factor analysis suggest a triple-factor structure in the form of 10 items. Garcia Lopez et al. [9] in a study on SPIN using single and three-factor confirmatory factor showed that both single and three factor models confirm favorable construct validity. But, given the high correlation between factors in three-factor model; these researchers rated single-factor model more appropriate. Results of a study by Osorio et al. [15] in relation to exploratory factor analysis of SPIN showed that in non-clinical sample with 3 extracted factors from the tool, 54.12% of SPIN variance, and in clinical sample with 5 extracted factors, 69.73% of SPIN variance can be explained. Tsai et al. [16] in their study of psychometrics of SPIN showed that it consists of three factors, which include: 1- Fear and avoidance from authority and criticism, 2- Fear and avoidance from social relationships, and 3- Physiological changes, and in total, these factors explained 50% of variance of SPIN. Ranta et al. [17] in their assessment of construct validity of SPIN using exploratory and confirmatory factor analysis showed that according to both single and three-factor structures, SPIN has a favorable construct validity.

Considering that use of a tool for research-clinical purposes requires investigation of its psychometrics in the target population, the present study aimed to assess construct validity of the Persian version of SPIN for use in clinic and research, and also to investigate its applicability in normal and abnormal populations, which explains and emphasizes the importance of this study. Thus, the present study attempted to examine construct validity of SPIN using exploratory and confirmatory factor analyses, and also measurement invariance across subgroups based on gender. According to Rajo et al. [20], invariance of a scale measures the same set of indicators and the same constructs in different groups, while lack of invariance indicates that the

difference between groups may not reflect the real mean difference between groups. Kline [21] also considers lack of invariance of a scale as construct bias, which indicates that a scale measures something different between two different groups. Thus, it can be asserted that invariance of a scale signifies degree of stability of psychometric properties of a tool against groups, and confirmation of invariance against gender will be the necessary prerequisite for meaningful interpretation of results from comparison of mean in two sexes. In this respect, the following research questions were considered:

Method

Study population consisted of all MSc students of Shahed University, Tehran, Iran in 2010-11. Considering similar SPIN construct validity studies by Oliver et al. [11], Connor et al. [10], and Rudemski et al. [22], 600 students were invited to take part in this study. Participants were selected from Tehran-Shahed University according to multi-stage cluster sampling method. To this end, students were selected in three stages, using different sampling units. For the first unit stage, schools of humanities, science, medicine and art were identified. For the second stage, 3 disciplines were randomly selected from each school, and for the third stage, 2 classes were randomly selected from each academic discipline. Then, questionnaires were simultaneously distributed among students. Study inclusion criteria were studying at one of the schools of humanities, science, medicine, and art in Shahed University, willingness to take part in the study, and lack of a serious or debilitating disease that may lead to reduced motivation for completion of questionnaires. Study exclusion criteria were physical disabilities like head trauma, epilepsy, seizures, and brain tumors. Note should be taken that all participants with a history of mental diseases other than social anxiety disorder were excluded from the study. Following completion of questionnaires in selected units and clusters, and after resolving defects in questionnaires, a total of 581 questionnaires were selected for final analysis. Moreover, a number of classes from school of Humanities were selected after coordinating with professors and using convenient sampling method to examine reliability of the scale. Then, at the beginning of each class, students were briefed about study objectives, and its timing and stages, and if they consented, the questionnaire was made available to them. Then, test was performed in groups. After 5 to 14 days, same explanations were given to students from the same classes, and if they consented, they were asked to complete the same questionnaire again.

Ethics was observed in all stages of the study. All participants had received written information about study, and took part if they wished so. Students were totally free not to take part. Subjects were assured of confidentiality of data, and their use for research matters only. To comply with principles of privacy, participants remained anonymous. Those wishing to know the results of the study were able to do so in the form of individual consultation after completion of study. To secure the proper process of study, all questionnaires were completed by researchers.

The tool used in the present study was SPIN, first developed by Connor et al. [10] for assessment for social phobia with 17 items and 3 subscales of fear (6 items), avoidance (7 items), and physiological distress (4 items). Each items is scored on a 5-point Likert scale (Not at all=0, a little bit=1, somewhat=2, very much=3, and extremely=4).

The tool was prepared for the purposes of this study as follows:

Stage 1) Translation of SPIN: This test was first used in a study by Hassanvand Amozadeh et al. [23]. To resolve potential problems, authors prepared the original version of SPIN, which was then translated into Persian according to translation protocol and equalization of International Quality of Life Assessment Project (IQOLA) [24]. To this end, two Persian speaking translators with sufficient experience and skill in translation of

English language texts, translated the English version of the test, and the Persian version thus prepared was given to two other translators. In the last stage of translation process, two other translators (fully articulate in both Farsi and English Languages) were asked to translate the Persian version into English. The English version obtained was revised by two other translators and the researchers over several meetings; finally, consensus was reached on a joint English translation. Next, the English version was compared with the original version to confirm sameness of the two. Following all above stages, a Persian version of the test with satisfactory quality of translation was prepared.

Stage 2) First, face validity was investigated because if any of the statements had to be changed, it would affect the validity of the whole questionnaire. To assess face validity of the Persian version of SPIN, a form was prepared for examination of items by 9 psychologists and psychiatrists in terms of fluency, clarity, understandability, and compliance with cultural conditions of society. Meanwhile, a 6-point scale was used, and an item was acceptable if 80% of participants had considered a score above 4 marks for that item, otherwise, the item was modified. Eight psychopathologists were used to determine content validity of SPIN. A 3-point scale based on Lawshe's table was used: important and relevant, could have been used, but not necessary, and irrelevant. An acceptable content validity ratio can be different depending on experts determining it. According to 8 experts, minimum acceptable content validity coefficient (based on Lawshe's method) is 75% [25]. In the present study, content validity coefficient was considered favorable.

Given the nature of the subject, two approaches of exploratory (analysis of main components using Varimax Rotation) and confirmatory factor analysis were used. Furthermore, to compare female and male student models, multi-group analysis approach was used.

Results

Participants included 335 female and 246 male students, with age groups as follows:

16.4% of students were younger than 19 years, 20.5% were 19 to 20 years, 20.3% were 20 to 21 years, 16.4% were 21 to 22 years, and 26.5% were older than 22 years of age. In terms of marital status, 87.3% of students were single, and 12.7% were married. In terms of academic discipline, 35.1% of students studied humanities, 4.6% science, 13.6% medicine, and 10.7% art.

Internal consistency based on Cronbach' alpha coefficient was found 0.905, 0.892, and 0.91 for the whole scale in female and male groups and all participants, respectively. To determine reliability, test-retest was performed in a number of study subjects, and coefficients found for female group (80 students), male group (65 students), and all participants (145) were 0.933, 0.921, and 0.933, respectively ($P<0.001$), indicating high level of internal consistency and reliability, and reliability of test scores with 5 to 14 days interval. Meanwhile, a high correlation existed between each item and the overall test score, and elimination of any of the items could not significantly increase Cronbach'a alpha.

Before performing factor analysis, the following assumptions should be observed [26]:

1- Sampling adequacy indicator KMO (Keiser-Meyer-Olkin) measure of sampling should be at least 0.6, and preferably higher than that.

2- Kruit-Bartlett index test result should be statistically significant

3- Factor-loading of each item in factor matrix and varimax matrix should be at least 0.3 or preferably higher.

4- Each factor should at least belong to 3 items.

Assessment of adequacy of sampling showed that level of variance in data, explained by factors was 0.924, indicating adequacy of sampling. Moreover, Kruit-Bartlett index value (Bartlett's test) (51.3565) also suggested rigor of correlation matrix among variables in the population, which confirms factor-ability of data (P-value=0.000). Given the above,

factor analysis report is possible.

Table of exploratory factor analysis results (Table 1) suggests that in total after rotation, the 3 factors of "fear of situation", "physiological distress due to situation" and "avoidance of situation" were extracted from study tool data, and explained 52.9% of variance of social phobia. Assessment of factor-loading associated with each item showed that items 3, 4, 8, 9, and 11 had the highest factor-loading on "fear of situation", items 2, 7, 13, 15, and 17 had the highest factor-loading on "physiological distress due to situation", and items 1, 5, 12, and 16 had the highest factor-loading on "avoidance of situation". Since items 6 and 14 had a high level of factor-loading on both "fear of situation" and physiological distress due to situation", they should be either eliminated from SPIN, or modified.

Table 1 *The results of exploratory factor analysis of SPIN*

	Factors		
	Fear in social situations	**Physiological discomfort in social situations**	**Avoidance of social situations**
1. Fear of people in authority	-0.013	0.189	0.789
2. Bothered by blushing	0.038	0.669	0.238
3. Fear of parties and social events	0.599	0.445	0.092
4. Avoids talking to strangers	0.669	-0.024	0.155
5. Fear of criticism	0.318	0.259	0.545
6. Avoids embarrassment	0.531	0.503	0.249
7. Distressed by sweating	0.167	0.747	0.158
8. Avoids parties	0.579	0.300	0.041
9. Avoids being the center of attention	0.684	0.235	0.226
10. Fear of talking to strangers	0.680	0.174	0.217
11. Avoids speeches	0.674	0.311	0.162
12. Avoids criticism	0.196	0.224	0.493
13. Distressed by palpitations	0.358	0.573	0.053
14. Fear of others watching	0.45	0.509	0.287
15. Fear of embarrassment	0.269	0.668	0.218
16. Avoids talking to authority	0.425	0.112	0.617
17. Distressed by trembling or shaking	0.182	0.667	0.190
Loadings after rotation	3.59	3.37	2.03
Percentage of explained variance after rotation	21.13	19.84	11.99
Cumulative percentage of explained variance after rotation	21.13	40.99	52.97

To examine structure of SPIN, factors obtained from exploratory factor analysis were analyzed in the form of an assessment model.

Figure 1 presents assessment model associated with components of SPIN, as well as standard estimated Path Coefficients associated with Fitting Model.

Results presented in Table 2 suggest that estimated Path Coefficients and standardized Parameters for each of the observed variables are statistically significant. Standardized

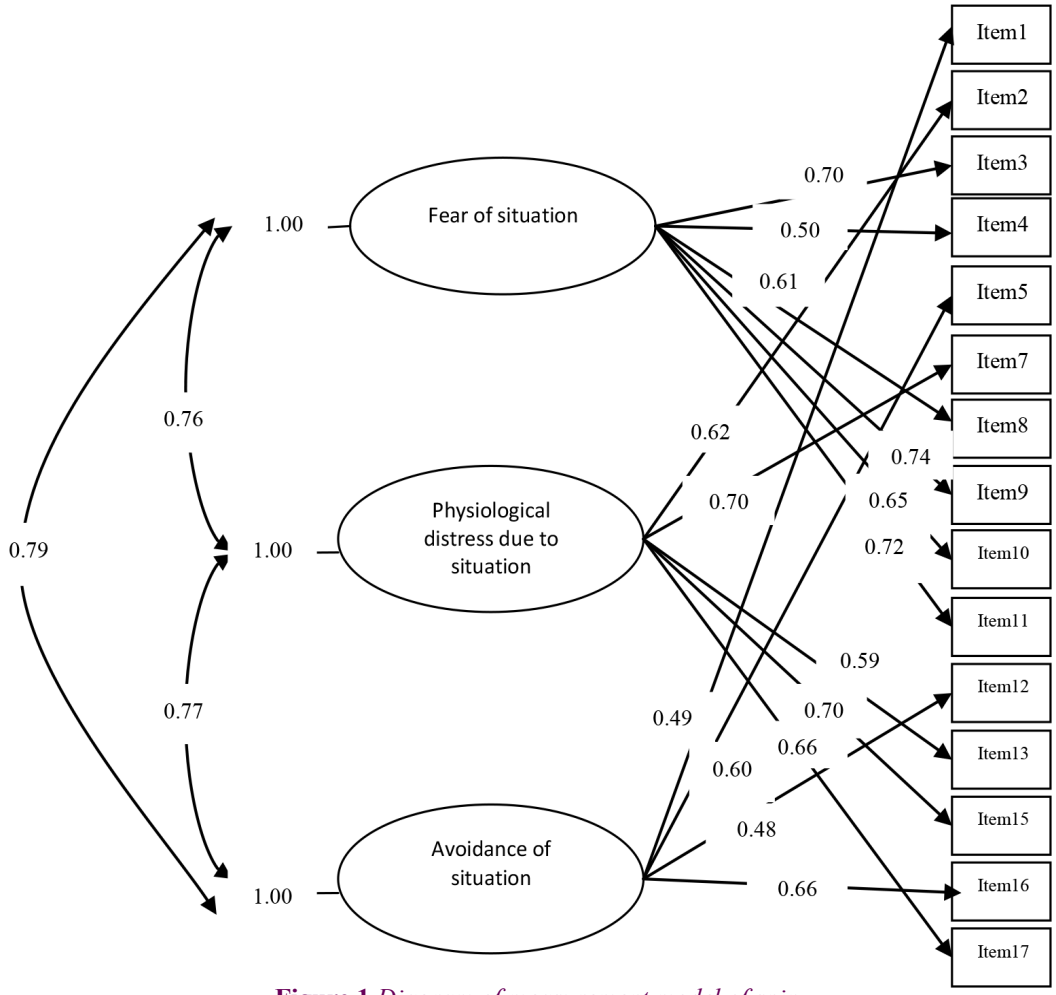

Figure 1 *Diagram of measurement model of spin*

coefficients and Squared Multiple Correlation presented in this table indicate strength and rigor of linear correlation, and their squared values indicate high capability of items in measuring

Table 2 *Estimated path coefficiont and standardized parameters of measurement model of SPIN*

Factors	Items	Estimated parameter	Standardized parameters	Standard error of estimate	T	Squared multiple correlation
Fear of situation	Item 3	0.59	0.70	0.03	*18.00	0.50
	Item 4	0.48	0.50	0.04	*11.86	0.25
	Item 8	0.57	0.61	0.04	*14.82	0.27
	Item 9	0.75	0.74	0.04	*19.08	0.54
	Item 10	0.48	0.65	0.03	*16.14	0.42
	Item 11	0.73	0.72	0.04	*18.52	0.52
Physiological distress due to situation	Item 2	0.69	0.62	0.05	*14.90	0.38
	Item 7	0.69	0.70	0.04	*17.41	0.49
	Item 13	0.48	0.59	0.03	*18.00	0.35
	Item 15	0.76	0.70	0.04	*11.86	0.49
	Item 17	0.75	0.66	0.05	*14.82	0.44
Avoidance of situation	Item 1	0.42	0.49	0.04	*19.08	0.24
	Item 5	0.55	0.60	0.04	*16.14	0.36
	Item 12	0.54	0.48	0.05	*18.52	0.23
	Item 16	0.54	0.66	0.04	*14.90	0.43

*P<0.01

each of the three factors comprising SPIN: "Fear of situation", Physiological distress due to situation", and "Avoidance of situation".

Assessment of goodness of fit of model presented in Table 3 suggests favorable fitness and compliance of model with data.

Multi-group analysis results:

Construct validity of SPIN, and results of measurement invariance were assessed using multi-group analysis approach. In this regard, the results of confirmatory factors analysis

Table 3 *Confirmatory factor analysis Goodness of fit index and adjusted goodness of fit index for SPIN*

ECVI	Adjusted Goodness of Fit Index (AGFI)	Goodness of Fit Index (GFI)	Standard Root Mean Remain (Standard RMR)	Root Mean Square Error of Approximation (RMSEA)	significant	df	X^2	Fitting index
0.68	0.90	0.93	0.046	0.068	0.000	87	314/74	Value

of measurement model for male and female students are presented in Table 4, and results of measurement invariance in the basic model (comparison of groups with no limitation), model 1 (comparison of groups for equivalent path and construct coefficients), model 2 (comparison of groups for equivalent path coefficient and factor correlation), and model 3 (comparison of groups for equivalent path coefficient, factor correlation, and measurement error) are presented in Table 5.

Results presented in Table 4 suggest statistical significance of estimated path coefficients and standardized parameters for each variable in measurement model for male and female groups of students. Standardized coefficients and squared multiple correlations in this table suggest high capability of items in measuring each of the three constituent factors in SPIN in both groups.

Table 4 *Estimated path coefficiont and standardized parameters of measurement model of SPIN according to gender*

		Males					Females				
Factors	Items	esti-mated param-eter	Stan-dardized parameters	standard error of estimate	T	Squared multiple correla-tion	esti-mated param-eter	Stan-dardized parameters	standard error of estimate	T	Squared multiple correla-tion
Fear of situation	Item 3	0.64	0.76	0.05	12.65*	0.55	0.56	0.67	0.04	13.09*	0.47
	Item 4	0.48	0.51	0.06	7.63*	0.24	0.47	0.49	0.05	9.05*	0.26
	Item 8	0.62	0.67	0.06	9.57*	0.36	0.50	0.54	0.04	11.15*	0.37
	Item 9	0.77	0.77	0.06	12.53*	0.54	0.70	0.70	0.05	14.18*	0.53
	Item 10	0.48	0.65	0.04	10.76*	0.43	0.50	0.68	0.04	12.75*	0.45
	Item 11	0.76	0.75	0.07	11.43*	0.47	0.69	0.68	0.05	14.58*	0.55
Physio-logical distress due to situation	Item 2	0.67	0.60	0.07	9.50*	0.37	0.69	0.62	0.06	11.34*	0.38
	Item 7	0.69	0.71	0.69	11.08*	0.47	0.66	0.68	0.05	13.27*	0.49
	Item 13	0.53	0.65	0.53	9.40*	0.36	0.44	0.55	0.04	10.62*	0.34
	Item 15	0.76	0.67	0.72	10.67*	0.44	0.79	0.73	0.06	14.09*	0.54
	Item 17	0.68	0.59	0.68	8.98*	0.33	0.81	0.71	0.06	14.00*	0.53
Avoid-ance of situation	Item 1	0.40	0.47	0.06	6.18*	0.19	0.45	0.52	0.05	9.64*	0.30
	Item 5	0.51	0.55	0.06	7.93*	0.31	0.59	0.64	0.05	11.42*	0.40
	Item 12	0.49	0.45	0.08	6.16*	0.19	0.56	0.51	0.06	8.95*	0.27
	Item 16	0.47	0.58	0.06	7.58*	0.29	0.58	0.70	0.04	14.27*	0.58

*P<0.01

Indices of goodness of fit model presented in table 5 also suggest favorable fitness and compliance of data with the proposed model, and thus indicate favorable rigor of study tool for female and male groups of students. Results presented in Table 5 on invariance test in equivalent condition of all path coefficients of SPIN measurement model in female and male groups of students,

Table 5 *Invariance test in equivalent condition of all path coefficients of SPIN measurement model in female and male groups of students*

p($\Delta\chi^2$)	(Δdf)	($\Delta\chi^2$)	nested models	CFI	NNFI	$\frac{\chi^2}{df}$	p(χ^2)	(df)	(χ^2)	
---	---	---	---	0.96	0.95	2.62	0.000	174	456.97	base model
0.633	15	12.59	Base -1	0.96	0.95	2.48	0.000	189	469.56	Model1
0.688	9	6.51	Base -1.1	0.96	0.95	2.53	0.000	183	463.48	Model1.1
0.574	10	8.56	Base -1.2	0.96	0.95	2.53	0.000	184	465.53	Model1.2
0.716	11	7.96	Base -1.3	0.96	0.95	2.57	0.000	185	464.93	Model1.3
1.000	18	1.91	2-1	0.96	0.96	2.45	0.000	192	471.47	Model2
0.000	33	86.76*	3-2	0.95	0.95	2.69	0.000	207	558.09	Model3

*P≤0.01

and in comparing model 1 with base model show no significant difference between two groups of students (male and female). In other words, all path coefficients of SPIN measurement model are equivalent in female and male groups of students. Results of invariance test in equivalent conditions of path coefficients for factors "fear of situation" in comparing model 101 with base model, "physiological distress due to situation" in comparing model 102 with base model, and "avoidance of situation" in comparing model 103 with base model, suggest no significant difference between path coefficients of these three factors in female and male groups. In other words, path coefficients of these factors are equivalent in the two groups. Results of invariance test in conditions of "equivalence of all path coefficients and factor correlation" and in comparing model 2 and model 1, reveal equivalence of two models' factor correlations. In conditions of "equivalence of all path coefficients, factor correlations, and measurement errors" in comparing model 2 and model 3, invariance test results suggest measurement errors associated with these models are not equivalent.

Discussion

Three approaches of exploratory and confirmatory factor analysis and multi-group factor analysis were used in the present study to assess construct validity of SPIN. Exploratory factor analysis results showed that SPIN consisted of three factors of "fear of situation", physiological distress due to situation" and "avoidance of situation". "Fear of situation" is considered the most important factor in explaining variance of social phobia, and together with other two factors, explain 52.97% of social phobia variance. His result is in line with findings by Connor et al. [10], and Osorio et al. [15].

Ranta et al. [17] assert that SPIN has appropriate construct validity for screening the general population of 12 to 17 years, which is in agreement with the present study results.

Confirmatory factor analysis results suggest statistical significance of estimated path coefficients and values of standardized parameters for each of the observed variables, indicating high strength of factor loading of each constituent factor of SPIN. Standardized coefficients and squared of multiple correlations also indicate that power and rigor of linear correlations and their squares represent proportion of explained variance for latent variables, which suggest high capability of items in measuring each of the three constituent

factors of SPIN. This result is in line with results obtained by Ranta et al. [20], Anthony et al. [18], and Rudemski et al. [22].

Assessment of indices of goodness of fit model also suggests favorable fitness and compliance of data with the proposed model, indicating favorable rigor of study tool, which is in agreement with results found by Carlton et al. [19].

Results obtained from multi-group analysis showed equivalence of path coefficients of all constituent factors of SPIN in male and female student groups, and thus indicate same high power of factor loading of variable observed for each latent variable of "fear of situation", "physiological distress due to situation", and "avoidance of situation" in both groups of students.

As in Ranta et al. study [17] conducted on Fin youths, in the present study, results of invariance of factor correlation in multi-group analysis approach showed equivalence of correlation between factors in female and male student groups, which indicates that SPIN has the same internal consistency in both student groups.

Multi-group analysis results of invariance test of measurement errors, which relates to comparison of reliability of study tool in two groups of students, showed non-equivalence of measurement errors associated with variables observe in male and female students groups, and despite reliability of study tool in each of these groups (female students 0.905, and male students 0.892), results suggest a significant difference in level of reliability of study tool among male and female students. This finding is in line with studies by Garcia Lopez et al. [9] and Ranata et al. [17].

In the present study, results of reliability of internal consistency and reliability of stability were considered appropriate, and this agrees with results obtained by other studies conducted in this regard. In a study by Anthony et al. [18] on patients with social phobia, internal consistency (Cronbach's alpha) for the whole scale was found, and reliability of retest with interval of 1 to 3 weeks suggested strong correlation between the two tests performed for overall score of the scale. In the present study, calculated reliability is in line with initial results obtained by Hassanvand et al. [23]. In their study, Cronbch's alpha of questionnaire in the first half of the test was found, and for the second half, and correlation between the two halves of the test was, and Spearman-Brown index was. Furthermore, Cronbach's alpha for all participants in social anxiety subscale was found: for avoidance, for fear, and for distress, indicating satisfactory reliability. Similarity in present findings with findings of other studies in different cultures can be attributed to the cross-cultural nature of social anxiety, although, cultural share of items in identifying social phobia may be different in different cultures.

Conclusion

According to the present study results, psychometric properties of Social Phobia Inventory were considered appropriate. Thus, despite the present study limitations, SPIN can be used to screen and identify predisposed people to social phobia amongst normal population, so that necessary interventions may be implemented before their problem becomes acute.

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Contributions

Study design: MHA
Data collection and analysis: MHA, KFB
Manuscript preparation: MHA, KFB

Conflict of interest

"The authors declare that they have no competing interests."

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