Exploratory Factor Analysis of SCL90-R Symptoms Relevant to Psychosis

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Objective: Inconsistent results have been reported regarding the symptom dimensions relevant to psychosis in symptoms check list revised (SCL90-R), i.e., "psychoticism" and "paranoid ideation". Therefore, some studies have suggested different factor structures for questions of these two dimensions, and proposed two newly defined dimensions of "schizotypal signs" and "schizophrenia nuclear symptoms". We conducted an exploratory factor analysis on the items of these two dimensions in a general population sample in Iran.

Method: A total of 2158 subjects residing in Southern Tehran (capital of Iran) were interviewed using the psychoticism and paranoid ideation questions in SCL90-R to assess severity of these symptom dimensions. Factor analysis was done through SAS 9.1.3 PROC FACTOR using Promax rotation (power=3) on the matrix of "polychoric correlations among variables" as the input data.

Results: Two factors were retained by the proportion criterion. Considering loadings >= 0.5 as minimum criteria for factor loadings, 7 out of 10 questions from psychoticism ,and 3 out of 6 questions from paranoid ideation were retained, and others were eliminated. The factor labels proposed by the questionnaire suited the extracted factors and were retained. Internal consistency for each of the dimensions was acceptable (Cronbach's alpha 0.7 and 0.74 for paranoid ideation and psychoticism respectively). Composite scores showed a half-normal distribution for both dimensions which is predictable for instruments that detect psychotic symptoms.

Conclusion: Results were in contrast with similar studies, and questioned them by suggesting a different factor structure obtained from a statistically large population. The population in a developing nation (Iran) in this study and the socio-cultural differences in developed settings are the potential sources for discrepancies between this analysis and previous reports.

Keywords: *Mental health, Paranoid disorders, Psychological Tests, Psychotic symptoms, Statistical factor analysis*

SCL90-R is a well known self report instrument to assess the psychological symptom status of individuals from "healthy controls" to "disordered ones" (1). It consists of 90 qu estions defined in 9 s ymptoms dimensions (depression, anxiety, phobic anxiety, hostility, obsessive-compulsive, interpersonal sensitivity, somatization, paranoid ideation and psychoticism dimensions). A good level of consistency and test-retest reliability has been reported for SCL90-R (2, 3).

The application of the instrument, with specific focus on two dimensions of psychosis (paranoid ideation and psychoticism dimension), has been done in at least two different models.

One approach used these two dimensions to detect psychotic like experiences in the general population (4,

5, 6). In fact, the researchers have used either the sum or mean of scores on the two dimensions as the reference score, and named the subjects with scores above the 75 to 90 percentiles "positive" for psychotic like experiences and predisposed to psychosis. In other studies, the percentage of affirmative answers has been used to detect the rate of psychotic symptoms in the general population based on an accepted cut off for the distressfulness of symptoms mentioned in the two dimensions (7, 8, 9).

Regarding the uncertain validity of the SCL90-R psychosis symptom dimensions which has been replicated in some studies and has raised the need for reanalysis (7, 10), it should be noted that Rössler and colleagues , in their twenty- year prospective study named "Zurich study", have also conducted an exploratory factor analysis on the questions of these

two dimensions to determine classes of psychotic experiences in them (9). Interestingly, they extracted two new dimensions of "schizotypal signs" and "schizophrenia nuclear symptoms "out of the original ones, by changing the order of some questions and omitting some others through their longitudinal six-step interview analysis. These newly defined dimensions have also been used in some further studies (11, 12).

Considering the paucity of explorative studies on the factor structure of these symptoms, we tested this structure in a general population sample of an Iranians living in an urban area to investigate whether different socio-cultural settings will affect it.

Materials and Method

The study population consisted of people aged 18 to 65 years residing in the catchment area of Abouzar health study center, a densely populated region in southern part of Tehran (the capital city of Iran). The sample comprised of 2158 participants with mean age of 33.17 (SD=12.45); of whom 1159 (54.7 %) were female. They were selected on the basis of a two-stage random sampling design from households in the area. In the first stage, five cultural centers were randomly selected from all the existing centers in the area ;and in the second stage, people from the selected age range residing around these centers were interviewed. The selection of dwelling was systematic and if the selected individual was not present, the interviewer left for the next house. Refusal rate was low (4%).

We used questions from the two dimensions of "paranoid ideation" and "psychoticism" in the Persian version of the SCL90-R to assess the psychotic symptoms. The time period covered by the SCL90 in the study was 4 weeks. In 1983, Derogatis and his colleagues showed that the internal consistency of the SCL-90-R test was satisfactory for the nine aspects ranging from 0.71 for psychoticism to 0.85 for depression. Test-retest reliability ranged between 0.68 and 0.91 for somatization and phobic anxiety respectively (13). The revised SCL-90 was translated from English into Persian and standardized by Mirzaei (14). Satisfactory internal consistencies with Cronbach's alphas of more than 0.7 for all of the dimensions and test-retest reliability coefficient of 0.79 were also reported in her analysis. In a study by Bagheri Yazdi and colleagues, a test- retest reliability of 97%, and validity, sensitivity and specificity of 96%, 94% and 98% were detected for this test in an Iranian population respectively, and it was indicated as a valid instrument for screening psychiatric disorders in epidemiological studies (1۵). According to SCL90-R manual, the "paranoid ideation" is a six-item dimension that evaluates projective thoughts, hostility, suspiciousness, grandiosity, centrality, fear of loss of autonomy and delusions. The "psychoticism" dimension (10 items) investigates the presence of a withdrawn, isolated or schizoid life style and also core psychotic symptoms like hallucination and thought broadcasting. The Likert scale response to each question ranges from "not at all"(0) to "a little bit"(1), "moderately" (2), "quite a bit"(3) and "extremely" (4) with respect to the level of distress a symptom can cause. Participants were asked about the existence of symptoms during the month before the interview.

Fifteen health technicians and paramedical students conducted the interviews. They were trained by a master of clinical psychology through a three-day workshop and one briefing session to prepare for the procedure. All subjects signed informed consent forms and their anonymity was assured. If participants were illiterate, questions were read to them and their answers were recorded. A pilot study, which lasted 6 months, was run to detect probable defects prior to the start of the main project. Factor analysis with promax rotation (16) was conducted using PROC FACTOR procedure of SAS (V9.1.3/Windows).

Results

The data were screened for outliers, and no out of range values were found. The factorability of the 16 questions in the two dimensions of paranoid ideation and psychoticism was tested. The Kaiser-Meyer-Olkin measure of sample adequacy was 0.949, which indicated adequacy of the sample with regards to the criterion measure of 0.6, and Bartlett's test was at significant level ($\chi2$ = 9.542E3, p < 0.01). Also the 16 items were correlated at minimum scale of 0.3 with one or more other items. Results were in favor of including all the 16 questions in our analysis.

Factor analysis was carried out with the PROC FACTOR procedure, using Promax rotation (power=3) on the "matrix of polychoric correlations" among variables as the input data.

For the Likert type variables, this matrix has been indicated, as item-level factor analyses using matrix of Pearson correlations yielding on at least some factors that are based on item distribution similarity and could cause wrong assumptions (17, 18) . In this situation, factor analysis on the matrix of polychoric inter-item correlations is believed to be the factor analyses of the relations between latent variables which underlie the data (19). Unweighted least square was selected for the extraction method as the SAS support manual suggests polychoric matrix analysis. Factor solutions were examined, using Promax and Oblimin rotations of the factor loading matrix. Two factors were retained by the proportion criterion. The differences between the two methods were ignorable. With regards to eigenvalues, the first factor explained 96% of the variance, and other factors had eigenvalues of less than one. The two factor solution was chosen as a well known structure and in line with the software criterion. Rotated factor pattern giving standardized regression coefficients is shown in table 1. Considering loadings >= 0.5 as the lowest level criterion for factor loadings, for the first factor three items (questions 8, 18 and 83), and for the second factor seven items (questions 7, 16, 35,62,84,87 and 90) were suggested to remain as the definers

Table 1. Factor loadings and communalities of the Promax rotation (rotated factor pattern-standardized regression coefficients) for 16 items from the two dimensions of psychosis in SCL90-R. (N = 2158)

Psychotic symptoms in SCL90-R	Factor 1	Factor 2	Communality
Q#8†.Feeling others are to blame for most of your troubles	.09	.62‡	.35
Q#18.Feeling that most people cannot be trusted	-.11	.79	.47
Q#43.Feeling you are watched or talked about by others	.44	.32	.43
Q#68.Having ideas or beliefs that others do not share	.28	.36	.52
Q#76.Others not giving you proper credit for your achievements	.29	.48	.46
Q#83.Feeling that people will take advantage of you if you let them	.05	.68	.49
Q#7.The idea that someone else can control your thoughts	.53	.09	.48
Q#16.Hearing voices that other people do not hear	.72	-.11	.35
Q#35.Other people being aware of your private thoughts	.65	.04	.51
Q#62.Having thoughts that are not your own	.64	.08	.52
Q#77.Feeling lonely when you are with people	.47	.31	.52
Q#84.Having thoughts about sex that bother you a lot	.51	.18	.42
Q#85.The idea that you should be punished for your sins	.36	.30	.37
Q#87.The idea that something serious is wrong with your body	.62	.08	.45
Q#88.Never feeling close to another person	.46	.28	.46
Q#90.The idea that something is wrong with your mind	.53	.27	.56

† Q#: Number of question according to the SCL90-R questionnaire. ‡ Loadings > .5 are bolded.

Table 2. Statistical characteristics of the two revised psychotic symptoms dimension factor scores (N = 2158)

	No. of items	Mean (SD)	Skewness	Kurtosis
Paranoid ideation	3	3.9(3)	.55	-.56
Psychoticism	7	3 (3.9)	1.9	4.4

and other items (questions 43, 68,76,77,85 and 88) were eliminated as they did not achieve the criterion level on their factor loadings for each of the factors.

We kept the factor labels of the two dimensions in SCL90-R unchanged, as they fitted the extracted factors. With respect to these labels and the previously specified questions, no cross- label switching was seen for any of the questions in these two dimensions. We conducted the same analysis with three sub-samples extracted from this sample (the upper half of th is sample in excel sheet, the lower half of this sample in excel sheet and the mid part of this sample in excel sheet). Although a bit different, the results invariably confirmed the whole model of our primary analysis, consistent with the factor loadings of the primarily extracted items. Rising the power of the Promax rotations, it r evealed more disparity between the loadings of items on each factor, for the better of the first proposed structure.

Internal consistency was tested for the two newly defined dimensions. Cronbach's alphas was 0.7 and 0.74 for paranoid ideation (3 items) and psychoticism dimension (7 items), respectively, which was acceptable comparing the criterion value of 0.7 (18). For each factor, we calculated a composite score out of the means of their loaded items. The scores show the intensity of the symptom dimension. Paranoid ideation showed much higher scores than the other dimension .

The statistics are shown in table 2. There were some degrees of positive skewness and negative kurtosis for paranoid dimension, and high degrees of positive skewness and positive kurtosis for psychoticism

dimension. The histograms proved them as well (Figure 1). There was a correlation of 0.54 between the two composite scores.

In sum, the factor structure suggested by the SCL90-R (1) was partially restated for these two dimensions, and the two revised homogenous factors and the original labels remained unchanged. Six of the sixteen items were omitted. Items 8, 18 and 83 for paranoid ideation dimension and items 7, 16, 35, 62, 84, 87 and 90 for psychoticism dimension remained strong definers of these two conditions.

Discussion

This analysis, though eliminating some of the questions from both dimensions, insisted on the same factor structure as the original questionnaire for the two dimensions of psychotic symptoms in SCL90-R. It is not in agreement with the Rössler et al. study (9) that proposes two new dimensions from the original instrument.

Considering the two study populations, it seems that there are some considerable differences between them. The population of this study mostly belongs to a low socioeconomic class with a different socio-cultural background in an eastern developing nation (the area where this study took place is one of the most densely populated and low socioeconomic regions of the capital) compared to Zurich study.

This study has been conducted on a population with a chronological age diversity (the age range was 52 years), but the six step analysis of Zurich study has been done on a s ame age sample in each step
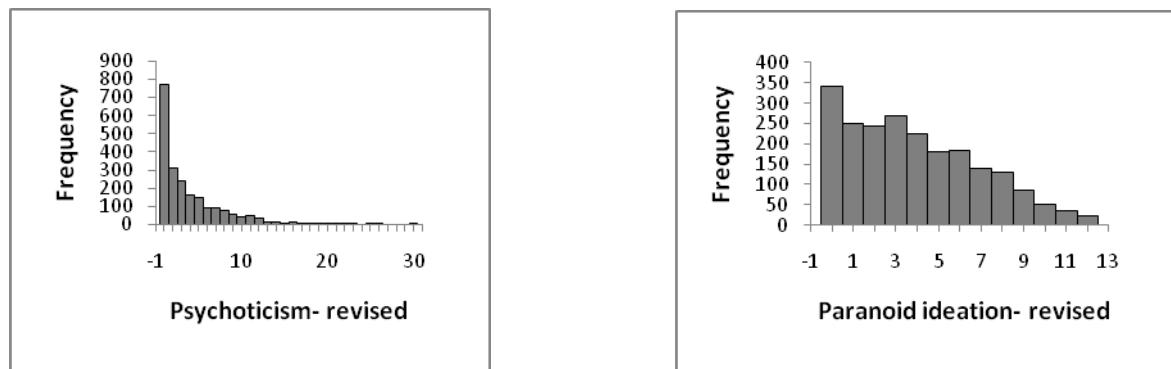
Figure 1. Histograms of the distribution of the composite scores for the two revised psychosis relevant dimensions of SCL90-R.

and at the end, the Zurich study population were enriched with participants at risk of p sychiatric disorders (2/3 of the whole sample) which was not the case for this study population consisting of random community samples. These differences should be considered before starting to interpret the results from the psychopathological viewpoint.

To elaborate on the analyses of the results, the present approach of keeping the first four questions of psychoticism dimension from the original questionnaire on the same factor seems in line with Rössler et al study, though they have defined a new entity of "schizophrenia nuclear symptoms" for this package of four questions.

Also they had retained the six questions of paranoid ideation on the same factor, and so did the present study for questions 8, 18 a nd 83. However, in this study, the other three questions were omitted from the final results as they did not reach the lowest criterion level on their factor loadings.

Comparing the remaining questions with the omitted ones (questions 43, 68 and 76), it seems there is a conceptual difference between them. The retained questions seem to ask for the type of paranoid ideas that are based on social beliefs and cultural attitudes (#18: feeling that most people cannot be trusted), and the other group seems to ask about the paranoid thoughts which are more typical of patients with psychotic disorders (#43: feeling you are watched or talked about by others). As this study sample consists of general population participants, it makes sense to retain just the indicated questions which are focused more on the culturally based paranoid ideas and to eliminate the other three which also could not contribute to any of the two factors.

Of the 10 questions of the psychoticism dimension, 3 were omitted by the present analysis and the rest were retained, with the same label of "psychoticism" for the revised dimension. One of the omitted variables was "The idea that you should be punished for your sins".

The religious culture of the study population may have contributed to such non-different measures of loading for this item on both factors. In fact, this seems to be a widespread religious belief rather than a psychotic-like idea. The other two omitted questions "Feeling lonely when you are with people" and "Never feeling close to another person", have been redefined as paranoid dimension symptoms in Rössler et al. study.

This analysis did not reach the same conclusion to switch them across labels.

Considering the concepts of "loneliness" and " not being close to any one" embedded in them, which seem to show some aspects of paranoia and also considering that neither questions could achieve the lowest criterion level regarding their factor loadings, we did not include them in the psychoticism dimension. The results also showed that the following questions: "having thoughts about sex that bother you a lot", "the idea that something serious is wrong with your body", and "the idea that something is wrong with your mind", should be retained in the psychoticism dimension in addition to the first four core psychotic symptoms questions. It results in a revised psychoticism dimension with seven items. In Rössler and colleagues' study, these questions were eliminated from the final model as they could not be assigned consistently to any of the two factors.

Composite scores did not yield a normal distribution and this was expected as previous research has shown that instruments that dimensionally assess psychotic experiences, typically display a h alf-normal distribution (6, 20). The sample size is good for generalization of the model, but as a self rating instrument, SCL90-R relies on an individual's accuracy in interpreting the questions which is susceptible to denial, minimization and bias mechanisms (21). This raises some concerns about reliability of the reports. In addition, as a cross sectional study, this analysis lacks a longitudinal design which could have allowed a better disentanglement of the underlying factor structure of the two dimensions.

In conclusion, although this study did not reject the idea of two reconstructed psychosis dimensions of the SCL90-R questionnaire proposed by Rössler and colleagues, it questioned them by producing different results through a statistically large population. The study population in a developing setting and the socio-cultural differences arising from it in addition to the demographic differences between the two study samples should be taken into account when considering the difference in the results of this study and that of

Zurich study. Nonetheless, it seems there is more than one structural solution for the two dimensions of psychoticism in SCL90-R.

Acknowledgment

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