

Factor Structure of the Iranian Version of 12-Item General Health Questionnaire

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Background: The 12-Item General Health (GHQ-12) questionnaire is one of the most commonly used instruments in screening studies on mental health.

Objectives: The current study aimed to examine the factor structure of the GHQ-12 questionnaire among the students in Iran.

Materials and Methods: It was a cross-sectional study in which 428 university students were recruited and completed the GHQ-12. Reliability of the GHQ-12 was evaluated using the Cronbach's alpha and the split-half method by applying the Spearman-Brown coefficient. Factor structure of the questionnaire was extracted by exploratory factor analysis (EFA). Confirmatory factor analysis (CFA) was conducted to assess how well the EFA extracted model fitted the observed data.

Results: The mean age of the participants was 22.83 years (SD = 3.09). Most of them were female (56.1%) and 81% were unemployed. The Cronbach's alpha coefficient for the Iranian version of GHQ-12 was 0.85. Using the split-half method, the alpha for the social dysfunction was found to be 0.77; it was 0.76 for the psychological distress. The principal component analysis revealed a two-factor structure for the questionnaire including social dysfunction and psychological distress that explained 48% of the observed variances. The confirmatory factor analysis was showed fit for the data.

Conclusions: The current study findings confirm that the Iranian version of GHQ-12 has a good factor structure and is a reliable and valid instrument to measure psychological distress and social dysfunction.

Keywords: General Health Questionnaire; Mental Health; Construct Validity

1. Background

The burden of mental disorders in terms of disability-adjusted life and economy is high in many societies and is considered as one of the most common causes of disability in the world (1-3). In addition, mental health is considered as an intrinsic value, as well as physical health (4).

In Iran, the prevalence of psychiatric disorders is 10.81% and the pattern is similar to those of the Western countries. In fact, seven million Iranians have one or more form of the mental disorders (5). A study from Iran revealed that the prevalence of mental disorders in rural areas and in urban areas were 21.3% and 20.9%, respectively (6). The studies conducted in Ardabil province, Iran, showed that 27.8% of the urban population have mental disorders (7); the rate of mental health disorders among caregivers with chronic psychiatric disorders in Mazandaran province was 35% (8). In general, the prevalence varied from 11.9% to 30.2%, indicating that 14%

of the global burden of disease could be contributed to disabling nature of mental disorders (9). Mental health is a significant indicator of societies' general health conditions and can be measured by various screening instruments, which are able to diagnose and determine disorders (10, 11). One of these instruments is General Health Questionnaire (GHQ) which is a screening instrument to detect the mental disorders in the general population and within community or non-psychiatric clinical settings (12). The original instrument has 60 questions, but other versions such as 12 (13), 30 (14) and 28 (6, 15), are also used. The GHQ-12 is a concise, affordable, available, efficient and well-validated instrument, recommended by World Health Organization (WHO) as a standard psychiatric screening instrument (16, 17). The GHQ-12 has been translated into different languages, and its psychometric properties have been examined

in various populations and countries (18-23). This questionnaire is scored in two different ways including Likert (0-1-2-3) and bimodal (0-0-1-1) scoring styles. For the first time, Montazeri et al. translated the questionnaire into Farsi and carried out a validation study. The results identified a two-factor structure for the questionnaire (22). Since then several studies use the Iranian GHQ-12 instrument (25, 26). However, in some other studies the 28-item version was used (24, 25). The Iranian national census found that approximately 21 million young people accounting more than one-third of the population, and adolescents and young adults constitute 40% of the general population (26). Recent studies of the disease burden have highlighted the importance of psychiatric conditions in young people.

2. Objectives

The current study aimed to determine the factor structure of the GHQ-12 by confirmatory factor analyses among the students of the University of Tehran, Iran; therefore, it was decided to examine psychometric properties of the Iranian version of the GHQ-12 in a sample of Iranian young people.

3. Materials and Methods

3.1. Study Design and Participants

It was a cross-sectional study. The study population consisted of the students of University of Tehran. The students of University of Tehran are mainly divided into three categories: engineering, basic sciences, and humanities. They were first classified according to their major and educational level, and then the desired number of samples was selected from each category based on the category size. Then, the proportional-stratified random sampling was performed based on the educational level and major for 2011-2012 academic year. The inclusion criteria were: university students aged 18 to 39 years, not diagnosed with a clear disability or chronic diseases. The exclusion criteria consisted of: university student aged over 40 years, diagnosed with mental disorders.

3.2. Questionnaires

The questionnaires included 1) demographic checklist, and 2) The Iranian version of the GHQ-12 (22). A bimodal scoring method of 0-0-1-1 is used for the 12 questions (0 = absence of common mental disorders, 1 = presence). Its total score ranges from 0 to 12 where the higher scores indicate the worse condition.

3.3. Analysis

Descriptive analyses were carried out to explore the data. Student's t-test and ANOVA were used to compare

the quantitative variables. In order to assess the psychometric properties of the Iranian version of GHQ-12, the following analyses were carried out:

1) Reliability

The Cronbach's alpha coefficient was used to examine the reliability of GHQ-12 questionnaire. The alpha values equal to or greater than 0.70 were considered satisfactory (27). Also, split-half method and the correlation between the halves were used to estimate the reliability of the test. The correlation between the two splits was evaluated using the Spearman-Brown Coefficient (28).

2) Factor Structure

Exploratory factor analysis and confirmatory factor analysis were used to extract the factor structure of the questionnaire. In order to minimize the number of variables with high loadings, exploratory factor analysis was used by principal component analysis and Varimax rotation method. Sampling adequacy to perform a satisfactory factor analysis was detected by Kaiser-Meyer-Olkin (KMO) and Bartlett's test of sphericity. Then, in order to approve the hypothesized factor structure of the questionnaire (including psychological distress and social dysfunction) confirmatory factor analysis was performed, using the Analysis of Moment Structures (AMOS). AMOS provides powerful and easy-to-use structural equation modeling (SEM) software that can create more realistic models than standard multivariate statistics or multiple regression models alone. It is recommended to use various fit criteria in combination to assess model fit. These model fit criteria are Chi-square (X^2), goodness-of-fit index (GFI), the adjusted goodness-of-fit index (AGFI), and the root-mean-square error of approximation (RMSEA). The most important fit statistic is chi-square (X^2), commonly used to compare the observed matrix with the expected one. Model is fit if GFI value is greater than 0.9, AGFI greater than 0.8, and RMSEA less than 0.08 (29). In all instances P values less than 0.05 were considered significant. Statistical analysis was performed using SPSS version 16 and AMOS version 18.

3.4. Ethics

The Ethics and Cultural Affairs of University of Tehran approved the study. The questionnaires were administered among the university students when verbal informed consent was obtained from participants. The university students filled out the questionnaire.

4. Results

4.1. The Study Sample

Totally, 428 university students participated in the study. The mean age of participants ($n = 428$) was 22.83 years ($SD = 3.09$). Most of them ($n = 240$ university students, 56%) were female, 81% unemployed, 90% single, 65% admitted in Master of Science, and 35% in Bachelor of Science. Sixty percent of the participants ($n = 256$) stated that their

Table 1. The study sample (n = 428) ^{a,b}

	No. (%)	Mean ± SD	P Value
Age			0.196
≤ 20	101 (23.6)	22.6 ± 6.2	
21-25	265 (62)	23.4 ± 6.1	
≥ 26	62 (14.4)	24.5 ± 6.2	
Education			0.272
Bachelor of science	150 (35.0)	24.4 ± 6.7	
Master of science	278 (65.0)	22.8 ± 5.7	
Marital Status			0.513
Single	386 (90.0)	24.4 ± 6.7	
Married	42 (10.0)	22.8 ± 5.7	
Employment			0.023
Employed	79 (18.4)	24.8 ± 6.5	
Unemployed	349 (81.5)	23.0 ± 6.0	
Sex			0.198
Female	240 (56.0)	23.7 ± 6.6	
Male	188 (44.0)	22.9 ± 5.4	

^a Abbreviation: GHQ, general health questionnaire.
^b Data are presented as No. (%) or Mean ± SD.

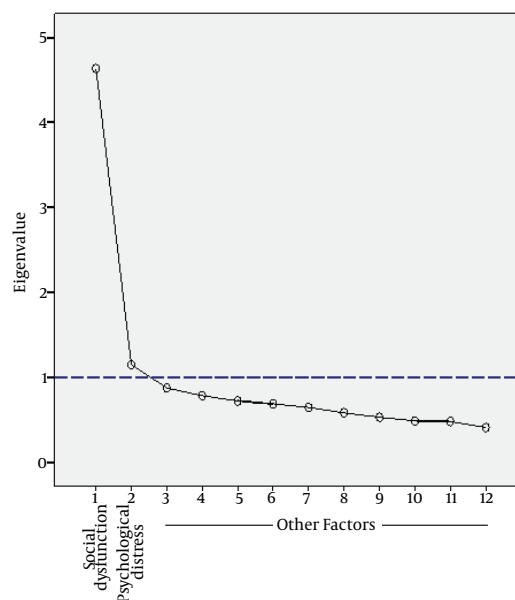


Figure 1. Eigen Value of Each Factor

Table 2. Descriptive Statistics, Cronbach's Alpha, Split-half Method, Spearman-Brown Coefficient of the GHQ-12 Subscales (n = 428)

	Number of Items	Mean ± SD ^a	Observed Range (Range)	Cronbach's Alpha	Spearman-Brown Coefficient	Split-Half Method
Factor 1 ^a	6	0.94 ± 1.493	0-6 (0-6)	0.772	0.86	0.77
Factor 2 ^b	6	1.46 ± 1.744	0-6 (0-6)	0.76		0.76
The total	12	2.40 ± 2.947	0-12 (0-6)	0.85		

^a Social dysfunction.
^b Psychological distress.

home town was not Tehran (the capital). The characteristics of the participants are shown in Table 1.

4.2. Reliability Analysis

The Cronbach's alpha for the subscales ranged from 0.70 to 0.76. The Cronbach's alpha value for the Farsi version of GHQ-12 was 0.85. Using split-half method, the alpha for the social dysfunction, and psychological distress factors were 0.77 and 0.76, respectively. The correlation between the two splits was 0.86, using the Spearman-Brown coefficient (Table 2). The analysis suggested satis-

factory internal consistency of the questionnaire.

4.3. Factor Structure

Exploratory and confirmatory factor analyses were used to check the construct validity and determine the items of the questionnaire. The calculated KMO was 0.92 and the Bartlett's test of sphericity was significant (P < 0.0001) showing that the sample size was adequate for the analysis. Based on Eigen, for the values higher than one a two-factor solution was extracted for the GHQ-12. The detailed results are shown in Figure 1, and Table 3.

Table 3. Exploratory Factor Analysis of the Iranian Version of GHQ-12 (n = 428)

GHQ-12 Questions	Factor 1 ^a	Factor 2 ^b
Been able to concentrate on what you are doing?		0.448
Lost much sleep over worry?		0.390
Felt that you are playing useful part in things?	0.684	
Felt capable of making decisions about things?	0.737	

Felt constantly under strain?		0.789
Felt you could not overcome your difficulties?	0.463	
Been able to enjoy your normal day to day activities?		0.713
Been able to face up to your problem?	0.682	
Been feeling unhappy or depressed?		0.726
Been losing confidence in yourself?	0.472	
Been thinking of yourself as a worthless person?	0.724	
Been feeling reasonably happy, all things considered?		0.598
Eigen values	4.736	1.130
Variance observed, %	24.559	24.324

^a Social dysfunction.
^b Psychological distress.

Table 4. Results of Confirmatory Factor Analysis ^a

2-factor Solution ^b	
Chi-Square	93.38
Df	50
X ² /df	2.6
RMSEA	0.04
AGFI	0.94
GFI	0.96

^a Abbreviations: Df, Degree of freedom; X²/df, Chi-Square/ Df; RMSEA, Root Mean Square Error of Approximation; AGFI, Adjusted goodness-of-fit index normed fit index; GFI, Goodness-of Fit Index.

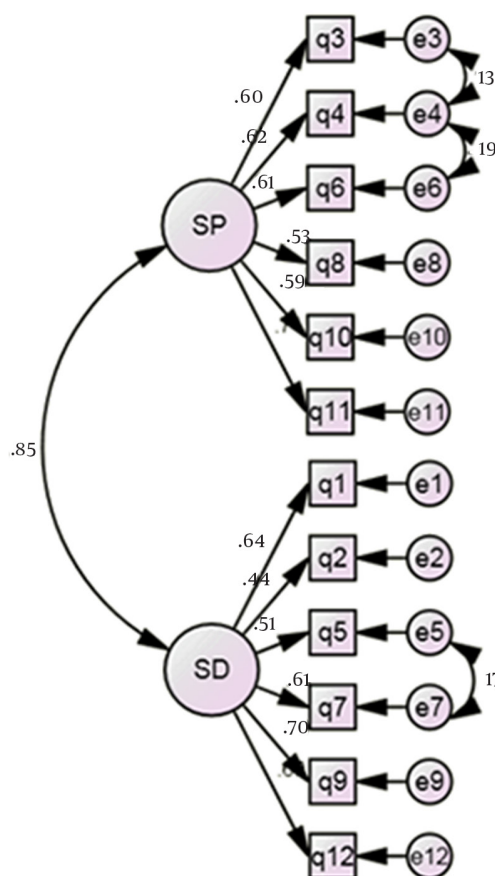
^b Degrees of freedom.

The two-factor solutions accounted for 48% of the total variances and were named: Social dysfunction and psychological distress (Table 3). Item loadings on the two factors are shown in Table 3. For example, question one with correlation value of 0.448: “Been able to concentrate on what you are doing?” was loaded on the psychological distress. The results of the confirmatory factor analysis showed that the model was highly consistent with that of the current study data. The CFA for the 12-items yielded a two-factor model that fitted the data very well as shown in Figure 2. All fit indices of the model had a satisfactory goodness of fit (normal theory weighted least squares X² = 93.38, Df = 50, GFI = 0.96, AGFI = 0.94 and RMSEA = 0.045). The ratio of X² to degrees of the freedom with values below three generally reflect a good fit (30). This ratio was the best in model (X²/df = 1.87). The results are shown in Table 4.

5. Discussion

The GHQ is a desirable instrument to measure non-psychotic diseases, minor mental disorders, and well-being (31); it is also used to diagnose depressive disorders and anxiety (32, 33). The prevalence of major depression in community settings is about 2-5% (34). The burden of undiagnosed depression and anxiety is substantial in

Figure 2. Confirmatory Factor Analysis Model



SD = Psychological distress; SP = Social dysfunction; e = Error; q = question.

community setting or among the patients. These disorders lead to negative outcomes including increased disability, adversely affecting quality of life, and decreased adherence, especially in chronic medical disorders (35). Regardless of the presence of chronic medical conditions, young individuals experience a higher prevalence of psychological distress (36). This study showed that

the GHQ-12 had a satisfactory internal consistency and was a good fit to the data for the two-latent structures of the questionnaire. A two-dimensional structure of the GHQ-12 was identified with EFA. The social dysfunction included items 3, 4, 6, 8, 10, and 11; the psychological distress also included items 1, 2, 5, 7, 9, and 12. These results were consistent with those of another study that reported two factors including social dysfunction and distress (21). However, in various studies and with different populations the number of factors varied even with almost the same internal consistency. For instance, in a study the two factors depression/anxiety and loss of positive emotion were reported among the Japanese adolescents (37), or in a study by Werneke the two factors were named depression and social dysfunction (38).

The findings of the current study showed that the two-factor solution accounted for 48% of the total variance. Another study identified two dimensions including general dysphoria and social dysfunction that explained 46.7% of the total variance (39). In a study on an adolescent population in Spain revealed that two-dimensional model explained 37.8% of the total variance (40). Montazeri et al. in a study carried out in Iran among young adults, aged 18 to 25 years, with a population similar to that of the current study, reported two factors namely psychological distress and social dysfunction with a total variance of 51%. The Cronbach's alpha was also very close to that of the current study ($\alpha = 0.87$) (22). In the study by Padron, the internal consistency of the questionnaire among the adolescent population in Southern Europe was 0.82, and the three factors, anxiety and depression, social dysfunction, and loss of confidence, obtained through exploratory factor analysis (EFA), were fit but lower than the three-dimensional model obtained through confirmatory factor analysis (CFA) by Graetz (41, 42). In the studies of Sweeting (43), Makikangas (44), and Gao (45), a three-factor model, rather than one- or two-factor models, was reported as fit by confirmatory factor analysis. A study on the Spanish general population revealed that, three factors with a Cronbach's alpha of 0.76 were obtained (46). Similarly, among the elderly, the 12-item GHQ showed three factors, namely anxiety, social dysfunction and lack of confidence (13). The Arabic version of this questionnaire with an alpha of 0.86 and three factors were extracted through explanatory factor analysis, including general dysphoria, lack of enjoyment, and social dysfunction on the university students (47). The three factors resulted from the study of Kuruvilla were named depression-anxiety, social performance, and self-esteem, in which the naming of the third factor was different from that of the other studies (48). Unlike the other studies, in the study of Gouveia (49) only one factor had the best fit, and the structure showed a reliability greater than 0.80 in all study groups. Doyle (50), Aguado (51) and Hankins (18) also reported one factor extracted in their studies that had the best fit. However, one can

attribute these differences to different methods of statistical analysis, scoring, populations with different ages, different sample sizes, different ways of answering the questions by samples, and finally, different ways of interpreting the responses. Even the type of rotation and the method of analysis can contribute to the difference in the results. Still, even when three factors were reported, the close relationship among these factors was evident. It has been even mentioned that the elderly are more at risk of minor mental disorders and depression; (50) hence, the age difference can also influence the analyses.

5.1. Limitations

It was a cross-sectional study, using a limited sample size from the freshmen of University of Tehran; thus, it cannot be generalized to the population of students or whole population of the country. Using a variety of the GHQ questionnaire, particularly the 28-and 30-item versions, can help to interpret the results better. Furthermore, the current study did not enjoy test re-test reliability, predictive validity, and the other psychometric tests. Future studies can be carried out on the other psychometric methods and other populations such as teenagers, women, and people with chronic diseases. The results revealed that the Farsi version of 12-item GHQ is a reliable and valid instrument to measure psychological distress and social dysfunctions among the youths, and that it can be used to predict the future minor mental disorders among this population. However, there still remains a need for other population-based investigations with stronger psychometric methods.

Acknowledgements

The questionnaires were administrated among the university students after we obtained verbal informed consent from participants. The university students answered the questionnaire, which required no individual name, without coercion and with peace of mind.

Authors' Contributions

Fatemeh Rahmati Najarkolaei: the main investigator, study designer, and writing the first manuscript. Fatemeh Raiisi: the study advisor. Parvin Rahnama: the main investigator consultant for finalizing the research project, analyzing the data, and writing the first manuscript. Mohammad Gholami Fesharaki: data analyzing. Omid Zamani: the editor of the paper. Mohammad Reza Jafari: data collection. Ali Montazeri: analyzing and providing the final manuscript. All authors read and approved the final revision of the manuscript.

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