



Original Article

## Construct validity and reliability of Symptom Checklist-25 (SCL-25)

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### Abstract

**Introduction:** Symptom Checklist-90 (SCL-90) is a mostly applied tool in studying mental health domain. Despite researchers interest for employing this tools high number of items restricted this process. The aim of current study was to investigate the factor structure, divergent validity and reliability of SCL-25.

**Materials and Methods:** By employing a correlative design and test validation, 1076 person (523 female and 553 male) were selected among all employed people in North Khorasan educational organization by employing multistage cluster sampling. They completed SCL-25, short form of Psychological well-being (Ryff, 1989) and short form of social well-being (Keyes, 1998). Investigating the validity was performed by employing exploratory and confirmatory factor analysis and also divergent validity and reliability was investigating through internal consistency, Cronbach alpha and split-half method. For this aim SPSS version 17 and LISREL version 8.54 were used.

**Results:** Finding related to exploratory factor analysis with principal components and varimax rotations confirms 7 factor structure for SCL-25 that can justify for 82.16 percent of the variance. Also confirmatory factor analyses show a good fitness with 7 factor fundamental model. In addition as there was a negative significant relationship ( $P < 0.05$ ) between sub variables of SCL-25, psychological and social well-being, divergent validity of SCL-25 was confirmed. Furthermore there was a positive significant relationship between subscales of SCL-25. Also it produces a high Cronbach alpha (0.71 to 0.95) and split-half coefficient (0.65 to 0.96) for subscales and the whole scale score.

**Conclusion:** It seems that seven factor structure of SCL-25 can perform as a useful scale in research and clinical settings because of its shortness, multidimensionality and having a good factor and divergent analysis.

**Keywords:** Factor analysis, Reliability, Symptom Checklist-25, Validity

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### Introduction

Symptom Checklist 90 (SCL-90) is made to assess the pathological symptoms in non-admitted psychiatric patients (1). The beginning of its history backs to Cornell Medical Index (CMI). This index was made in 1948 by Wider for assessment the psychological profile of soldiers of World War II who referred with psychiatric symptoms. In 1953 Parloff et al. used this index for made of their Discomfort Scale to primary assessment of improvement after psychotherapy (2). The current corrections and addition of other states led to Hopkins Symptom Checklist (HSCL). This checklist has little variety but the 58 states of this

questionnaire concerned as turning point in evaluation of scale. This form named as Symptom Distress Checklist (SCL). Factorial structure included of 4-6 dimensions has been used by various researchers but this assessments accompanies with exclusion, insertion or change in some statements and different factorial structure (3). Finally, Derogatis, Lipman, Rickels, Uhlenhuth, and Covi made SCL-90 through addition of some statements to HSCL and they assessed its psychometric indexes. This scale was revised and it was named as SCL-90-Revised version (SCL-90-R). This checklist measures 9 dimensions of symptoms included: somatization, obsession-compulsion, interpersonal sensitivity, depression, anxiety, hostility, paranoid thought and neuroticism. 7 additional items are concerned in this list that they only are calculated in total scoring (2). Although Derogatis et al. approved the same structure to 9 dimensions of SCL-90 but in

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various conducted studies (5-8), SCL-90 has different factorial structure. This heterogeneity in addition to current use of this form and large number of statements led to reevaluation of its factorial structure and compilation of short forms. As example, Derogatis made the Brief Symptom Inventory (BSI-53) that it evaluates main 9 dimensions through fewer statements. Hardt and Gerbershagen (10) and Hardt et al. (11) evaluated the 27 symptom list in other studies. They made 6 dimensions structure consists of depressive symptoms, dysthymic symptoms, vegetative symptoms, agoraphobic symptoms, symptoms of mistrust and social phobia through factorial analysis and they approved high convergent and predicting validity with SCL-90. In another study Derogatis (12) assessed the Brief 18-Symptoms (BSI-18) that it evaluates 3 dimensions of somatization, depression and anxiety. Harfst et al tried to make SCL-14 that it consists only 3 dimension of depression (6 statements), phobia (4 statements) and somatization (4 statements) (13).

On the other way, some researchers have made short forms of SCL with mono-factor structure for assessment of psychopathology. Rosen et al. (14) made two checklists (SCL-10 and SCL-6) with a total score through study on posttraumatic stress disorder patients and they approved its convergent validity with original version. Also Klaghofer and Brähler (15) made SCL-9 that evaluates only global severity of symptoms index (GSI). Prinze et al. (16) studied 90, 53, 27, 18, 14 and 9 items of SCL at the same time on emotional disorder patients and they approved convergent validity related to short forms with original version.

Current use of SCL-90 by national researchers, different reported factorial structure and some researchers focus on apply of single-factorial structure led to Najarian and Davoudi (17) made a short form in 2001. They performed SCL-90 on 801 students of Shahid Chamran University of Ahvaz and they applied exploratory factor analysis with principle components and varimax rotation to assess factorial structure.

Factor analysis of 3 factors indicated Eigen value over than 1 that most explained variance was related to first factor and second and third factor explained 9.9% of variance through addition of 20 items. Based this issue, researchers applied factorial load as 0.785 for every component and they made the single factorial structure that it explained 50.4% of total variance by 25 items. They made this 25-item scale with a total score of psychopathology according to the original introduction and they

named it as SCL-25. Also they reported high convergence between this item and SCL-90 dimensions. They approved validity of this new scale through internal consistency and re-test and convergent validity through measurement of correlation index of psychopathology of SCL-25. In addition they approved its validity through relation between psychological resilience and psychopathology of SCL-25.

After spreading of SCL-25, native researchers applied this instrument on high-school students (22), college students (18,19,21,23,24,25), and adult patients (20). Review of some of this researches showed that some researches applied SCL-25 for a total score according to Najarian and Davoudi (17) and they extracted general psychopathology index through their analysis.

This accordance may be explained through 8 main dimensions of SCL-25 included: somatization, obsession-compulsion, interpersonal sensitivity, and phobia (3 statements for every of them), depression (2 statements), anxiety (6 statements), paranoid thought (1 statement) and neuroticism (4 statements) with 1 statement of Additional Items (ADI) without hostility dimension. Despite of this structure, only single-factorial structure was approved and eight-factorial structure was not extract from this analysis.

Despite of this issue, some researchers tried to derivation of dimensions same to original version. For example, Arabian et al. (19) extracted the participants' scores in 8 disorders via SCL-25. Talaei et al. (20) have been extracted 9 disorders from SCL-25 despite of lack of any statement for hostility. Also Mahdipour et al. (23) and Riahi et al. (24) extracted depression and somatization and 9 disorders from SCL-25 respectively.

Overall, review of past researches indicated that SCL-25 which made by Najarian and Davoudi (17) because of having single-dimension could not supply the native researches needs to multi-dimension scale with appropriate reliability and validity despite of save-time for assessment of general psychopathology and it leads researchers to mistake in their decision in some cases. Based on this issue, re-evaluation of factorial structure and psychometrics properties is necessary according to various brief multi-dimensional versions (9,10,12-15) and it can supply more perfect instrument. The present study aimed to assess the factorial structure, divergent validity and reliability of SCL-25.

## Materials and Methods

In a correlative research and validation of scale, 1076 participants were selected among all of

employed personnel in schools of North Khorasan Province included teacher, manager/senior and services personnel in 2011-12. Sampling process conducted in multi-phase method because of deviation of schools and conventional variables such as gender, rural/tribal/urban population.

At first, the cities of province were divided into 3 districts as: affluent, semi-affluent and deprived. Then one city was selected from every district. Based on Cochran formula with consideration of  $\alpha=0.05$ ,  $P=50\%$  and  $d=0.05$ , 291 schools were selected as cluster. Then by city, gender, ordinary or extraordinary and rural/urban/tribal situations the schools divided in proportion to volume. For selection of personnel, considering to 3-5 and 5-7 persons in urban/rural primary or middle schools and 10 persons in high-schools and technical schools, the questionnaires distributed among 1587 participants. Trained interviewers who were generally educated in psychology and counseling conducted this research according to research ethics through brief description about the aims of research and emphasize on the confidentiality of identity and participants oral consent. Inclusion criteria only included full-time employment in schools. Finally, after exclusion of questionnaires, 1076 questionnaires were analyzed. Data gathered via the researcher-made demographic form, SCL-25, brief form of psychological well-being and brief form of social well-being.

#### **Research instruments**

- *Symptom Checklist-25 (SCL-25)*: This is a brief form of SCL-90 which made by Najarian and Davoudi (17) based on the original version through explorative factor analysis. Participants' response in a Likert scale included: never (0), a few (1), somewhat (2), great (3) and very great or severe (4) according to the original scale. A total score extracts from this list and higher scores mean more psychopathology. Najarian and Davoudi (17) assessed its validity through factorial analysis, convergent and divergent validity and reliability via and internal consistency and re-test. They reported Cronbach's  $\alpha$  of new version as 0.97 for women and 0.98 for men and re-test coefficients after 5 weeks in total sample as 0.78, women 0.77 and men 0.79.

- *Brief Form of Psychological Well-being*: Psychological well-being scale has been designed by Ryff (26). The original form consists of 120 statements. In subsequent studies the brief forms with 84 questions, 54 questions and 18 questions also were provided. Psychological well-being scales-18 has 6 subscales as: self-follow, dominance on environment, personal growth, positive relations

with others, aim in life and self-acceptance. Participants are asked to read the statements and express their judgments about themselves in a 7 degree Likert scale as absolutely disagree (1) to absolutely agree (7). The higher score means more psychological well-being. The scoring performs reversely in some phrases. The validity and reliability of this scale have been approved in native and foreign studies (27,28). Joshanloo et al. (29) in a study that aims to make comprehensive well-being on college students, approved 6-factorial structure of scale and they reported reliability coefficients as 0.43 to 0.57 for subscales.

- *Brief Form of Social Well-being*: This scale was made by Keyes (30) to measure of optimal function in social function. It measures 5 social well-being dimensions included: social integration, social acceptance, social cooperation, social inflorescence and social perception through 15 components. Participants response in a 7 degree Likert scale as absolutely disagree (1) to absolutely agree (7). The higher score in every subscale means more optimal situation. The validity and reliability of this scale have been approved in foreign studies (31,32). In Iran, Joshanloo et al. (29) approved the 5-factorial structure validity through explorative factor analysis and Cronbach's  $\alpha$  in a range of 0.60 to 0.76.

The approval and explorative factor analysis and Pearson correlation were used for its validity and divergent validity of SCL-25. The reliability was assessed through Cronbach's  $\alpha$  and half-off coefficient. Data analysis performed by SPSS version 17 and LIRESL 8.54.

#### **Results**

The participants mean age was  $38.79 \pm 7.42$  years. Amongst them 51.4% were female and 48.6% were male. According to marital status, 7.8% were single, 92.1% were married and 1% of them were divorced or widow.

The assessment of internal consistency of SCL-25 showed that Cronbach's  $\alpha=0.94$  and  $\alpha$  will change in range of 0.933-0.937 by exclusion of every statement. According to middle-high power of judgment of phrases through their correlation with total score (0.34 to 0.68), none of the statements could not be excluded in this stage.

The explorative factor analysis with main components model and varimax rotation were performed to assess that made scale can repeat the hypothesized structure on statistical community. The results of Kaiser-Meyer-Olkin (KMO) test as 0.90 and Bartlett's test of sphericity ( $p \leq 0.0005$  and  $\chi^2(276)=23820.05$ ) indicate the adequate sample

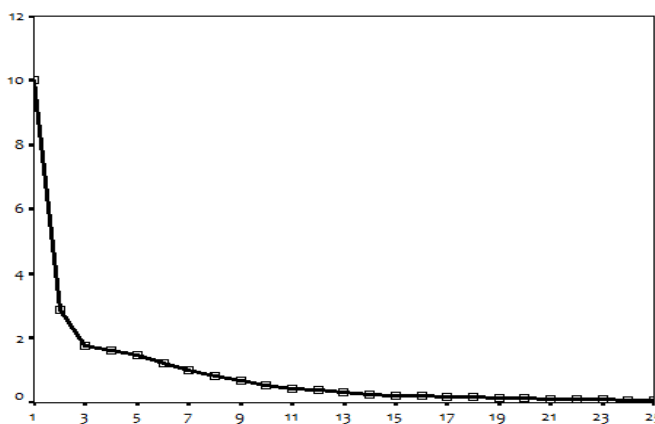
size and ability of components for factorial role. The explorative factor analysis and Scree plot (fig. 1) indicated 7 factors with specific value higher than 1. The minimum factorial load for statements is

concerned as 0.35. The explained variance of 7 factors was 82.16%. In Table 1, SCL-25 phrases, factorial load and specific amounts have been presented.

**Table 1.** Results of factorial load of main components of SCL-25 after varimax rotation

statements	factors						
	SO	O-C	INT	PHOB	ANX	PSY	DEP
16. Do you have feel lump in your throat?	0.88						
17. Have you experience the flashing or coldness?	0.87						
12. Do you have had nausea or upset stomach?	0.86						
25. Do you have feeling of weakness in some parts of your body?	0.86						
2. Have you experience dyspnea?	0.85						
6. Do you feel numbness or murmur in your body?	0.83						
18. Have you loss your appetite?	0.39						
21. Do not have any attention? This means that you have had difficulty in attention.		0.90					
11. Do you have lack of attention or accuracy in doing some duties?		0.89					
22. Do you have experience that your brain does not work?		0.89					
20. Do you feel comfortableness when people talk about you or look at you?			0.87				
9. Have you had feels that people are unlikely or unfriendly to you?			0.86				
5. Have you been prig?			0.85				
14. Have you had fear in traveling by train or bus?				0.92			
15. Have you had this feeling fear about you go away from home lonely?				0.92			
10. Have you do not do something or touch things because of fear?				0.80			
7. Have you scared?					0.83		
3. Have you scared suddenly without any reason?					0.81		
8. Have you feel tremor in your limbs?					0.80		
19. Have you heard voices that others cannot hear them?						0.78	
23. Have you had thoughts that you feel they not related to you but others inserted them in your brain?						0.77	
1. Have you had this feeling in the past week that others know about your private thoughts without you talk them?						0.74	
24. Have you had this feeling that others talk about you or detect you?						0.37	
13. Have you had thoughts about suicide?							0.87
4. Have you had thoughts about loss your hope about future?							0.82
Specific value	9.87	2.87	1.77	1.59	1.46	1.23	1.02
Percent of explained variance	20.90	12.07	11.42	11.21	10.27	9.16	7.14
Percent of cumulative variance	20.90	32.97	44.38	55.59	65.86	75.02	82.16

SO: somatization, O-C: obsession-compulsion, INT: interpersonal sensitivity, PHOB: phobia, ANX: anxiety, PSY: psycho-neuroticism, DEP: depression



**Fig 1.** Screen plot for detection of factors of SCL-25

The results of explorative factor analysis showed that all statements have been loaded under related subscales such as original version but statement 18 was additional in original version and it was principal in Najarian and Davoudi scale (17). In the present study it loaded under somatization subscale associated with statements of 16, 17,12, 25, 6 and 2. In addition, statement 24 has been loaded under paranoid subscale in original version but it was added to statements of 23, 19 and 1 in the present study that they overall named as psycho-neuroticism subscale.

It is possible that there are other alternative models in addition to assume model so the single-factorial structure was assessed for mare insurance about the

nations of acquired factors. The explained variance of single-factorial structure with maintenance of all phrases was 47.69%. For accuracy of factorial structures fitness and basic dimensions, approved factor analysis conducted on single and seven factorial models through maximum likelihood pattern. The fitness of models were assessed based on chi-square properties, proportion of chi-square/degree of freedom, Root Mean Square Residual (RMR), Goodness of Fit Index (GFI), Adjusted Goodness of Fit Index (AGFI), Comparative Fit Index (CFI) and Root Mean Square Error of Approximation (RMSEA) that the results were presented in Table 2.

**Table 2.** Goodness of Fit Index in SCL-25

Assumed models	$\chi^2$	df	P	$\chi^2/df$	GFI	AGFI	RMSEA	RMR	CFI
Single-factor	18442.81	275	0.000	67.06	0.42	0.32	0.25	0.14	0.73
Seven-factor	1783.32	231	0.001	7.72	0.88	0.87	0.05	0.07	0.97

The chi-square tests this hypothesis that assumed model accords to covariance model between seen variables. Minor  $\chi^2/df$  shows more fitness. RMR means difference between matrix elements in sample group and predicted matrix elements if assumed hypothesis is true. If RMR of model tends to zero, the model has more fitness. GFI and AGFI which presented by Joreskog and Sorbom do not affect by sample size reversely to other indexes which presented in this section. GFI and AGFI indicate that model has how much fitness compared

to absence of it. The amount of these indexes should be more than 0.90 for acceptance of model. CFI explanation is same to them. Also RMSEA between 0 to 0.05 means good fitness and amounts of 0.05 to 0.08 means acceptable fitness (33). The results of Table 2 show that goodness of fit indexes of seven-factor model is higher compared to single-factor model. This indicates that data analysis with seven-factor model has suitable fitness and the items of this scale accord to fundamental structure.

**Table 3.** Coefficients of SCL-25 subscales with psychological well-being and social well-being

Variables	Neuroticism	Somatization	Anxiety	Depression	Interpersonal sensitivity	Phobia	Obsession-Compulsion	General psychopathology
Self-acceptance	-0.05	-0.35**	-0.33**	-0.44**	-0.43**	-0.28**	-0.40**	-0.08**
Aim in life	-0.08**	-0.18**	-0.20**	-0.22**	-0.20**	-0.15**	-0.19**	-0.06*
Dominance on environment	-0.02	-0.27**	-0.28**	-0.37**	-0.33**	-0.25**	-0.33**	-0.06*
Positive relations with others	-0.10**	-0.20**	-0.22**	-0.27**	-0.35**	-0.19**	-0.26**	-0.07*
Personal growth	-0.05	-0.23**	-0.29**	-0.36**	-0.31**	-0.22**	-0.28**	-0.08*
Self-following	-0.07*	-0.12**	-0.12**	-0.11**	-0.15**	-0.10**	-0.15**	-0.05
Psychological well-being	-0.10**	-0.35**	-0.37**	-0.45**	-0.45**	-0.30**	-0.41**	-0.10**
Social comprehension	-0.01	0.05	-0.05	-0.02	-0.03	-0.04	-0.02	-0.05
Social integration	-0.03	-0.06*	-0.06	-0.06	-0.10**	-0.12**	-0.05	-0.06*

Social acceptance	-0.06*	-0.14**	-0.12**	-0.24**	-0.27**	-0.11**	-0.25**	-0.06*
Social coordination	-0.03	-0.20**	-0.21**	-0.28**	-0.30**	-0.22**	-0.29**	-0.01
Social efflorescence	-0.03	-0.24**	-0.23**	-0.35**	-0.32**	-0.18**	-0.31**	-0.03
Social wellbeing	-0.05	-0.21**	-0.20**	-0.31**	-0.33**	-0.22**	-0.30**	-0.07*

$P < 0.01^{**}$ ,  $P < 0.05^{*}$

Finally coefficients of subscales, Cronbach's  $\alpha$ , and split-half for SCL-25 were assessed to internal consistency. The results have been presented in Table 4.

**Table 4.** Descriptive indexes, coefficients, Cronbach's  $\alpha$ , and split-half for SCL-25 subscales

Variables	1	2	3	4	5	6	7	8
Psycho-neuroticism	-	0.07*	0.05	0.02	0.10**	0.00	0.06	0.69**
Somatization		-	0.69**	0.54**	0.57**	0.39**	0.55**	0.11**
Anxiety			-	0.52**	0.55**	0.45**	0.60**	0.14**
Depression				-	0.58**	0.41**	0.51**	0.08**
Interpersonal sensitivity					-	0.39**	0.61**	0.12**
Phobia						-	0.41**	0.05
Obsession-compulsion							-	0.10**
General psychopathology								-
Cronbach's $\alpha$	0.71	0.95	0.92	0.91	0.95	0.92	0.95	0.94
Half-off	0.65	0.96	0.84	0.91	0.85	0.84	0.85	0.91
Mean	0.58	0.89	0.82	0.54	0.86	0.41	0.94	0.76
Standard deviation	0.61	0.82	0.70	0.70	0.73	0.69	0.78	0.56

The results of Table 4 indicate that there is a positive and significant relation between SCL-25 dimensions and all of subscales have good validity.

**Discussion**

The present study aimed to assess the factorial structure, divergent validity and reliability of SCL-25. This instrument is a brief form of SCL-90 that it made and validated by Najarian and Davoudi (17) but only a total score for general psychopathology could be extracted from this list. Some of internal researches applied 7, 8 and 9 factorial structures of this instrument (19,20,23,24). On the other hand, the brief forms of 14, 18, 27 and 53 statement of this scale with structures of 3, 6 and 9 factors were made and applied in foreign studies (9-13) so re-evaluation of factorial structure of SCL-25 is necessary.

Therefore, explorative factor analysis with main components and varimax rotation performed. This analysis indicated a seven-factor structure that it concludes all of 25 statements (Najarian and

Davoudi (17)) and it accords to this study (17) but in opposite, the acquired seven-factor structure in the present study with minor replacement in statements, accords to SCL-90 in factorial structure and it can explain 82.16% of total variance. The approved factor analysis also indicates appropriate fitness with fundamental structure. In addition, single-factorial structure only explains 47.69% of total variance.

In opposite to Najarian and Davoudi research (17), it does not seem that SCL-25 has a single-dimension structure. This finding does not accord with Rosen and Klaghofer and Brähler studies (14,15) because they approved the a single-dimension structure of SCL-25 with 6, 10 and 9 components respectively. Although difference in number of components with Najarian and Davoudi research (17) may be a reason for this opposition but low percentage of explained variance of single-dimension structure and inappropriate fitness in this study compared to Najarian and Davoudi research (17) may be induced by different properties of statistical community. In

Najarian and Davoudi research (17) college students with mean age of 23.19 year were assessed. So, it is possible that different properties of statistical community are reasons for differences between results of two studies.

In the present study, the seven-factorial structure with psychoneuroticism, somatization, anxiety, depression, interpersonal sensitivity, phobia and obsession-compulsion and good fitness with basic structure accord to Derogatis (9,12), Hardt and Gerbershagen (10) and Harfst et al. studies (13) because they could extract multi-dimensional structure of SCL-25 with fewer components.

The correlation between SCL-25 dimensions with social and psychological well-being was assessed. The results showed that there is a negative and significant relation between psychological disorders based on SCL-25 and social and psychological well-being so the divergent validity of SCL-25 was approved because social well-being and psychological well-being are been considered as positive psychological aspects and in addition to physical health, they conclude the general concept of health. On the other hand, there is a positive and significant relation between psychological disorders extracted from SCL-25. It means that this scale has a good internal consistency. In addition, Cronbach's  $\alpha$  and half-off coefficients indicated high reliability of SCL-25 subscales.

Same to other studies, the present study have limitations. First, this statistical community consisted of employees in schools that they have specific properties because of social and professional situations generalization of these results to other groups and populations may be limited. On the other hand, re-test validity was not used. Although Najarian and Davoudi research (17) assessed re-test validity of SCL-25 in 5 weeks interval in college students and they reported 0.77, 0.79 and 0.78 for women, men and total samples respectively but because of differences in community and factorial structure, this re-test

validity can test the high consistency of the new structure.

In addition, convergent validity of this new scale of SCL-25 with the original version of SCL-90 has not been assessed. Although the results of Prinze et al. (16) indicate the high correlation between brief forms of 14, 18, 27 and 53 statements with the original version and Najarian and Davoudi (17) also assessed the correlation between total score of SCL-25 and its dimensions and they reported high coefficients (0.80 to 0.97) but it is possible that acquired factorial structure has different convergence to SCL-90. Other limitation of this research relates to sample drops. Although analysis was conducted on 1076 individuals but this drop may decrease the variation demographic characteristics of samples and it causes limitation in generalization of data.

### Conclusion

The findings indicated that seven factor structure of SCL-25 can be used as a useful scale in research and clinical settings in psychiatry and behavioral sciences because of its concision, multidimensionality and having a good reliability and factor and divergent validity. So, it may be recommended for usage to psychologists and psychiatrists. Further studies may be needed to assess the cut point, re-test reliability, and convergent validity of SCL-25 with SCL-90 and repeated assessment of factor structure of SCL-25 in general population.

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