A BRIEF MENTAL HEALTH INDEX

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A BRIEF MENTAL HEALTH INDEX[1]

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The Cornell Medical Index (CMI) was administered to 630 Navy psychiatric patients and 454 healthy controls. Patient and control samples were split into two groups for cross-validation purposes, and two methods, regression analysis and a new item selection technique called SEQUIN, were applied to the problem of selecting the most discriminating set of CMI items. The percentages correctly classified "sick" or "well" when results from Sample 1 were used to predict Sample 2 and vice versa were 82% and 85% by the regression method and 86% and 86% by the SEQUIN method. Seven items, perhaps representing general attributes defining mental illness in the Navy culture, contributed significantly to the predictive scales regardless of particular item selection method or sample.

The Cornell Medical Index (CMI) has been widely used as an aid to clinical diagnosis (Brodman, Erdmann, & Wolff, 1956; Erdmann, 1959) and as a measure of the prevalence of somatic and emotional symptoms in various populations (Abramson, Terespolsky, Brook, & Kark, 1965). The Index has repeatedly demonstrated validity as an indicator of general health or of emotional health when compared with clinical ratings, but has proved less useful as an indicator of the presence of specific diseases or in comparing health status in different populations and cultures (Abramson, 1966). In a previous study of the Navy population, the total CMI score (the number of "yes" responses over the entire 195-item health questionnaire) discriminated efficiently between psychiatric inpatients and healthy controls using a cutting score of 15 (Arthur, Gunderson, & Richardson, 1966). This result suggested that the CMI might have potential value as a psychiatric screening device and as an epidemiological tool in the Navy setting.

The next logical step in developing a useful screening index was to identify the specific items in the CMI which best differentiate patients from healthy controls and to determine the most efficient combination of these items. It seemed plausible that a short scale of highly selected items might be devised which could discriminate mentally ill from healthy individuals in the Navy population as well as the entire CMI inventory.

METHOD

Subjects

The Ss for the study were 630 psychiatric inpatients from two naval hospitals and a normal control group of 454 enlisted men who were currently on active duty and were not medical or psychiatric patients at the time of the study. The control group consisted of students from an electronics technicians school, Marine guards, hospital corpsmen, and Navy enlisted men from several occupational categories on duty at a West Coast naval station, and participants in underwater demolition training. The mean ages of the patient group and the control group were 22 yr. and 21 yr., respectively. Distributions in pay grade (rank) were approximately the same for both patients and controls, although seamen recruits were represented in the patient group but not in the control group.

Procedure

CMI questionnaires were administered individually or in groups by medical personnel at the various facilities included in the study. The total sample of 1,084 patients and controls as divided into two subgroups for purposes of cross-validation by sorting on odd or even last digits of service numbers. By this method, 560 cases were selected for Sample I, of whom 335 were patients and 225 were controls. The composition of Sample II was 295 patients and 229 controls, for a total of 524 Ss.

The frequency of "yes" responses given by patients and controls for all 195 CMI items was examined, and, on the basis of the differences in percentages answering "yes," 60 items were chosen for intensive analyses. The regression technique was used to select the most discriminating of the 60 items and to determine regression weights for sets of items derived separately from Samples I and II. The regression weights from Sample I then were used to predict the patient versus control criterion in Sample II ($0 =$ control, $1 =$ patient), and, similarly, regression weights from Sample II were used to predict the illness criterion in Sample I. An alternative method of item selection and weighting, called SEQUIN (Moonan & Pooch, 1966), also was used for cross-validation. The most important difference between the two methods is the assignment of unit weights to items selected by the SEQUIN method as opposed to the assignment of variable weights in the regression method.

Correlations were computed by the product-moment method for the cross-validities as well as the regression analysis and by the biserial method for the SEQUIN analysis; the two methods of correlation yielded identical results in the present analyses.

RESULTS

Table 1 presents the items, correlations with the criterion, and the regression coeffi-

cients derived from Samples I and II. The items most highly correlated with the criterion in both samples were, "Does worrying continually get you down?" and "Are you considered a nervous person?" The item, "Were you ever a patient in a mental hospital (for your nerves)?" had relatively large regression weights in both samples. Of all CMI questions, these items most directly refer to severe emotional disturbance. Substantial weights were received by the items, "Do you smoke more than 20 cigarettes a day?" "Do you suffer badly from frequent severe headaches?" and "Do you need glasses to read?" The relationship of these items to mental illness is less obvious than the relationships of the aforementioned items; however, headaches, reading difficulties, and excessive smoking are commonly recognized concomitants of emotional distress. Various specific emotional symptoms, for example, "shy or sensitive," "frightening thoughts," and "unhappy and depressed" contribute to discrimination

TABLE 1

CORRELATIONS AND REGRESSION COEFFICIENTS FOR CORNELL MEDICAL INDEX (CMI) ITEMS SELECTED BY THE REGRESSION METHOD

Item no.	CMI section	Item	Sample I		Sample II	
			r^a	Regression coefficient	r	Regression coefficient
1	A	Do you need glasses to read?	.23	.13	.27	.16
79	G	Do you suffer badly from frequent severe headaches?	.41	.13	.38	.14
113	I	Do you suffer from severe nervous exhaustion?			.39	−.11
133	K	Are you definitely underweight?	.30	.12	.32	.11
142	L	Do you smoke more than 20 cigarettes a day?	.42	.23	.39	.13
143	L	Do you drink more than six cups of coffee or tea a day?			.30	.12
146	M	Do you get nervous and shaky when approached by a superior?	.40	.13		
158	N	Do you usually feel unhappy and depressed?	.45	.14		
162	N	Do you often wish you were dead and away from it all?			.40	.16
163	O	Does worrying continually get you down?	.48	.09	.49	.18
166	O	Are you considered a nervous person?	.47	.16	.46	.14
168	O	Did you ever have a nervous breakdown?			.35	.13
169	O	Did anyone in your family ever have a nervous breakdown?	.20	−.08		
170	O	Were you ever a patient in a mental hospital (for your nerves)?	.28	.21	.32	.19
172	P	Are you extremely shy or sensitive?	.36	.13		
180	Q	Are you easily upset or irritated?	.39	−.11		
184	Q	Do people often annoy and irritate you?			.45	.11
189	R	Do sudden noises make you jump or shake badly?	.43	.10		
193	R	Do frightening thoughts keep coming back in your mind?	.42	.13		
194	R	Do you often become suddenly scared for no good reason?	.28	−.13		
		Multiple r	.69		.69	

Note.—Items which contributed significantly ($p < .05$) to an increase in the multiple correlation were included.
[a] Correlation between item responses (yes-no) and patient versus control criterion.

TABLE 2

CORRELATIONS OF ITEMS SELECTED BY THE SEQUIN METHOD

Item No.	Cornell Medical Index section	Item	Sample I	Sample II
1	A	Do you need glasses to read?	.22	.27
79	G	Do you suffer badly from frequent severe headaches?	.40	.38
85	G	Have you fainted more than twice in your life?	.28	
133	K	Are you definitely underweight?	.30	.32
139	L	Do you usually have great difficulty in falling asleep or staying asleep?		.45
142	L	Do you smoke more than 20 cigarettes a day?	.42	.39
143	L	Do you drink more than six cups of coffee or tea a day?	.31	.30
146	M	Do you get nervous and shaky when approached by a superior?	.40	
147	M	Does your work fall to pieces when the boss or a superior is watching you?	.40	
158	N	Do you usually feel unhappy and depressed?	.44	
162	N	Do you often wish you were dead and away from it all?		.39
163	O	Does worrying continually get you down?	.48	.49
166	O	Are you considered a nervous person?	.46	.45
167	O	Does nervousness run in your family?		.29
168	O	Did you ever have a nervous breakdown?		.35
170	O	Were you ever a patient in a mental hospital (for your nerves)?	.28	.32
175	P	Does criticism always upset you?		.37
184	Q	Do people often annoy and irritate you?		.44
189	R	Do sudden noises make you jump or shake badly?	.43	
193	R	Do frightening thoughts keep coming back in your mind?	.42	
		Cumulative r	.67	.68

Note.—The correlations are between item responses (yes-no) and patient versus control criterion.

in one or the other sample, but are less consistent than the previously mentioned items.

Three suppressor items appeared in the Sample I analysis and one in the Sample II analysis. These items correlated positively with the criterion, but in combination with the entire set of significant items they received negative regression weights for the prediction of the patient-control criterion. The fact that none of the negative (suppressor) weights were replicated in the other sample would recommend caution in interpreting these results.

Items selected by the SEQUIN method and their correlations with the criterion for Samples I and II are shown in Table 2. All but five of the items selected by the SEQUIN method also had been selected by the regression method in at least one sample. Thus, the item content of the scales derived by the two methods was quite similar.

Multiple or cumulative correlations and cross-validation results are shown in Tables 3 and 4. Fifteen items significantly contributed to discrimination of patients from controls in Sample I by the regression method.

A multiple correlation of .69 was achieved with this set of items against the illness criterion. When the regression weights in Sample I were used to predict "well" versus "sick" status for Sample II, a cross-validity coefficient of .69 was obtained. Regression weights for 12 significant items were derived from Sample II in order to predict patient-control status for Ss in Sample I. The multiple-

TABLE 3

MULTIPLE CORRELATIONS AND CROSS-VALIDITY COEFFICIENTS FOR TWO ITEM-SELECTION METHODS

Method	No. of items	Multiple correlation	Cross-validation[a]
Regression			
Sample I	15	.69	.69
Sample II	12	.69	.64
		Cumulative correlation	
SEQUIN			
Sample I	14	.67	.72
Sample II	14	.68	.71

[a] Items and weights from Sample I were used to predict patient or control status in Sample II and vice versa.

TABLE 4

Cross-Validity Distributions for
Two Item-Selection Methods

Method	Sample I		Sample II	
	Actual		Actual	
	Well	Sick	Well	Sick
Regression Predicted[a]				
Sick	47	259	42	244
Well	170	45	180	34
Correct predictions	82%		85%	
SEQUIN Predicted[a]				
Sick	39	295	38	261
Well	186	40	191	34
Correct predictions	86%		86%	

[a] Predictions for Sample I were based upon items and weights derived from Sample II and vice versa. Cutting points for predicted criterion scores were based upon actual proportions "sick" and "well" in each sample.

correlation and cross-validity coefficients were .69 and 64, respectively, for this set of items.

Using the SEQUIN technique for item selection, 14 items were found to cumulatively increase the correlations with the criterion for both Samples I and II. Cumulative correlations of these sets of items with the illness criterion were .67 and .68, respectively, and cross-validity correlation coefficients were .72 and .71, respectively, for Samples I and II.

The distributions obtained when the regression or SEQUIN results from Sample I were used to predict Sample II and vice versa are given in Table 4. The percentages classified correctly, that is, "sick" or "well," were 82% and 85% by the regression method and 86% and 86% by the SEQUIN method.

Discussion

The development of a short, self-administered mental health index which provides a reasonable approximation of the results of a brief psychiatric examination would have obvious importance for both research and practice. Opportunities for comparative studies of populations using clinical examination methods are extremely limited, and investigations of prevalence of symptoms and illness almost always must rely upon Ss' own reports of health status. Important relationships of personality, cultural, and environmental factors to emotional illness and invalidism can be readily adduced by means of survey methods if valid questionnaire techniques can be devised.

In military psychiatric practice, decisions concerning fitness for military duty or the need to hospitalize often must be made rapidly and without the benefits of extended clinical study. A standardized screening instrument obviously could have value in settings with rapid patient turnover, for example, an outpatient clinic, where allocation of the psychiatrist's or physician's time is an important consideration. Also, the specific questions identified as most significant in differentiating "sick" from "well" individuals may suggest particularly useful areas to be explored in brief clinical interviews because these items have a clearly demonstrated relevance for estimating the probability of mental illness.

The findings of the present study are viewed as encouraging with respect to the possibility of developing a brief but efficient mental health index for the Navy population. It is clear that selection of items by linear multiple regression or similar techniques can provide great economies in scoring the present CMI questionnaire and at the same time slightly increase validity as well. Scoring only from 12 to 15 items by means of regression weights or unit weights resulted in concurrent validities consistently higher than those attained with scores based on unit weights for all 195 items in a previous study.[2] Split-half cross-validation results indicated high stability and comparability for the various brief predictor scales obtained.

The apparent superiority of the SEQUIN method of item selection for scale cross-validations suggests that simple counting of diagnostic answers ("yes") would be preferable

[2] When scores based upon all 195 items were dichotomized at 15 and were correlated with a sick-well criterion, a concurrent validity coefficient (phi) of .65 was attained. Details concerning the discriminating power of scores based upon the entire 195-item CMI were given in the study by Arthur et al. (1966).

to more complex differential weighting procedures in scoring a mental health index. This simplicity of scoring would offer practical advantages for many clinical settings.

A large proportion of the items included in the various experimental scales was drawn from Sections M–R of the CMI questionnaire. These items were designed to elicit psychological symptoms, and it is not surprising that they are the most discriminating with respect to mental illness. Three items from Section L—items usually not scored as emotional symptoms—also were highly significant correlates of diagnosed mental disorder. These items—"Do you usually have great difficulty in falling asleep or staying asleep?" "Do you smoke more than 20 cigarettes a day?" and "Do you drink more than six cups of coffee or tea a day?"—should be included in scales designed to estimate mental health status in the naval population.

Seven "universal" items emerged from the various analyses; that is, items which contributed significantly to the predictive scales regardless of particular item-selection method or sample. These questions perhaps represent a set of general attributes which are most important in defining mental illness in the Navy culture. The items, in order of importance, are, "Does worrying continually get you down?" "Are you considered a nervous person?" "Do you smoke more than 20 cigarettes a day?" "Do you suffer badly from frequent severe headaches?" "Are you definitely underweight?" "Were you ever a patient in a mental hospital (for your nerves)?" "Do you need glasses to read?" These items appear to offer a useful nucleus of questions for a brief psychiatric index. Other questions could be added as their relevance was consistently demonstrated.

Using different methods of item selection, Abramson et al. (1965) devised a scale of 10 "key" CMI items (Hebrew version) which correlated highly $(r = .63)$ with physicians' ratings of emotional health in a randomly selected sample of Jerusalem males. Seven of these 10 key items appeared in the experimental scales of the present study, suggesting a surprising generality in the present findings.

Studies of the relationships of brief mental health index scores to psychiatrists' decisions concerning fitness for duty and need for hospitalization are in progress, and the effects of social and cultural differences upon health-questionnaire responses also are being evaluated.

Because the predictive value of the brief, CMI scales derived in this study has not yet been tested, the accuracy and usefulness of these scoring techinques for diagnostic purposes with new or suspected patients remain to be demonstrated, and they obviously should not be used for intake screening until such verification can be achieved.

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13. ABSTRACT

In a previous study of the Navy population, the total Cornell Medical Index (CMI) score discriminated efficiently between psychiatric inpatients and healthy controls. It seemed plausible that a short scale of highly selected items might be devised which could discriminate mentally ill from healthy individuals in the Navy population as well as the entire CMI inventory. Subjects were 630 psychiatric inpatients from two naval hospitals and a normal control group of 454 enlisted men who were currently on active duty and were not medical or psychiatric patients at the time of the study. Correlations were computed by the product-moment method for the cross-validities as well as the regression analysis and by the bi-serial method for a technique of item selection called SEQUIN; the two methods of correlation yield identical results in the present analyses. The findings were encouraging with respect to the possibility of developing a brief but efficient mental health index for the Navy population. It is clear that selection of items by linear multiple regression or similar techniques can provide great economies in scoring the present CMI questionnaire while at the same time slightly increasing validity as well. Scoring only 12 to 15 items by means of regression weights or unit weights resulted in concurrent validities consistently higher than that attained with scores based on unit weights for all 195 items in the previous study.

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