

## ORIGINAL PAPER

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## Patterns of psychopathological manifestations among ethnic Chinese living in Brazil

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**Abstract** *Background* Common mental disorders (CMD) are critical issues in community studies. The 12-item version Chinese Health Questionnaire (CHQ-12) has not been sufficiently explored for use in Chinese communities around the world. This paper evaluates CMD among ethnic Chinese living in Brazil, by examining its psychometric properties and factorial structure of CHQ-12. *Method* For 211 community subjects who completed the CHQ-12, we used the ROC curve analysis to calculate its internal consistency and criterion validity, adopting the interview SCAN as criterion. Principal component analysis was performed. *Results* Considerable evidence was found for the internal consistency (Cronbach's  $\alpha$ ) and item-total correlation of CHQ-12. The best cut-off point was 2/3, which allowed calculating criterion validity: 75 % sensitivity, 71 % specificity, 55 % PPV, 86 % NPV, 28 % misclassification rate and area under the ROC curve 0.728 (SE: 0.102, 95 % CI: 0.528–0.927). The 3-dimensional structure of CHQ-12 could be described as somatic, depressive and worrying factor, accounting for 47.8 % of the total variance. *Conclusions* When applied to the Brazilian Chinese community, the CHQ-12 presented comparable psychopathologic pattern, psychometric properties and factorial structure to that of Taiwan.

**Key words** mental health · screening · reliability and validity · Chinese · Brazil

### Introduction

The nature and dimensional structure of common mental disorders (CMD) among culturally diverse community samples has recently attracted much interest of international cross-cultural epidemiology (Jacob et al. 1998; Wernecke et al. 2000). The symptom profile of CMD among community respondents can allow the evaluation of the psychopathological differences between Chinese and Western individuals, a critical issue for research.

Since its introduction in 1970, the General Health Questionnaire (GHQ) has been shown to be a useful screening method aimed to detect non-psychotic mental disorders in general clinical settings (Goldberg and Blackwell 1970). The GHQ has been translated into many languages and regarded as applicable in many countries, with good validity indicators (Goldberg et al. 1997, 1998).

Cheng and Williams (1986) translated and reconstructed the 60-item English version of the GHQ after discriminatory analysis, adapting it to the Chinese culture. Renamed as the Chinese Health Questionnaire (CHQ), its applicability to detect CMD in overseas samples has been reported in Chinese communities of the United Kingdom (Pan and Goldberg 1990) and New Zealand (Cheung and Spears 1993; Abbot et al. 1999). Although Cheng et al. (1990) explored the psychometric properties and factorial structure of CHQ-30, there is no study on its factorial structure or on the concurrent validity of CHQ-12. This paper aims to report the symptomatic pattern of a Chinese community sample of Brazil from the results of CHQ-12, by examining its psychometric properties, factorial structure and concurrent validity.

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## Method

### Subjects

This is a cross-sectional observational study to assess non-psychotic psychopathologies in a Chinese sample living in São Paulo, the most economically important city of Brazil. Community members were approached after Sunday services in a Chinese protestant church and were asked to fill out the questionnaire. Only those with both parents of Chinese ethnicity and aged 15 and over were considered eligible. Incomplete questionnaires were not included in the final analysis.

The final sample had 211 Chinese individuals. The study sample had a mean age of 24.9 (SD 7.39), and included slightly more women (57.7%). The majority was single (79.1%), students (64.5%), Protestants (80.1%), had higher formal education (87.2%), and had been born in Brazil (72%). Fifty-six individuals (26.5%) had emigrated from Taiwan (first generation), about 21.13 years before the study (S.D. 7.75).

### Measures

*The Chinese Health Questionnaire (CHQ-12)* is a 12-item self-reporting instrument for detecting non-psychotic psychiatric morbidity in communities and non-psychiatric settings in the previous two weeks (Cheng and Williams 1986). The original CHQ-12 was translated into Portuguese from Chinese ideogram characters (Chong and Wilkinson 1989) by two bilingual psychiatrists (Y. P. W. and F. I. L.). The final Portuguese version of CHQ-12 was reached after comparison with the Portuguese version of GHQ-12 (Mari and Williams 1984) and discussion among team members. The traditional scoring method [0-0-1-1] was adopted to define caseness.

*The Schedule for Clinical Assessment in Neuropsychiatry (SCAN)*, version 1.0 (World Health Organisation 1992) was applied in the second stage. Seventy subjects (accounting for 1/3 of the whole sample) who first completed the self-report questionnaires were invited (by phone, mail or personally) for a detailed interview. Indeed, a high refusal rate (64%) allowed only 25 SCANS to be obtained. To control possible participation bias, the sociodemographic variables of subjects who took part and those who refused were compared by the means of chi-square or Fisher's test (Eaton et al. 1992; Badawi et al. 1999). Those individuals who refused interview did not differ significantly from those who completed SCAN, in terms of sociodemographic characteristics (sex, age, marital status, migration, education level, religion, etc.). The trained interviewer was blind to the CHQ-12 score, and the interview took place one to four weeks after the screening day. The SCAN Index of Definition (ID) of 3 was fixed as the threshold for caseness.

*The Beck Depression Inventory (BDI)* is a common severity measure of depressive symptoms (Beck et al. 1961). There are good reliability and validity evidences for both the Chinese version (Chan and Tsoi 1984; Yang et al. 1987; Zheng et al. 1988; Shek 1990; Zheng and Lin 1991; Furham and Li 1993) and the Portuguese version (Gorenstein and Andrade 1996; Gorenstein et al. 1995, 1999).

*The State-Trait Anxiety Inventory (STAI)* has been designed to measure both state and trait anxiety (Spielberger et al. 1970). There is good reliability and validity evidence for both the Chinese version (Shek 1993) and the Portuguese version (Gorenstein et al. 1995; Andrade et al. 2001). The STAI-Trait version was employed in this investigation.

*The Life Event Scale (LES)* is adapted from the original Social Readjustment Rating Scale (Holmes and Rahe 1967) to evaluate psychosocial stressors in the last year. Twenty-six life-events can be categorised according to six stress sources: financial problems, family problems, interpersonal difficulties, environment change, job problems and loss of social support.

*The Physical Symptom Scale (PSS)* is adapted from the somatic items of the Diagnostic Interview Schedule – DIS (Robins et al. 1981) and Symptom Checklist – SCL-90-R (Derogatis 1983). The fifty-six most common physical complaints were kept in the full scale.

### Statistical and factor analysis

Cronbach's  $\alpha$  coefficient of internal consistency and item-total correlation were calculated for the CHQ-12. The Receiver Operating Characteristic (ROC) curve was drawn to estimate the area under curve (AUC) and CHQ-12's specificity, sensitivity, positive predictive value (PPV), negative predictive value (NPV), misclassification rate, and best cut-off point against SCAN ID 3.

The factorial structure of CHQ's 12 items was assessed using the principal component analysis. The number of factors retained was determined using Cattell's scree test, followed by varimax orthogonal rotation. The resulting factor scales were checked for internal consistency, using Cronbach's  $\alpha$ . Finally, the correlation between factor scores and BDI, STAI, LES, PSS was computed by Pearson's product-moment coefficient.

## Results

### Psychometric properties of the CHQ-12

Cronbach's  $\alpha$  coefficient for CHQ-12 in the community sample was calculated to be 0.71. The item-total correlation for each item was good and ranged from 0.25 to 0.55 ( $p < 0.05$  and higher).

ROC analysis was performed with the scores of individuals who completed the SCAN interview. The AUC was calculated as 0.728 (SE: 0.102; 95% CI: 0.528–0.927). The best cut-off point for CHQ-12 was 2/3, with 75% sensitivity, 71% specificity, 55% PPV, 86% NPV, and a 28% misclassification rate (Table 1).

### Factorial structure of the CHQ-12 among community respondents

A principal component analysis was first performed on data from the CHQ-12 filled out by community respondents ( $n = 211$ ). To find a simpler structure, the initial solution went through the varimax procedure for better interpretation. Three factors were found to account for

**Table 1** Criterion validity of CHQ-12: sensitivity, specificity, positive predictive value (PPV), Negative Predictive Value (NPV), misclassification rate for different thresholds against SCAN ID 3 standard

Threshold	Sensitivity	Specificity	PPV	NPV	Misclassification rate
0/1	100.0	24.0	38.0	100.0	52.0
1/2	88.0	53.0	47.0	90.0	36.0
2/3	75.0	71.0	55.0	86.0	28.0
3/4	50.0	76.0	50.0	76.0	32.0
4/5	38.0	76.0	43.0	72.0	36.0
5/6	25.0	82.0	40.0	70.0	36.0
6/7	25.0	88.0	50.0	71.0	32.0
7/8	13.0	88.0	33.0	68.0	36.0
8/9	0.0	94.0	0.0	67.0	36.0
9/10	0.0	100.0	100.0	68.0	32.0
10/11	0.0	100.0	100.0	68.0	32.0
11/12	0.0	100.0	100.0	68.0	32.0

47.8% of the total variance. Table 2 shows the factorial structure with all loadings greater than 0.4. To be retained in a factor, one item has to load higher than 0.5. When an item did not reach 0.5, the highest loading in one group was the criterion for retention.

In factor I, clearly all the items evaluated somatic complaints, but interestingly “been taking things hard” (CHQ06) also loaded high in this factor. In factor II, emotional items like feelings of “hopelessness” (CHQ12), “hopeful about the future” (CHQ10) were maintained, but the social functioning item “getting along well with your family or close relatives” (CHQ07) loaded less than 0.5 in this factor (0.412). Finally, items like “worry about family” (CHQ11), “losing confidence” (CHQ08) and “lost sleep over worrying” (CHQ05) loaded high in factor III. These 3 factors explained 17.1%, 16.7% and 14% of the data variance, respectively (Table 2).

It was possible to identify 3 different factors defined as follows: I) somatic symptom factor; II) depression factor; and III) worrying factor. The variance distribution and internal consistency for each factor were checked for their explained variance and Cronbach's  $\alpha$  coefficient (Table 2).

### ■ Concurrent validity of CHQ-12

The concurrent validity was assessed by Pearson's product-moment correlation coefficient between the measures applied simultaneously with CHQ-12. In Table 3, the same contents evaluated by CHQ-12 were highly correlated with BDI ( $p < 0.0005$ ), STAI ( $p < 0.005$ ), LES ( $p < 0.005$ ) and PSS ( $p < 0.005$ ).

**Table 3** Correlation matrix of CHQ-12 factors, BDI, STAI, PSS, and LES

	CHQ-12 Total	Factor I Somatic	Factor II Depression	Factor III Worrying
BDI	0.661***	0.127	0.504***	0.267***
STAI	0.177**	-0.011	0.149*	0.107
PSS	0.201**	0.122	0.167*	0.091
LES	0.233**	0.211**	0.127	0.084

BDI Beck Depression Inventory; STAI State-trait Anxiety Inventory; PSS Physical symptom scale; LES Life-event scale

\*  $p < 0.05$ ; \*\*  $p < 0.005$ ; \*\*\*  $p < 0.0005$

When CHQ-12 was split into its factorial structure, new facets were uncovered from the correlation analysis. The somatic factor (I) strongly correlated with LES ( $p < 0.005$ ), but did not with PSS ( $p > 0.05$ ). The depression factor (II) correlated well with BDI ( $p < 0.0005$ ), STAI ( $p < 0.05$ ), and PSS ( $p < 0.05$ ). Finally, the worrying factor (III) correlated highly with BDI scores ( $p < 0.0005$ ), and did not with STAI ( $p > 0.05$ ). This factor accounts for worrying about family and close friends (CHQ11), loss of confidence (CHQ08) and insomnia over worrying (CHQ05), and might not indicate depressive states.

## Discussion

### ■ Psychometric properties of CHQ-12

Our data indicate that CHQ-12 is a reliable instrument with satisfactory internal consistency in this Chinese community sample. In Taiwan, Cheng et al. (1990) ob-

**Table 2** CHQ-12's 3-factor structure, rotated solution

CHQ-12 Item	Factor I Somatic	Factor II Depression	Factor III Worrying
2. Had palpitations and worried that you might have a heart trouble?	<b>0.718</b>		
4. Been suffering from shaking or numbness of your limbs?	<b>0.620</b>		
3. Had discomfort or a feeling of pressure in your chest?	<b>0.558</b>		0.486
6. Been taking things hard?	<b>0.538</b>		0.430
1. Been suffering from headache or pressure in your head?	<b>0.507</b>	0.483	
12. Been feeling that life is entirely hopeless?		<b>0.707</b>	
10. Been feeling hopeful about your future?		<b>0.677</b>	
9. Been feeling nervous and highstrung?		<b>0.551</b>	
7. Been getting along well with your family or close relatives?		<u>0.412</u>	
11. Been worrying about your family or close relatives?			<b>0.769</b>
8. Been losing confidence in yourself?		0.411	<b>0.574</b>
5. Lost much sleep over worry?			<u>0.431</u>
Percentage of explained variance	17.10%	16.70%	13.98%
Cronbach's $\alpha$ of internal consistency	0.698	0.744	0.720

Boldface: loading  $> 0.50$ , the highest loading on a factor for a given item

Underline: loading  $< 0.50$ , but significantly contributed to the factor

Suppressed: loading  $< 0.40$ , non-significant to the factor

tained a Cronbach's  $\alpha$  coefficient of 0.84 and 0.83, respectively, for community and hospital CHQ-12 samples. Our  $\alpha$  coefficient of 0.71 is slightly lower, but it is acceptable for the values generally found for many screening tests. Typically, the  $\alpha$  coefficient decreases with fewer item versions as the 12-item CHQ. A review of the individual items showed that all of them had significant item-total correlation greater than 0.2, and 2/3 of them greater than 0.3. The data suggest that the Portuguese version of CHQ-12's items are homogeneous and are measuring the same psychological construct.

There have been 19 validity studies of the 12-item GHQ (e.g. Tennant 1977; Banks 1983; Mari and Williams 1985; Bellantuono et al. 1987; Van Hemert et al. 1995; Jacob et al. 1997 and others). The median value for GHQ-12 sensitivity is 78.3% (range 60–96.7%) while the specificity is 82.7% (range 59.9–93%). Thresholds of 1/2 and 2/3 have been suggested as the modal values when the results of all GHQ-12 studies were summarised (Goldberg and Williams 1988; Goldberg et al. 1997). For the CHQ-12, thresholds of 2/3 and 3/4 have been suggested as criterion (Cheng and Williams 1986; Chong and Wilkinson 1989; Pan and Goldberg 1990).

The criterion validity is a critical issue every time an instrument is applied to a new population (Goldberg and Williams 1988). Since all subjects were not interviewed by gold standard SCAN, the sensitivity and specificity indicators of CHQ-12 should be viewed only as an estimate of criterion validity. Indeed, our estimate of criterion validity for CHQ-12 in this Chinese community is comparable with those reported in the international studies of GHQ-12 and CHQ-12. It also suggests that the threshold of 2/3 is more efficient for screenings. The 1/2 threshold had lower specificity and a higher false positive rate. When 3/4 cut-off point was adopted, the CHQ-12 became less sensitive but slightly more specific. The 2/3 threshold is recommended for obtaining samples of Chinese respondents with a high likelihood of being cases. In addition to CHQ-12's test characteristics, diagnostic criteria and features of the sample (like morbidity prevalence, culture, setting etc.) may affect the threshold and criterion validity indicators (Goldberg et al. 1997, 1998). In our study, the cut-off 2/3 is like that of Taiwan, but we employed SCAN ID 3 as a standard criterion and our smaller sample contains individuals from a specific Chinese immigrant community in Brazil. These differences may explain the variation observed in our validity criterion.

### ■ Structural dimensions of CHQ-12

In the only previous factor analysis of the CHQ, Cheng et al. (1990) explored the 30-item version (CHQ-30) on both hospital and community samples and found four factors: somatic symptoms (I), anxiety and worrying (II), social dysfunction (III) and depression/poor family relationship (IV). Using a similar technique, the principal component analysis with varimax rotation and Cat-

tell's scree test, we could extract three factors in CHQ-12, where many similarities could be traced by comparing our results with those of CHQ-30, at the dimension and item levels.

First, the social dysfunction factor was absent in our study, because the items on this topic were withdrawn in the shorter CHQ-12. Intuitively, shorter versions generally reveal fewer factors since factors with higher percentage of variance would take on other components. Interestingly, the only social dysfunction item (CHQ07) loaded highly in the depression factor (II). This pattern confirms the same findings of CHQ-30, suggesting the association between depression and poor family relationship among Chinese individuals (Cheng et al. 1989, 1990).

In the Western factor analysis of GHQ-12, most studies reported components like general dysphoria, social dysfunction, anxiety, and depression factors (Goldberg and Williams 1988; Wernecke et al. 2000). Factors extracted from different item pools or in different populations with the same items are likely to be relatively different (Goldberg and Williams 1988), and are sometimes difficult to compare (Wernecke et al. 2000). Similar to CHQ-30, a strong somatic component was observed for CHQ-12. Since many somatic items were added during the development of CHQ to convey the Chinese style of expressing illness (Cheng 1986), a somatic factor (I) was observed in our analysis (25.17% of variance, non-rotated solution). Although GHQ-12 also contains somatic items, no factor analytic study had reported somatic dimension across many culturally diverse samples (Wernecke et al. 2000). Once the modified CHQ-12 employs different pool of questions, highly focused on somatic complaints, this might lead to different dimensional structure in this instrument.

The depression factor (II) contains items of depression (CHQ12, CHQ08 and CHQ10), anxiety (CHQ09), family relationship (CHQ07) and somatic symptoms (CHQ01). Except for CHQ09 and -01, the items in our CHQ-12 sample were identical to those in the CHQ-30. Indeed, according to our data, CHQ01, 07 and 08 loaded lower than 0.5. The high correlation between the depression factor and BDI was expected, but the correlation with STAI deserves further analysis. In a recent factor analysis, Andrade et al. (2001) argued that STAI actually evaluates depressive cognition and negative affectivity. The PSS was uncorrelated with the somatic factor (I), but was substantially correlated with the depression factor. Therefore, PSS might be evaluating somatic manifestations of depressive states, but a different aspect of those physical complaints related to somatic factor.

Although one may argue that a core depressive symptom could be found across different cultures (Murphy et al. 1964), this item combination displays the undifferentiated symptom presentation of the depressive phenomenon among Chinese individuals. One explanation is that Chinese people would report depressive symptoms differently from their Western counterparts (Kleinman 1982) or the diagnostic style of Chinese psychiatrists

may favour the label of neurasthenia over depression (Tseng et al. 1986; Zheng et al. 1997).

The last factor (III) was composed by items on worrying about family and friends (CHQ11), loss of confidence (CHQ08), insomnia over worrying [05], physical complaints (CHQ03) and “been taking things hard” (CHQ06). The items of the worrying factor seem to display a unique Chinese psychopathological manifestation, viewed by some as the idiomatic expression of emotional distress, known as *fan nao*. This Chinese phrase describes an emotional state in which the individual is concerned most of time by some worrying issue, overloaded and tortured by repetitive negative thoughts and losing the sleep is a common outcome.

Worrying is a prominent but non-specific feature in anxiety disorders and in depression (Brown 1997; Dugas et al. 1997; Abramowitz and Foa 1998). On other hand, worrying is one of the most frequent symptoms among Chinese neurotics (Cooper and Sartorius 1996), but much less reported among Western individuals (Vázquez-Barquero et al. 1988; Jenkins et al. 1997; Jacob et al. 1998). In the CHQ-12, the neurotic preoccupation accounts for the worrying factor. In the Chinese culture, chronic worrying and apprehension are the core symptomatic features of *fan nao*, a Chinese way to express psychological distress. Some Chinese psychiatrists view *fan nao* as part of a full neurasthenic syndrome as a general indicator of distress (Lee 1996, 1997).

There are still many controversies about the factorial structure of GHQ-12 across cultures (Wernecke et al. 2000). However, it has been suggested that what is known as CMD does not consist of a single dimension, but is composed of rather different psychopathological dimensions like anxiety, depression and somatisation (Goldberg 1996). The overlap of some CHQ-12 items with depressive, somatic and worrying components seems to support the undifferentiated nature of CMD. While our factor I was loaded by items mostly related to somatic symptoms, factor II retained depressive feelings and factor III preoccupation items. Larger sample community studies with emic tools are needed to clarify this issue and to enable comparisons.

Furthermore, it is important to bear in mind that factor analysis is a technique of data reduction. It identifies which symptoms in a group are highly intercorrelated, indicating that they frequently co-occur in the same individual. This is a description of its co-occurrence, but this relationship should be further clarified through the investigation of their conceptual, clinical, diagnostic, and biological meanings among Chinese individuals. An independent replication of this three-factor solution would be advisable to establish the dimensional stability of CHQ-12.

### ■ Concurrent validity of CHQ-12

The full CHQ-12 was found to correlate significantly with all other measures of psychopathology (BDI, STAI,

LES, and PSS). Focusing on CHQ-12 factor's concurrent validity, the results indicated that the factor scores were partially correlated to each measure applied. Factor I (somatic symptoms) was found to correlate most highly with measures of life-event (LES), and factor III (worrying) correlated well with measures of depression (BDI). In addition, factor II (depression) correlated significantly with measures of depression (BDI), anxiety (STAI) and physical symptoms (PSS). This correlation pattern between CHQ factors and clinical scores reflects that its underlying dimensions are sensitive to different measures of psychopathology, although the strengths of association between these dimensions and criterion measures varied somewhat across factors.

The tendency for somatisation among Asian individuals is a striking finding of CHQ-12's construct that has already generated many debates. Leff (1988) suggested that in most cultures, psychological distress is normally expressed through somatoform complaints and that the psychological mode of expressing distress is predominantly a recent Western phenomenon. In addition, Kleinman (1982) described a consecutive series of 100 Chinese neurasthenics in Hunan, China, who complained of somatic symptoms over the psychological ones. This author equalled Chinese neurasthenia to a somatised form of depression. Recently, Simons et al. (1999) did not confirm this tendency among Asians in his cross-cultural comparison of the data from World Health Organisation study in primary care settings (Sartorius et al. 1993), which was based on an *etic* instrument GHQ-12. One explanation may be the instrument bias provoked by cultural differences. Our results rely on a culturally-specific questionnaire (CHQ-12) and support the view of Asian individuals' tendency to “soma-tise” emotional distress into physical complaints rather than “psychologise” in depression or anxiety (Hsu and Folstein 1997). In our sample, LES correlated significantly with PSS ( $r = 0.136$ ;  $p < 0.05$ ), and the somatic factor ( $r = 0.211$ ;  $p < 0.005$ ). Since item CHQ06 (“been taking things hard”) also loaded on the somatic factor (I), this somatic dimension seems to correspond to symptomatic manifestations of Chinese individuals facing pressure or psychosocial stressors. These data are in full agreement with those found in a nationwide study in mainland China (Zheng and Lin 1994), which documented a similar correlation pattern between psychosocial stressors and somatic symptoms ( $r = 0.244$ ;  $p < 0.01$ ).

### Conclusion

The Chinese population is the largest one on the planet and studies on their mental health are seen as an important topic for research. The CHQ-12 is a rare example of the few emic tools for psychiatric morbidity screening in Chinese settings, and it has never been validated for use in Chinese communities in Brazil. This is the first study of dimensional and concurrent validity of 12-item CHQ.

The main findings in our study indicate that CHQ-12 showed a good estimate of reliability, criterion validity, concurrent validity and structural validity. Therefore, this questionnaire can be considered a culturally sensitive tool for the detection of psychiatric morbidity among Chinese individuals.

The small size of the sample limits the generalisation of its results. Due to sample recruiting bias (only in a protestant church), results should not be extended to the whole Chinese community or to Chinese patients in clinical settings. Another major limitation of this study is that all respondents were not evaluated by gold standard SCAN, which impairs the validity of our findings.

Finally, this study documents a pattern of psychopathological manifestations among ethnic Chinese living in Brazil by means of psychometric and validity aspects of CHQ-12 and favours its application in other Chinese populations around the world. More studies should be encouraged to demonstrate the dimensional differences of common mental disorders across cultures.

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