VALIDATION OF THE SHORT MICHIGAN ALCOHOLISM SCREENING TEST THAI VERSION IN NORTHEASTERN THAILAND

Somsong Nanakorn[1], Katsuhiro Fukuda[2], Itsuro Ogimoto[2], Tawee Tangseree[3] and Suchart Treethiptikhun[4]

[1]Department of Biology, Faculty of Science, Khon Kaen University, Khon Kaen, Thailand;
[2]Department of Public Health, Kurume University School of Medicine, Kurume city, Japan;
[3]Khon Kaen Psychiatric Hospital; [4]Northeastern Drug Dependence Treatment Center, Khon Kaen, Thailand

Abstract. This study aimed to validate the Short Michigan Alcoholism Screening Test-Thai version-12 items (SMAST-T) compared to the psychiatrist's diagnosis based on DSM-III-R criteria, as a gold standard, among psychiatric patients residing in the northeast of Thailand. Sixty-one pairs of male cases with alcohol use disorders (AUD) and controls were collected through routine examination of psychiatric outpatients, 18-65 years old, who visited the Khon Kaen Psychiatric Hospital or the Northeast Drug Dependence Treatment Center, located in Khon Kaen Province, northeast Thailand, between November, 1996 and February, 1997. Controls were matched for each case in terms of age (±5 years), province and urbanization of residence. They were interviewed using the SMAST-T and a structured questionnaire. Receiver operating characteristic analysis revealed that the optimum cutoff point of 4 or over on the SMAST-T yielded the best sensitivity and specificity (96.7% and 95.1%, respectively), along with the area under the curve of 0.994, indicating that it was sensitive and specific in discriminating AUD from the non-AUD patients. Validation of the SMAST-T suggests its applicability as a screening interview questionnaire to detect AUD among northeast Thai males, with a specific cutoff point.

INTRODUCTION

The field of mental health research, and in particular, alcohol use disorders, has frequently relied on the use of screening instruments to assess individuals' symptomatology (Jacobson, 1983). Such screens are typically easy to administer, interpret, score and are relatively short. A number of such screens have been developed to identify problem drinkers. These include the Michigan Alcoholism Screening Test (MAST, Selzer, 1971) and its derivatives: brief MAST (Pokorny *et al*, 1972), short MAST (SMAST, Selzer *et al*, 1975), the Cutdown-Annoyed-Guilt-Eye-opener (CAGE, Mayfield *et al*, 1974), the Munich Alcoholism Test (MALT, Bech *et al*, 1993), and the Alcohol Use Disorders Identification Test (AUDIT, Babor *et al*, 1989). The SMAST, developed and shorten modified by Selzer and colleagues (1975), is a questionnaire consisting of 13 yes-no questions of items 1, 3, 5, 6, 8, 9, 11, 14, 16, 20, 21, 24 and 25 of the original full-length MAST (25-item; Table 1) with unweighted scoring. The SMAST has been proven

Correspondence: Somsong Nanakorn, Department of Biology, Faculty of Science, Khon Kaen University, Khon Kaen 40002, Thailand.
E-mail: somnan@kku.ac.th

reliable and valid for screening alcohol problems in medical populations (Woodall, 1988; Al-Ansari and Negrete, 1990; Hays and Revetto, 1992; Nilssen and Cone, 1994), and general populations (Lowe *et al*, 1997) in many countries including Thailand.

In Thailand, it is the consensus of authorities that alcohol use, and hence alcohol misuse, is on the increase (McGovern, 1982). Several studies using some of these screening instruments have shown a prevalence of alcohol problems varying from 15 to 32% among various groups of the Thai population, for example, 15% among male medical outpatients in the southern region of Thailand by the SMAST-Thai version (SMAST-T; consisting of 12 items from the SMAST except item 9; Table 1, Assanangkornchai, 1993), 25% among the same subjects by the MAST-Thai version (MAST-T; 23-item, Tanchaiswad, 1988) and 32% among bus drivers in Bangkok by the MAST-T (Otrakul *et al*, 1988). The relatively large variation of these prevalences may be partly due to the extent of instrument validity. Empirical studies have shown that a screening instrument is valid if a special cutoff point is used on a special population (Storgaard *et al*, 1994; Cherpitel, 1995). It is therefore important to validate an alcohol screening instrument for future studies among the northeast Thai population,

as there has been no validation study of such an instrument before.

The present study reports the validity of the SMAST-T with possible cutoff points to differentiate the alcohol use disorders (AUD) patients from the other psychiatric patients residing in northeast Thailand, using the DSM-III-R diagnostic criteria as a gold standard.

This study was approved by the Ethical Review of Research Committee, Ministry of Public Health, Thailand.

MATERIAL AND METHODS

Questionnaires

Two sets of questionnaires were used for the present study. The SMAST-T questionnaire consisted of 12 items, as shown in Table 1. The second questionnaire contained socio-demographic characteristics, past, present and family histories of illnesses, including smoking and drinking habits.

Method of data collection has been described elsewhere (Nanakorn *et al*, 1998). In brief, eligible subjects were males 18-65 years of age living in the northeast of Thailand, and being outpatients of the Khon Kaen Psychiatric Hospital or the Northeastern Drug Dependence Treatment Center which are located in Khon Kaen Province, between November, 1996 and February, 1997. The eligible AUD cases were identified among the eligible subjects through a routine outpatient examination by Board certified psychiatrists (TT and ST) based on the DSM-III-R diagnostic criteria (American Psychiatric Association, 1987) as alcohol abuse (305.00), alcohol dependence (303.90), uncomplicated alcohol withdrawal (291.80), alcohol withdrawal delirium (291.00), alcohol hallucinosis (291.30), alcohol amnestic disorder (291.10), or dementia associated with alcoholism (291.20) within one month after the first visit. The potential controls were selected from those eligible subjects who were diagnosed by the same psychiatrists as having other psychiatric disorders without AUD, past history of AUD, and/or alcoholic liver diseases. The eligible control was obtained for each case by matching in terms of age (±5 years), province, and rural/urban classification of residence. Sixty-one pairs of case-control were recruited for analyses.

Data analysis

Chi-square testing for 2 x n tables was used to compare statistical differences between cases and controls. The Fisher's exact test and rank-order Tau-b correlation were used as appropriate. The related two sample *t* tests based on equal and unequal variances were used for means comparison (Armitage and Berry, 1994; SAS Institute Inc, 1990). All statistically significant differences were detected at the 5% level. The score of one for each item of the SMAST-T was used according to the original SMAST (Selzer *et al*, 1975). A reliability of the SMAST-T was assessed in terms of an internal consistency using the Cronbach alpha coefficient (α). Correlation between the SMAST-T scores of the present study and the MAST-T scores of the previous study (Nanakorn *et al*, 1998) obtained from the same subjects was performed as well by using the Pearson Product Moment Correlation coefficient (r_p). Validity of the SMAST-T was evaluated by Receiver Operating Characteristic (ROC) analysis (Murphy *et al*, 1987). The ROC was obtained by plotting sensitivities against one minus specificities for all possible cutoff points. The ROC curve and the area under the curve (AUC) were constructed using the "proc logistic" and "proc gplot" procedure in the SAS/STAT® software release 6.12 (SAS Institute Inc, 1997). Finally, an optimum cutoff point that provides the best sensitivity and specificity was selected by acquiring two conditions. Firstly, the value of the sensitivity should be larger than specificity for the purpose of screening (Griner *et al*, 1981). Secondly, the sum of the sensitivity and specificity should be the maximum, as compared to other possible sets.

RESULTS

Sociodemographic, clinical diagnoses, family histories, smoking and drinking habits

Subjects' characteristics have been detailed elsewhere (Nanakorn *et al*, 1998). Briefly, the majority of cases and controls live in rural areas. The average ages (mean±SD) were 38.4±9.7 and 38.7±9.6 years for the cases and controls, respectively. Significant differences were observed between the cases and controls in terms of occupations but not for the marital status and educational background. Based on the DSM-III-R diagnostic criteria, the cases included 37.7% with alcohol dependence, 24.6% with alcohol hallucinosis, 21.3% with alcohol abuse, and 16.4% with alcohol withdrawal delirium, while most of the controls were diagnosed with anxiety disorders.

Table 1
Number of responses by SMAST-T items.

SMAST-T items	Cases	Controls	χ^2
1 Do you feel you are a normal drinker? (yes=0, no=1)	53	7	69.4[a]
3 Does your wife (or parents) ever worry or complain about your drinking? (yes=1, no=0)	60	23	51.6[a]
5 Do you ever feel bad about your drinking? (yes=1, no=0)	49	38	4.8[a]
6 Do friends or relatives think you are a normal drinker? (yes=0, no=1)	58	2	102.8[a]
8 Are you always able to stop drinking when you want to? (yes=0, no=1)	31	1	38.1[a]
11 Has drinking ever created problems with you and your wife? (yes=1, no=0)	45	3	60.6[a]
14 Have you ever gotten into trouble at work because of drinking? (yes=1, no=0)	37	1	49.5[a]
16 Have you ever neglected your obligations, your family, or your work for two or more days in a row because you were drinking? (yes=1, no=0)	33	1	41.7[a]
20 Have you ever gone to anyone for help about your drinking? (yes=1, no=o)	38	2	48.2[a]
21 Have you ever been in a hospital because of drinking? (yes=1, no=0)	22	0	26.8[a]
24 Have you ever been arrested, even for a few hours, because of drunk behavior? (yes=1, no=0)	2	0	2.0
25 Have you ever been arrested for drunk driving or driving after drinking? (yes=1, no=0)	4	0	4.1[a]

Item numbers correspond to those of the original full-length MAST (Selzer *et al*, 1971), scoring of one point (in the parenthesis) was assigned to each item for the SMAST (Selzer *et al*, 1975), and for the present study.
[a]Statistically significant different at the 5% level.

A smaller proportion of cases had a past history with stomach diseases compared with controls. Parents' past histories were similar in cases and controls. The cases tended to currently smoke more than controls, and on average 14±7 cigarettes per day comparing to 11±7 for the controls. Statistically significant difference was observed for drinking habits. All the cases were current drinkers, while 55.8%, 31.1%, and 13.1% of the controls were current, ex-, and non-drinkers, respectively (χ^2 =34.7, df=2). The current drinkers' drinking frequencies of <1-1/mo, 2-4/mo, 2-4/wk, and >4/wk were 23.1%, 13.7%, 11.6%, and 51.6%, respectively (Table 2). A statistically significant difference in the average amount of alcohol consumed on each occasion during the past year was observed (mean±SD; 120.6±70.9 g for the cases and 22.9±28.3 g for the controls; Student's *t*-test based on unequal variances = 9.89, df = 80.9).

Reliability of the SMAST-T

The Cronbach alpha coefficient was 0.89, indicating considerable intercorrelation between the SMAST-T items. A number of responses by each SMAST-T item are shown in Table 1. Eleven of the twelve items were shown as significantly different in the number of responses between the cases and the controls indicating that these items are able to differentiate the cases from the controls.

Correlation between the SMAST-T scores and the MAST-T scores

Pearson correlation between the SMAST-T scores and the MAST-T scores yielded r_p = 0.98 (p = 0.001) suggesting that the SMAST-T is able to screen AUD as good as the MAST-T.

Drinking frequency and the SMAST-T scores

The proportion of drinking frequencies (<1-1/mo, 2-4/mo, 2-4/wk, and >4/wk) are associated with the SMAST-T scores (0, 1, 2, 3, and ≥4; χ^2 = 76.9, p = 0.000; Kendall's Tau-b = 0.67) as shown in Table 2, suggesting that, indeed, higher frequency drinkers tend to have higher scores on the SMAST-T.

Sensitivity, specificity, cutoff point and ROC curve

The SMAST-T scores for the cases and the controls ranged from 3 to 12 and 0 to 5 (mean±SD; 7.1±2.0, and 1.3±1.1, respectively). Table 3 shows

Table 2

Number and percentage of response to SMAST-T scores by drinking frequency levels of current drinkers.

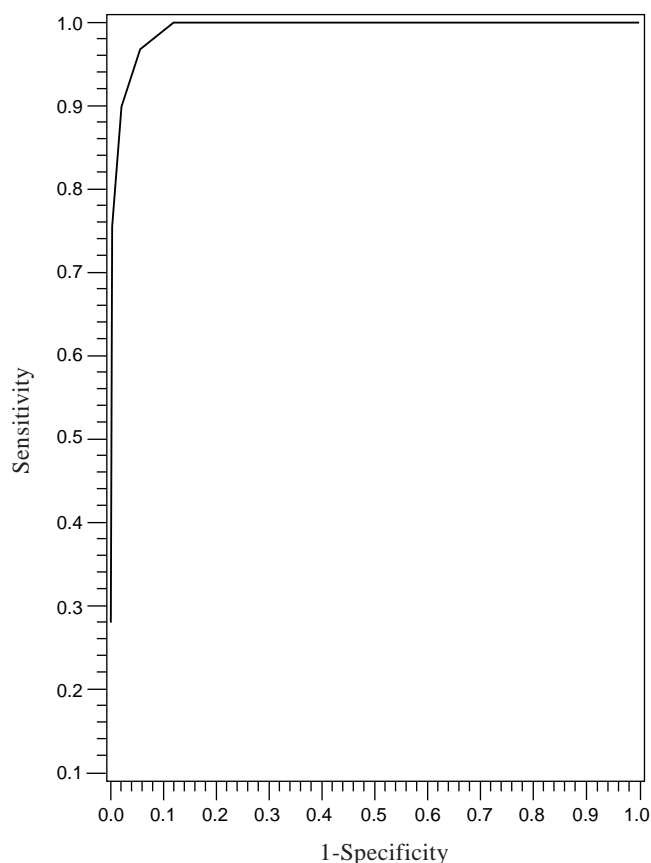| SMAST-T scores	Drinking frequency levels of current drinkers				Total
	<1-1/mo	2-4/mo	2-4/wk	>4/wk	
0	22.7 (5)	0 (0)	18.2 (2)	0 (0)	(7)
1	36.4 (8)	23.1 (3)	9.1 (1)	0 (0)	(12)
2	36.4 (8)	7.7 (1)0	0 (0)	0 (0)	(9)
3	0 (0)	15.4 (2)	9.1 (1)	4.1 (2)	(5)
≥4	4.5 (1)	53.8 (7)	63.6 (7)	95.9 (47)	(62)
Total	23.1 (22)	13.7 (13)	11.6 (11)	51.6 (49)	100.0 (95)

$\chi^2 = 76.9$, df = 12; p = 0.000; Tau-b = 0.67

Fig 1–The ROC curve for the Short Michigan Alcoholism Screening Test-Thai version (SMAST-T). The ROC curve and the Area Under the Curve (AUC) were constructed to evaluate the efficiency of the SMAST-T by using the "proc logistic" and "proc gplot" procedures provided in SAS/STAT® 6.12 which calculated the AUC value of 0.994.

distribution of the SMAST-T scores by cases and controls, and calculated sensitivity, specificity at various cutoff points. An optimal cutoff point of 4 was selected as it fulfilled the two conditions described above. It yielded 96.7% for the sensitivity and 95.1% for the specificity. Fig 1 displays the ROC curve constructed based on the SMAST-T scores yielding the AUC of 0.994.

DISCUSSION

The DSM-III-R diagnostic criteria was used as the gold standard in the present study instead of ICD-10. Although, there are differences among these two diagnostic systems, there is considerable similarity (Grant and Towle, 1990), or they do not produce dissimilar results from each other (Hasin *et al*, 1996a). Rounsaville *et al* (1993) and Cottler (1993) found a good agreement for dependence criteria across the DSM-III-R and the ICD-10, while there was a low level of concordance between the abuse and harmful use diagnoses. Moreover, it has been confirmed for the fair to good agreements on the alcohol abuse and the dependence diagnoses, respectively, between those two diagnostic systems supporting the hypothesis that they were measuring the same underlying construct (Hasin *et al*, 1996b).

The highly significant correlation between the SMAST-T scores and the MAST-T scores ($r_p = 0.98$) may indicate that the SMAST-T will perform as well as the MAST-T as a screening test for AUD. This result is consistent with the study by Selzer *et al* (1975) which yielded $r_p = 0.97$ between the SMAST and the MAST. The SMAST had been shown to be as effective as the full-length MAST

Table 3
Sensitivity, and specificity of the SMAST-T at various cutoff point.

SMAST-T score	Cases	Controls	Sensitivity	Specificity
0	0	16	-	-
1	0	23	100	26.2
2	0	15	100	63.9
3	2	4	100	88.5
4[a]	4	2	96.7	95.1
5	8	1	90.2	98.4
6	12	0	77.0	100.0
7	10	0	57.4	100.0
8	8	0	50.0	100.0
9	9	0	27.9	100.0
10	6	0	13.1	100.0
11	1	0	3.3	100.0
12	1	0	1.6	100.0

Sensitivity: Proportion of AUD subjects having scores equal to or larger than the cutoff point on the SMAST-T.
Specificity: Proportion of non-AUD subjects with scores less than the cutoff point on the SMAST-T.
[a]Selected cutoff point.

as a screening test for AUD in American society (Selzer *et al*, 1975), in Arab Muslim society (Al-Ansari *et al*, 1990), and in Thai Buddhist society (Assanangkornchai, 1993). It has been used as a gold standard for criterion validation of biological alcohol markers in alcohol problems screening as well (Nilssen *et al*, 1996).

The ability of the SMAST-T items to differentiate the cases from the controls was found in 11 of 12 items, except for the item "Have you ever been arrested, even for a few hours because of drunk behavior?" as shown in Table 1. One reason for that may be that police action was not active enough to do so in such a rural area.

The SMAST-T scores were significantly moderately correlated with subjects' drinking frequency levels (Tau-b = 0.67). It implies that the higher scores on the SMAST, the more severe the alcohol use disorders. This finding is consistent with the study by Harburg *et al* (1988) which found a significant correlation of total SMAST scores with subjects' drinking levels among men (Tau-b = 0.21).

The present study of the SMAST-T validity among psychiatric patients residing in northeastern Thailand showed high sensitivity and specificity (96.7% and 95.1%, respectively) at the cutoff point of 4. It is appreciable as it gave a high value of the AUC (0.994) indicating a high efficiency for

discriminating an AUD from a non-AUD. It is comparable to its validity performed among general patients residing in southern Thailand which provided a cutoff point of 3 with a sensitivity of 68.0%, and a specificity of 77.8% (Assanangkornchai, 1993). One possible reason for discrepancy of cutoff points is that the present study was undertaken in psychiatric or drug dependence care facilities where relatively severe AUD or drug addicts may visit, while the Assanangkornchai's study (1993) had been performed in general practice which contains a wide variety of drinkers from predependents to alcoholics. This phenomenon is consistent with the study by Robins (1985) which found that the Diagnostic Interview Schedule's sensitivity was higher in a patient sample than in a general population sample.

There is ambiguous wording in some items of the SMAST-T that give different comprehension among respondents which arises during the interview, even though the MAST-T has been verified by a method of back translation (Tanchaiswad, 1988) and yields high sensitivity and specificity of validation among the southern Thai outpatients (Assanangkornchai, 1993). Such ambiguity, for example, is "normal drinker", "feel bad", or "lost friends". Thus, to avoid an ambiguity of word-meaning in the SMAST-T items for a future study, an explanation should be paraphrased for those items to obtain a consistent comprehension and to enhance smooth interview. Therefore, a further validation

of the SMAST-T with adoption of wording for some items in the general population, general practice clinic and other groups of the Thai population needs to be completed before use. However, the SMAST-T seems to be practically convenient use for alcohol screening purpose as its easiness in scoring, few items and equal validity comparing to the MAST-T.

ACKNOWLEDGEMENTS

REFERENCES

Al-Ansari EA, Negrete JC. Screening for alcoholism among alcohol users in a traditional Arab Muslim society. *Acta Psychiatr Scand* 1990; 81: 284-8.

American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders, 3rd ed. DSM-III-R. Washington DC: American Psychiatric Association, 1987.

Armitage P, Berry G. Statistical methods in medical research, 3rd ed. Oxford: Blackwell Scientific Publications, 1994.

Assanangkornchai S. Drinking problem: a hidden problem in general practice. *J Med Assoc Thai* 1993; 3: 252-9.

Babor TF, de la Fuente JR, Saunders J, *et al*. The alcohol use disorders identification test: guidelines for use in the primary health care. Geneva: World Health Organization, 1989; 89.4.

Bech P, Matt UF, Dencker SJ, *et al*. Scales for assessment of diagnosis and severity of mental disorders. *Acta Psychiatr Scand* 1993; 87 (suppl): 53-77.

Cherpitel CJ. Analysis of cut points for screening instruments for alcohol problems in the emergency room. *J Stud Alcohol* 1995; 56: 695-700.

Cottler LR. Comparing DSM-III-R and ICD-10 substance use disorders. *Addiction* 1993; 88: 689-96.

Grant BF, Towle LH. Standardized diagnostic interviews for alcohol research. *Epidemiol Bull* 1990; 26: 340-8.

Griner PF, Mayewski RJ, Mushlin AI, *et al*. Selection and interpretation of diagnostic tests and procedures: principles and applications. *Ann Intern Med* 1981; 94: 553-600.

Harburg E, Gunn R, Glieberman L, *et al*. Using the short Michigan Alcoholism Screening Test to study social drinkers: Tecumseh, Michigan. *J Stud Alcohol* 1988; 49: 522-31.

Hasin D, McCloud S, Li Q, *et al*. Cross-system agreement among demographic subgroups: DSM-III, DSM-III-R, DSM-IV and ICD-10 diagnoses of alcohol use disorders. *Drug Alcohol Depend* 1996a; 41: 127-35.

Hasin D, McCloud S, Endicott J. Agreement between DSM-III, DSM-III-R, DSM-IV and ICD-10 alcohol diagnoses in US community-sample heavy drinkers. *Addiction* 1996b; 91: 1517-27.

Hays RD, Revetto JP. Old and new MMPI-derived scales and the short-MAST as screening tools for alcohol disorder. *Alcohol Alcsm* 1992; 27: 685-95.

Jacobson GR. Detection, assessment, and diagnosis of alcoholism: current techniques. *Recent Dev Alcohol* 1983; 1: 377-413.

Lowe LP, Long CA, Wallace RB, *et al*. Epidemiology of alcohol use in a group of older American Indians. *Ann Epidemiol* 1997; 7: 241-8.

Mayfield D, McLeod G, Hall P. The CAGE questionnaire: validation of a new alcoholism screening instrument. *Am J Psychiatry* 1974; 131: 1121-3.

McGovern MP. Alcoholism in Southeast Asia: prevalence and treatment. *Int J Soc Psychiatry* 1982; 28: 36-44.

Murphy JM, Berwick DM, Weinstein MC, *et al*. Performance of screening and diagnostic tests: application of Receiver Operating Characteristic analysis. *Arch Gen Psychiatry* 1987; 44: 550-5.

Nanakorn S, Fukuda K, Tangseree T, *et al*. Validation of the Michigan Alcoholism Screening Test-Thai version in northeast Thailand. *Kurume Med J* 1998; 45: 313-9.

Nanakorn S, Fukuda K, Nishiyori A, *et al*. Aldehyde dehydrogenase genotypes and male alcohol use disorders: a case control study in Khon Kaen, northeast Thailand. *Psychiatr Clin Neurosci* 1999; 53: 397-405.

Nilssen O, Cone H. Screening patients for alcohol problems in primary health care setting. *Alco Health Res World* 1994; 2: 136-9.

Nilssen O, Ries R, Rivara FP, *et al*. The "WAM" score: sensitivity and specificity of a user friendly biological screening test for alcohol problems in trauma patients. *Addiction* 1996; 91: 255-62.

Otrakul A, Wong-arsa C, Boonshuya C, *et al*. Identification

of alcoholism among BMA bus drivers in Bangkok. *J Psychiatr Assoc Thai* 1988; 33: 55-60 (in Thai).

Pokorny AD, Miller BA, Kaplan HB. The Brief MAST: a shortened version of the Michigan Alcoholism Screening Test. *Am J Psychiatry* 1972; 129: 342-5.

Robins LN. Epidemiology: reflections on testing the validity of psychiatric interviews. *Arch Gen Psychiatry* 1985; 42: 918-24.

Rounsaville BJ, Bryant K, Babor T, *et al*. Cross system agreement for substance use disorders: DSM-III-R, DSM-IV and ICD-10. *Addiction* 1993; 88: 337-48.

SAS Institute Inc. SAS/STAT® User's guide. Version 6, 4th ed. Vol 2, SAS Institute, Cary, NC, USA, 1990.

SAS Institute Inc. SAS/STAT® software: changes and enhancements through release 6.12. SAS Institute, Cary, NC, USA, 1997.

Selzer ML. The Michigan Alcoholism Screening Test: the quest for a new diagnostic instrument. *Am J Psychiatry* 1971; 127: 1653-8.

Selzer ML, Vinokur A, van Rooijen L. A self-administered Short Michigan Alcoholism Screening (SMAST). *J Stud Alcohol* 1975; 36: 117-26.

Storgaard H, Nielsen SD, Gluud C. The validity of the Michigan Alcoholism Screening Test (MAST). *Alcohol Alcsm* 1994; 29: 493-502.

Tanchaiswad W. MAST: the instrument for screening alcoholism. *J Psychiatr Assoc Thai* 1988; 33: 47-54 (in Thai).

Woodal HE. Alcoholics remaining anonymous: resident diagnosis of alcoholism in a family practice center. *J Fam Practice* 1988; 26: 293-6.