

BRIEF ALCOHOLISM SCREENING QUESTIONNAIRE: ESTABLISHMENT AND VALIDITY IN TAIWANESE

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Background and Purpose: There has been a marked increase in the prevalence of alcoholism in the Taiwanese population over the past 6 decades. This study was designed to establish a Taiwanese Brief Alcoholism Screening Questionnaire (BASQ) for use in early detection in medical and public health settings.

Methods: Interview data were collected from the database of the Taiwan Psychiatric Epidemiological Project (TPEP). The TPEP interviews had been conducted using the Chinese-modified version of the Diagnostic Interview Schedule (DIS-CM) that included a section on alcoholism diagnosis. Data collected from a community sample of 13,373 subjects was used in this study. Twenty nine DIS-CM items for alcoholism diagnosis were entered into an analytic model with 7 statistical filters to identify cross-cultural items. A brief alcoholism screening questionnaire was constructed using these selected items. The validity of the questionnaire was tested in subjects (n = 457) recruited from a local medical center, a hospital clinic, and a psychiatric clinic for the treatment of alcoholism.

Results: Four cross-cultural items were identified and the BASQ was constructed. This BASQ had a best cut-off point of 3 with adequate sensitivity (0.86 to 0.88), specificity (0.88 to 0.89), and positive prediction rate (0.90 to 0.91). It detected a varying prevalence of alcoholism (10.1 to 90.3%) in diverse clinical settings.

Conclusions: A 4-item BASQ was established with adequate validity for clinical and public health application in the early detection of alcoholism in Taiwanese subjects.

Key words: Alcoholism, Cultural characteristics; Questionnaires, Reproducibility of results; Sensitivity and specificity

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The Taiwan Psychiatric Epidemiological Project (TPEP)^{1,2} revealed a marked increase in the prevalence of alcoholism in the Taiwanese population during the past 6 decades. Patients in general medical settings also showed a high prevalence of alcoholism.³ Alcoholism induces a wide range of personal, family, social, and medical problems, such as job difficulties, car accidents, arrests, family violence, and liver disease. The social cost of alcoholism is immense. It is thus important to develop an alcoholism screening schedule suitable for use in the Taiwanese population to detect potential cases of alcoholism for early intervention. CAGE⁴ is a simple alcoholism screening test, composed of 4 screening items, which was developed for use in a Caucasian population of alcoholism patients, not in community samples. Thus, CAGE might not be appropriate for use in early detection of alcoholism in public health and primary care settings or for use in Taiwanese subjects.

In the TPEP, alcoholism and other psychiatric disorders were identified using a Chinese language

version of the Diagnostic Interview Schedule (DIS-CM).^{5,6} The DIS section of alcoholism for case identification was found to be valid in the broader Taiwanese population as well as in the Taiwan aboriginal population.^{2,7} The 29 symptom criteria used in the alcoholism section of the DIS-CM were adopted from the Diagnostic and Statistical Manual, third edition (DSM-III).⁸ The database of the TPEP included subjects of different ethnicities, such as the broader Taiwanese population and aborigines, and samples with different demographic characteristics, such as residents of urban or rural areas or those with elementary versus high school education.

In order to develop a brief alcoholism screening test that can be applied to populations with different sociocultural backgrounds, the 29 DIS items were tested using a cross-cultural model⁹ with 7 psychometric statistical filters (EM7SF). Only those items that are applicable across the various samples of the TPEP were used to construct the Taiwan version

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of the Brief Alcoholism Screening Questionnaire (BASQ). Its psychometric properties were then assessed using the original TPEP database. The sensitivity and specificity of the newly developed BASQ and the CAGE screening tools were tested using different groups of clinical subjects.

Methods

Alcoholism symptom items

The highly structured DIS¹⁰ has been used in worldwide population studies.¹¹ In Taiwan, the DIS section of alcoholism, composed of 29 criterion items with various prevalence rates in the community samples, was applied in different sociocultural groups, including aborigines and the broader Taiwanese population, for case identification of non-alcoholism, alcohol abuse and alcohol dependency.^{1,2} Thirty one percent (9) of these 29 DIS true/false items concerned pathological alcohol consumption, 20% (6 items) psychosocial detriment, 20% (6 items) psychical dependency, 17% (5 items) somatic disorders and 10% (3 items) physical dependency.

Samples

The sample (n = 13,374) of the TPEP database^{1,2} had 8 subsamples, categorized as metropolitan city (n = 5001), towns (n = 3001), villages (n = 2981), Atayal-Taiwan (n = 815), Atayal-Wulai (n = 438), Atayal-Fushin (n = 442), Paiwan (n = 595) and Yami (n = 100). The Atayal-Wulai and Atayal-Fushin samples were recruited independently from the Atayal-Taiwan sample, the latter including Atayals from counties other than Wulai and Fushin originally recruited in an independent study.² Detailed information about the samples used in this study can be obtained from our previous reports.^{1,2} To evaluate clinical applicability of the BASQ as well as the CAGE, subjects who had signed informed consent forms were recruited from a clinic of the department of family medicine of a medical center, a clinic of a local hospital, and an alcoholism clinic of a psychiatric center.

Standards of the clinical diagnoses

In the TPEP study,^{1,2} the diagnoses of alcohol abuse and alcohol dependency were established following the diagnostic criteria of DSM-III.⁸ Diagnoses in the new sample used to study the validity of the BASQ were made using an interview schedule for psychopathological study of alcoholism.¹² The interview schedule for psychopathological study of alcoholism was found to have adequate procedure validity against the diagnosis of a psychiatrist.¹² A well-trained interviewer who was unaware of the

results of the BASQ performed the interview. The reference criteria for the diagnosis of alcoholism in the validity study were those of the Diagnostic and Statistical Manual, 4th edition (DSM-IV)¹³ and the International Classification of Disease, 10th edition (ICD-10).¹⁴

Design of the cross-cultural model

The cross-cultural model⁹ with 7 statistical filters (EM7SF) was designed following the assumption that a high degree of similarity in the psychometric properties of the symptom item across samples of different socio-cultural backgrounds was essential for an item to be considered culture-free, i.e. an etic item. The statistical filter of the EM7SF was used as the criterion to identify items with a high specificity by restricting the impact of false-positive cross-cultural items obtained in factor analysis. The design of the EM7SF also confers the same importance to all of the 29 DIS items and their respective etic or cross-cultural properties. A cross-cultural DIS item must fulfill all of the following 7 filters^{15,16}: 1) in factors using exploratory factor analysis, the item has an eigen value ≥ 1 ; 2) the item has a positive factor loading ≥ 0.50 or a negative factor loading ≤ -0.50 ; 3) under the criterion of 2), if the specific item loads ≥ 0.50 positively in some factors, it must show negative loadings or positive factor loadings ≤ 0.50 in the rest of the factors, or, if the specific item loads ≤ -0.50 negatively in some factors, it must show a positive loading or negative loadings > -0.50 in the rest of the factors; 4) the item exhibits consistent results of filters 1), 2), and 3) in at least 2 of the 4 factorial algorithms used in this analysis, including principal component, principal axis factoring, maximum likelihood, and alpha factoring analyses; 5) the item exhibits consistent results of filters 1), 2), and 3) in at least 3 of the 5 rotations, including varimax, quartimax, equamax, direct oblimin, and non-rotation of the factorial matrix, used within the same algorithm; 6) the item has loading consistency in a specifically assigned factor reached by at least 2 of these 4 factorial algorithms and at least 3 of these 4 rotations used in the same algorithm; and 7) the item has loading consistency, meeting filters 2) through 6), in all 8 Taiwanese subsamples.

The EM7SF (etic model of 7 statistical filters) used to select cross-cultural items in this study employs a heuristic, novel approach. The results of the items obtained using this heuristic statistical model were then tested for applicability in a post hoc manner in the original TPEP sample, by examining the percentage of correct classification and validity indicators using an appropriate cut-off point of the sum of these culture-free items.

Design of the Brief Alcoholism Screening Questionnaire

The DIS etic items extracted by the EM7SF were organized into the BASQ. Each item was rewritten as a self-answer questionnaire form using plain language to be used by persons who had at least a secondary education level. The validity and applicability of this newly developed BASQ were empirically evaluated in a sample recruited from different clinical patient populations.

Statistical procedures

The prevalence of each symptom item was analyzed in Taiwanese and aboriginal samples. In order to empirically evaluate the fitness of the EM7SF to select items from the 29 DIS items that showed the described culture-free profile, these 2 samples were analyzed using algorithms which anchored the respective databases to the Statistical Package for the Social Sciences (SPSS) for Windows.¹⁷ Because the answers to the 29 DIS items were dichotomous, the data were transformed into tetrachorical coefficients¹⁸ using SPSS for UNIX.

The psychometric profile of the novel screening instrument composed of these extracted culture-free DIS items was evaluated using data collected from the database of the TPEP sample. To fulfill the cross-cultural methodological requirements,⁹ several psychometric validity criteria were examined. The criterion-related validity was established using Cramer's coefficient.^{16,19} The tetrachorical¹⁸ item structure was determined using factor analysis as a confirmatory procedure^{9,20} to examine the construct validity. Sample-half validation was used to examine the rate of correct classification of case identification. The diagnostic cut-off points of the novel screening questionnaire were composed of those extracted cross-cultural items that were first estimated using chi-squared test,^{16,19} and then by implementing the discriminant analysis.²¹ The reliability of the measurements was established by using internal consistency and split-half techniques.²² The rates of classification errors were examined using sensitivity, specificity, and positive prediction rate under the assigned cut-off points. These were examined²³ against the diagnosis

based on DSM-III criteria used in the TPEP study. To evaluate the results obtained, a meta-analysis across 8 TPEP subsamples was implemented.²⁴ Accordingly, the validity or reliability coefficients were squared²⁴ and then submitted to the chi-squared test to evaluate percentage frequencies.

In the empirical study of the BASQ using a newly recruited clinical sample, the test-retest reliability of the BASQ was evaluated using kappa coefficient,²⁵ and the cut-off points of case identification were evaluated using the criteria of maximal Yuden index estimated by the statistics implicit in the Receiver Operation Characteristics (ROC).²⁶ Sensitivity, specificity and positive prediction rate were evaluated based on the diagnosis of alcoholism according to DSM-IV and ICD-10 criteria.^{13,14}

Results

The profiles of prevalence of the 29 symptom criteria items were different between the Taiwanese and aboriginal samples. Except for the item of "Family objects to your drinking" (24.9% in Taiwanese *vs* 12.9% in aboriginal samples), all other criteria items had significantly higher prevalence in the aboriginal sample than in the Taiwanese sample. The 6 items with highest prevalence in the Taiwanese samples were: "Family objects to your drinking" (24.9%), "Someone said you were drinking too much for your own good" (11.5%), "Ever drank a fifth of liquor?" (5.4%), "Have you ever thought of drinking excessively?" (4.8%), "Wanted to stop drinking but couldn't?" (2.6%), and "Promise yourself not to drink during special times/occasions" (2.4%). In the aboriginal sample, the 6 items with highest prevalence were: "Someone said you were drinking too much for your own good" (26.4%), "Wanted to stop drinking but couldn't?" (25.9%), "Ever drank a fifth of liquor?" (23.8%), "Have you ever had blackouts?" (22.8%), "Promise yourself not to drink during special times/occasions" (21.6%), and "Gastrointestinal problems" (15.9%).

Table 1 shows the factor loadings of the 4 selected cross-cultural items in the total sample and the 8

Table 1. Factor loadings of 4 selected cross-cultural items in the total sample and 8 subsamples.*

Selected item	Total sample	Metropolitan city	Town	Village	Fushin-Atayal	Wulai-Atayal	Taiwan-Atayal	Paiwan	Yami
1. Has your family ever objected to your drinking?	0.92	0.93	0.92	0.94	0.77	0.77	0.91	0.83	0.98
2. Have you ever thought of drinking excessively?	0.79	0.73	0.76	0.83	0.58	0.75	0.60	0.68	0.12*
3. Have you ever had blackouts?	0.61	0.57	0.63	0.52	0.86	0.48*	0.47	0.58	0.81
4. Have you ever wanted to stop drinking but couldn't?	0.74	0.45*	0.61	0.63	0.86	0.89	0.84	0.83	0.91

* Items with factor loading below 0.50 in some study samples.

Table 2. Component items and kappa values of test-retest reliability of the Brief Alcoholism Screening Questionnaire.

Component item	Yes	No	Kappa value
1. Has your family ever objected to your drinking?	<input type="checkbox"/>	<input type="checkbox"/>	0.89
2. Have you ever thought of drinking excessively yourself?	<input type="checkbox"/>	<input type="checkbox"/>	1.00
3. Have you ever had blackouts?	<input type="checkbox"/>	<input type="checkbox"/>	0.89
4. Have you ever wanted to stop drinking but couldn't?	<input type="checkbox"/>	<input type="checkbox"/>	0.79

subsamples using the statistical filters of the EM7SF designed in this study. The factor loadings of all 4 of these items were > 0.50 in the total sample. With some exceptions, all of these 4 items had factor loadings > 0.50 in all subsamples as required in this study design.

Table 2 shows the 4 cross-cultural items derived from the 29 DIS items under the EM7SF model across 8 different sample groups of the original TPEP sample. These 4 DIS items were rewritten as a self-administered questionnaire form to construct the Brief Alcoholism Screening Questionnaire (BASQ). The underlying diagnostic structure of the BASQ is dual, as the first 3 items are concerned with the psychopathological domain of pathological drinking, and the fourth item is a psychic dependency symptom. This BASQ was subjected to test-retest reliability study. The resulting kappa coefficients of 0.79 to 1.00 were very high (Table 2).

Table 3 shows the psychometric validity profiles of the BASQ composed of the 4 cross-cultural items. It demonstrates that the proposed BASQ is a valid and

reliable test. The Cramer's coefficients ranged from 0.50 to 0.63. The explained variance of the single factor solution varied from 33.0 to 49.3%. The sample-half validation showed 100% correct classification of the alcohol dependence. The correct classification of cases into alcohol abuse and non-alcoholism ranged from 86.7 to 100% and 96.9 to 100%, respectively. The total percentage of correct classification varied between 93.7 and 99.9%. The internal consistency ranged from 0.49 to 0.69. The sensitivity, specificity, and positive prediction rate varied from 64.4 to 95.6%, 81.5 to 98.7%, and 40.0 to 87.6%, respectively, across different subsamples. The best cut-off point was 3 using discriminant analysis and chi-squared test in the TPEP sample. Meta-analysis showed that only 1 of the 13 psychometric properties, the positive predictive rate, was significantly different among the 8 subgroups (χ^2 , 14.07; degrees of freedom, 7; $p < 0.05$). This is due to the significantly lower rate of positive prediction in the Yami sample.

The BASQ was tested in a newly recruited study sample of 457 male subjects from different clinical patient populations. Of these, 258 cases (56.5%) were from a clinic of the department of family medicine of a medical center (SMC); 127 cases (27.8%) were from a clinic of a local hospital (SLC); and 72 (15.8%) were from an alcoholism clinic of a psychiatric center (SAC).

Sixty seven percent (306 cases) of the 457 subjects of the sample were married, 24.3% (111 cases) were single, 5.9% (27 cases) were divorced, 2.0% (9 cases) separated, and 0.9% (4 cases) were widowed. The age of the subjects varied from 15 to 60 years, with a mean

Table 3. Validity indicators of the Brief Alcoholism Screening Questionnaire among 8 study subsamples.

Validity indicators	Metropolitan city (n = 5001)	Town (n = 3001)	Village (n = 2981)	Fushin-Atayal (n = 442)	Wulai-Atayal (n = 438)	Taiwan-Atayal (n = 815)	Paiwan (n = 595)	Yami (n = 100)	χ^2
Concurrent criterion-related validity									
1. Cramer's coefficient	0.58	0.62	0.51	0.63	0.59	0.57	0.56	0.50	6.2
Construct validity									
2. Number of items with loading ≥ 5000	4	4	4	4	4	4	4	4	
3. Number of factors	1	1	1	1	1	1	1	1	
4. Explained variance (%)	33.0	40.7	36.0	49.1	51.3	48.9	49.3	39.2	7.9
Sample-half validation									
5. Number of discriminant items	4	4	4	4	4	4	4	2	0.93
6. Correct classification									
Non-alcoholics (%)	99.8	99.8	99.9	100.0	100.0	97.3	96.9	98.9	0.11
Alcohol abuse (%)	95.7	96.6	100.0	86.7	88.1	98.8	94.6	100.0	1.9
Alcohol dependence (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	0.0
Reliability									
7. Internal Consistency (α values)	0.49	0.63	0.55	0.66	0.69	0.68	0.67	0.54	14.3
Rates of classification errors									
8. Sensitivity	0.72	0.77	0.64	0.92	0.90	0.92	0.966	0.75	11.3
9. Specificity	0.98	0.98	0.98	0.82	0.84	0.89	0.89	0.90	3.3
10. Positive prediction rate (%)	70.4	81.2	75.6	86.3	87.6	70.6	68.9	40.0	21.7*

* $p \leq 0.05$.

Table 4. Case distribution [n (%)] by test score of the Brief Alcoholism Screening Questionnaire in 3 study samples — subjects from the family medicine department of a medical center (SMC), a local hospital clinic (SLC), and the alcoholism unit of a psychiatric center (SAC).

Test score	SMC (n = 258)	SLC (n = 127)	SAC (n = 72)	Total (n = 457)
0	151 (58.5)	64 (50.4)	2 (2.8)	217 (47.5)
1	43 (16.7)	30 (23.6)	2 (2.8)	75 (16.4)
2	38 (14.7)	14 (11.0)	3 (4.2)	55 (12.0)
3	16 (6.2)	12 (9.4)	16 (22.2)	44 (9.6)
4	10 (3.9)	7 (5.5)	49 (68.1)	66 (14.4)

Table 5. Sensitivity, specificity, false positive rate, positive prediction rate, and Yuden index obtained by analysis of receiver operation characteristics of the Brief Alcoholism Screening Questionnaire based on ICD-10 and DSM-IV criteria for diagnosis of alcoholism.

Cut-off point	Sensitivity		Specificity		False-positive rate		Positive prediction rate		Yuden index	
	ICD-10	DSM-IV	ICD-10	DSM-IV	ICD-10	DSM-IV	ICD-10	DSM-IV	ICD-10	DSM-IV
1	0.96	0.97	0.41	0.42	0.59	0.57	0.66	0.69	0.37	0.37
2	0.94	0.94	0.64	0.67	0.36	0.33	0.76	0.79	0.58	0.60
3	0.88	0.86	0.88	0.89	0.12	0.11	0.90	0.91	0.77*	0.76*
4	0.64	0.63	0.99	1.00	0.01	0.00	0.98	1.00	0.63	0.63

* The highest Yuden index for detecting the best cut-off point at 3.

ICD-10 = International Classification of Disease, 10th edition; DSM-IV = Diagnostic and Statistical Manual, fourth edition.

age of 42.0 years and a standard deviation of 10.7 years. 197 subjects (43.1%) were in the age range of 31 to 45 years, 190 (41.6%) were aged from 46 to 60 years, and 70 (15.3%) were aged between 15 and 30 years. Thirty five percent (160 cases) of subjects in this sample had finished senior high school, 29.3% (134 cases) had only secondary education, and 35.7% (163 cases) had an educational level higher than senior high school. 388 subjects (78.3%) had a full time job, 72 subjects (15.8%) had a part-time job, and 27 subjects (5.9%) were unemployed.

Table 4 shows the case distribution of each BASQ score among 3 subsamples. Subjects from the SAC had higher BASQ scores. Twenty two percent of the 72 subjects from the SAC had a score of 3, while 68.1% had a score of 4. In comparison, of the 258 subjects from the SMC, only 6.2% and 3.9% had a BASQ score of 3 and 4, respectively. Among the 127 subjects of the SLC, 9.4% had a BASQ score of 3 and 5.5% had a score of 4.

As shown in Table 5, the best cut-off point of the BASQ was at 3, as demonstrated by the highest Yuden index of 0.77 and 0.76 using ICD-10 and DSM-IV criteria, respectively, for the diagnosis of alcoholism. In this study, an ICD-10 diagnosis of harmful use of alcohol was made in only one case, and alcohol dependence was diagnosed in all other cases. Using the ICD-10 and DSM-IV criteria, respectively, as the diagnostic reference for alcoholism, the BASQ showed adequate sensitivity (0.96 and 0.97), specificity (0.88 and 0.89) and positive predictive value (0.90 and 0.91). Using the cut-off point of 3 (Table 5), the prevalence of alcoholism in subjects from the SMC, SLC, and SAC was 10.1%, 15.0%, and 90.3%, respectively. The CAGE was also shown to have a best

cut-off point of 3. The CAGE exhibited a sensitivity, specificity, and positive prediction rate of 0.95, 0.71, and 0.51, respectively, using the ICD-10 diagnostic criteria, and 0.92, 0.72, and 0.56, respectively, using the DSM-IV diagnostic criteria.

Discussion

This study used a 2-step process to establish a brief BASQ based on the community epidemiological data obtained using the alcoholism section of the Chinese modified version of Diagnostic Interview Schedule or DIS-CM.^{5,6,10} Data on alcoholism used in this study had been collected based on 29 symptom items derived from the DSM-IV criteria.⁸ In the first step of this process, appropriate etic items were extracted across the subsamples, and the psychometric validity profile of the questionnaire was examined in the original community samples. The second step was to find the appropriate cut-off point and to test the validity of this newly developed screening questionnaire in samples from various medical settings. This is the first report of development of an alcoholism screening questionnaire based on this set of diagnostic criteria.

A major goal in developing this alcoholism screening questionnaire was to achieve a high specificity with sufficient sensitivity in a cross-cultural sense. The TPEP study population had a relatively heterogeneous sociocultural background. It was assumed that emphasis on cross-cultural methodological rigor, by use of the etic model,⁹ would facilitate development of a screening test with greater cross-cultural or etic validity as demonstrated in this study.

This EM7SF fulfilled the required cross-cultural criteria implicit in the cross-cultural comparison.⁹ The design of the filter structure of the EM7SF prevented the inclusion of false-positive etic items. From the 29 DIS-CM items, 4 cultural-free items (Table 1) were extracted by the EM7SF. These 4 items were used in the questionnaire to cover cross-cultural aspects of the diagnosis of alcoholism that are specific to Taiwanese. The psychometric characteristics of the screening questionnaire including these 4 cross-cultural items were demonstrated to be very satisfactory (Table 2) for every subgroup of the original sample of the TPEP database. Also, results obtained using a method reported in a previous meta-analysis²⁴ showed minimal fluctuation of the psychometric profiles of this proposed screening instrument, the BASQ, among the 8 subsamples (Table 3). This could be due to the advantage of the EM7SF in selecting items with consistency within each subsample as well as among the 8 subsamples.

The low positive prediction rate in the Yami sample (40.0%) could be due to the exceptionally low factor loading (0.122) of the criterion item: "Have you ever thought of drinking excessively?". Even though the sensitivity (0.75) and specificity (0.90) of the BASQ in the Yami sample were satisfactory, application of the BASQ in this specific sample deserves further study in the future. The Yami people may have a high cultural tendency to avoid acknowledgment of excessive drinking as a problem, and this culturally determined phenomenon may reduce the positive prediction rate of the BASQ in the Yami people. All other subsamples had satisfactory rates of positive prediction (68.9 to 87.6%). This 4-item alcoholism screening questionnaire thus had cross-cultural value in screening alcoholism cases in general.

The validity study of this BASQ was carried out using a sample of male subjects recruited from hospital settings. The results demonstrated that the BASQ can be used in a general medical setting for detecting male cases of alcoholism in the patient population. However, there were several limitations of this study design, such as not including females and aborigine subjects in the study samples. Also, adolescents and elderly people were not included. Further study of the BASQ in female subjects and in community samples including aborigine, elderly, and adolescent populations are needed to show the applicability of this tool in the general population.

The CAGE⁴ was originally developed for use in Caucasian alcoholism patient samples but has been widely used in different populations. The 4 CAGE questionnaire items were: "Have you ever felt you could not cut down on your drinking?", "Have people annoyed you by criticizing your drinking?", "Have you

ever felt bad or guilty about your drinking?", and "Have you ever needed a drink first thing in the morning to steady your nerves or get rid of a hang-over (eye-opener)?"²⁷

The wording of the CAGE items carries strong negative connotations, such as "people annoyed you by criticizing your drinking" and "felt guilty about your drinking". Also, "eye-opener" is suggestive of physical dependence representing a severe state of alcoholism. These reasons may render it inappropriate for use in a general medical setting for alcoholism screening. Kuo et al²⁸ also recognized the problem of wording connotation of the original CAGE, and developed a Chinese language version of the CAGE (CAGE-C). The CAGE-C also had only moderate sensitivity (84.6%) and specificity (63.2%).²⁸

In this study, using the best cut-off point of 3, the validity indicators of the CAGE-C were still inferior to the newly developed BASQ (Table 5) based on the 29 criterion items of the DIS-CM database. This supports the usefulness of the BASQ, and also supports the approach in implementing the cross-cultural methodology for developing screening questionnaires.

Even with some potential limitations, the BASQ could be applied in populations with various socio-cultural backgrounds in Taiwan and was easily answered by the examinees using yes/no responses to the 4 questionnaire items. This BASQ was demonstrated to have satisfactory test-retest reliability (Table 2) and to have a best cut-off point of 3. The clinical applicability of the BASQ was also shown by its differential detection of the prevalence of alcoholism in diverse clinical patient populations: 90.3% in the SAC, 14.9% in the SLC, and 10.1% in the SMC (Table 4). By using either ICD-10 or DSM-IV criteria for defining alcoholism, the sensitivity and specificity (0.88 to 0.89) of the BASQ were found to be satisfactory. The positive prediction rates were also high (0.90 and 0.91, respectively; Table 5). This BASQ is recommended as a convenient, rapid, and valid tool for alcoholism screening in the general medical and in the public health settings in Taiwan. However, the BASQ cannot replace a comprehensive clinical examination.

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References

1. Hwu HG, Yeh EK, Chang LY: Prevalence of psychiatric disorder by Chinese Diagnostic Interview Schedule. *Acta Psychiatr Scand* 1989;79:136-47.
2. Hwu HG, Yeh YL, Wang JD, et al: Alcoholism among Taiwan aborigines defined by the Chinese DIS: A comparison with alcoholism among Chinese. *Acta Psychiatr Scand* 1990;82:374-80.
3. Chen CC, Yeh EK, Hwu HG, et al: Drinking patterns in inpatients of a general hospital: lifetime prevalence of alcohol abuse and dependence. *Clin Psychiatry* 1987;1:166-72.
4. King M: At risk drinking among general practice attenders: Validation of CAGE questionnaire. *Psychol Med* 1986;16:213-7.
5. Hwu HG, Yeh EK, Chang LY: Chinese diagnostic interview schedule. I. Agreement with psychiatrist's diagnosis. *Acta Psychiatr Scand* 1986;73:225-33.
6. Hwu HG, Yeh EK, Chang LY, et al: Chinese diagnostic interview schedule: A validity study on estimation of lifetime prevalence. *Acta Psychiatr Scand* 1986;73:348-57.
7. Hwu HG, Yeh EK, Yeh YL, et al: Alcoholism by Chinese diagnostic interview schedule: A prevalence and validity study. *Acta Psychiatr Scand* 1988;77:7-13.
8. American Psychiatric Association: Diagnostic and Statistical Manual of Mental Disorders. 3rd ed. Washington, D.C.: American Psychiatric Association Press; 1980:163-70.
9. Van De Vijver FJR, Leung K: Methodological issues in psychological research on culture. *J Cross Cult Psychol* 2000;1:33-51
10. Robins LN, Helzer JE, Croughan J, et al: Diagnostic Interview Schedule: Its history, characteristics and validity. *Arch Gen Psychiatry* 1981;38:381-9.
11. Helzer JE, Canino GL, Yeh E-K, et al: Alcoholism-North America and Asia. A comparison of population surveys with the Diagnostic Interview Schedule. *Arch Gen Psychiatry* 1990;47:313-9.
12. Lin LS, Hwu HG, Soong WT, et al: The establishment of an interview schedule for psychopathology of alcoholism: inter-rater reliability and procedure validity. *Chin Psychiatry (Taiwan)* 1995;9:111-21.
13. American Psychiatric Association: Diagnostic and Statistical Manual of Mental Disorders. 4th ed. DSM-IV. Washington, D. C.: American Psychiatric Association Press; 1994:175-204.
14. World Health Organization: The International Classification of Mental and Behavior Disorders. 10th ed. Geneva: World Health Organization; 1992:70-83.
15. Stevens JP: Applied Multivariate Statistics for the Social Sciences. New Jersey: Lawrence Erlbaum; 2002:113-29.
16. Gorenc KD, Hwu HG, Peredo S, et al: Determination of the culture-free items of the Munich Alcoholism Test (MALT). *Taiwan J Psychiatry* 2000;2:18-30.
17. Norsis MJ: SPSS/PC+ Statistics TM 4.0 for IBM PC/XT/AT and PS/2. Chicago: SPSS International BV, 1990.
18. Richer G, Klemm PG, Zahn M: Beitrag zur Lösung des Dreigruppen-Trennproblems in der Alkoholismus-Diagnostik — Vorschlag für einen 9-Item-Screening-Test. *Zeitschr Klini Medi* 1990;1:79-83.
19. Feuerlein W, Kufner H, Ringer CH, et al: Manual of the Munich Alcoholism Test (MALT). Weinheim: Beltz; 1979:13-7.
20. Gorenc KD, Oeredo S, Pacurucu S, et al: Validity of the Cross-Cultural Alcoholism Screening Test (CCAST). *Arch Med Res* 1999;30:399-410.
21. Lohnes PR. Discriminant analysis. In: Keeves JP, editor. Educational research, methodology, and measurement: An international handbook. Oxford: Pergamon Press; 1990:628-32.
22. Thorndike RL. Reliability. In: Keeves JP, editor. Educational research, methodology, and measurement: An international handbook. Oxford: Pergamon Press; 1990:330-43.
23. Chapman WW, Fizman M, Chapman BE, et al: A comparison of classification algorithms to automatically identify chest X-ray reports that support pneumonia. *J Biomed Inform* 2001;34:4-14.
24. Copas JB, Shi JQ: A sensitivity analysis for publication bias in systematic reviews. *Stat Methods Med Res* 2001;10:251-65
25. Bartko JJ, Carpenter WT: On the methods and theory of reliability. *J Nerv Ment Dis* 1976;163:307-17.
26. Swets JA. ROC analysis applied to the evaluation of medical imaging techniques. *Radiology* 1979;14:365-77.
27. Mayfield D, Mcleod G, Hali P: The CAGE questionnaire: Validation of a new alcoholism screening instrument. *Am J Psychiatry* 1974;131:1121-3.
28. Kuo CJ, Chen WJ, Cheng ATA, et al: Validity of the CAGE questionnaire in a primary care setting in Taiwan: a cross-cultural examination. *Chin J Public Health (Taipei)* 1999;18:87-94.