

Construction of a Screening Inventory for Major Mental Disorder in the Army

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Abstract

The development of a 29-item self-report inventory to screen for non-adaptiveness with an episode or a history of major mental disorder in the army is described. Initially, a 58-item inventory was constructed. However, through a pilot study 46 items remained. The reliability and validity test of the 46-item inventory was then carried out on 357 patients and 126 controls. Firstly, item analyses were performed which showed 12 items that distinguished between schizophrenic patients and controls, 9 items that distinguished between depressive patients and controls and 8 items that distinguished between manic patients and controls. A final 29-item inventory was found to have satisfactory reliability, sensitivity and specificity. The analyses of the best cut-off scores using the receiver-operating-characteristic curve suggested a score of 3 for the Schizophrenia Scale, 2 for the Depression Scale, and 3 for the Mania Scale. The inventory can be completed in about 5 to 10 minutes and has a simple method of scoring. The use of this screening inventory in the army is discussed.

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Key words: Military psychiatry, Screening instrument, Sensitivity, Specificity

Introduction

Since basic training is the first stress encountered in the army and some individuals do not survive it, prior elimination of these people would be of great value.¹ In the past forty years, early detection and appropriate disposition of non-adaptable military recruits has been a concern to the military. Various branches of the military have conducted large studies searching for accurate, cost-effective ways to predict which recruits could and could not adapt to military training.² Several tests and mental health screening processes have been developed.³⁻⁸ Research today continues in an effort to improve the mental health screening process.⁹ In Taiwan, those who are suffering from severe emotional impairment and met diagnostic criteria for major mental disorders are excluded from compulsory military service as they are unfit for military training. A two-stage mental health screening programme for the detection of conscripts with major mental disorders was proposed and studied in 1985.¹⁰ In stage I, the Ko's Mental Health Questionnaire (KMHQ),¹¹ a widely used questionnaire modified from the Minnesota Multiphasic

Personality Inventory, was administered to identify the high risk drafts which need further evaluation. In stage II, the high risk drafts were evaluated by a psychiatrist or clinical psychologist using psychiatric interviews and further psychological testing. Since mental health screening has to be carried out in around 100 000 conscripts every year, a screening tool with both high sensitivity and specificity is very necessary for the army in stage I to accurately identify the high risk group and save the cost of stage II. However, the KMHQ as a screening instrument in stage I was found to be unsatisfactory because of its low accuracy.¹⁰⁻¹²

Careful examination of the content of the KMHQ reveals three major problems. Firstly, many items on the scale are not criteria of major mental disorders of the Diagnostic and Statistical Manual of Mental Disorders-Third Edition-Revised (DSM-III-R).¹³ Moreover, the criteria of DSM-III-R are inadequately covered by KMHQ. Secondly, the long list of items (282 items) increases the probability of some items being missed and incompleteness.¹⁰ Thirdly, the lack of a valid cut-off point results in low accuracy.¹¹ The present study was designed to

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construct a short screening scale with high accuracy for identifying high risk groups with major mental disorders in the army.

Materials and Methods

Construction of the Scale

A detailed analysis of the suitability of the KMHQ,¹¹ DSM-III-R criteria for Schizophrenia and Mood Disorders,¹³ and Schedule of Affective Disorder and Schizophrenia¹⁴ was carried out by a research team which included psychiatrists, clinical psychologists and research assistants. Finally, 58 items were selected, which were considered to be appropriate for the detection of high risk drafts, including several which were modified and constructed by us.

Pilot Study

These items were then tested on 100 outpatients in psychiatry and 50 outpatients in non-psychiatry using extensive pilot interviews. The detailed wording of the items, their acceptability and readability to a person with low educational level, as well as their likelihood of detecting major mental disorders were then carefully evaluated. Forty-six items were eventually selected which included 23 items for the Schizophrenia Scale, 12 items for the Mania Scale, and 11 items for the Depression Scale.

Item Analyses and Validation

An item analysis was performed to establish the validity of the 46-item scale, and those items which differentiated significantly between patients with major mental disorder and controls were selected as the final version.

The validity study was carried out on 357 psychiatric patients recruited from the Department of Psychiatry, and 126 controls sampled from the non-psychiatry department of Tri-service General Hospital. Among the 357 subjects, 121 met the DSM-III-R criteria for schizophrenic episode or a history of schizophrenia, 115 with a manic episode of bipolar disorder or a history of mania, and 121 with a major depressive episode or a history of major depressive disorders. Each subject was interviewed by a psychiatrist using a clinical interview according to the DSM-III-R criteria and subsequently completed the 46-item screening inventory by self-report so that the interviewer remained blinded to the score of the screening inventory. The characteristics of the validation sample are shown in Table I. There were no differences among the four groups on sex and age.

Results

Item Analyses

Each item on each subscale of the inventory was analyzed to test whether they could distinguish be-

TABLE I: DEMOGRAPHIC DATA FOR THE VALIDATION SAMPLE

Sex	Normal control	Schizophrenia	Mania	Major depression	χ^2	P
Male	63	65	69	65	5.19	0.16
Female	63	56	46	56		
Age					1.01	0.80
≤ 25 y	53	44	51	46		
> 25 y	73	62	64	75		

tween the target psychiatric group and the control group. The results showed that 12 items on the scale of schizophrenia distinguished clearly between schizophrenic patients and controls, 9 items between depressive patients and controls, and 8 items between manic patients and controls. Finally, a 29-item screening inventory was constructed (Appendix I).

Analysis of the Reliability of the 29-item Screening Inventory

Reliability analysis revealed that the Kuder-Richardson reliability coefficient was 0.80 for the Schizophrenia Scale, 0.64 for the Mania Scale, and 0.79 for the Depression Scale.

The Cut-off Score

In order to find the best cut-off score for each scale in detecting possible cases in the army, the sensitivity and specificity for various cut-off scores in each scale were analysed (Tables II to IV) and illustrated as the receiver-operating-characteristic curve (Figs. 1-3). In considering both the sensitivity and specificity, the best cut-off score, was 3 for the Schizophrenia Scale with sensitivity of 66% and specificity of 90%, 2 for the Depression Scale with sensitivity of 78% and specificity of 68%, and

TABLE II: ANALYSES OF VARIOUS CUT-OFF SCORES FOR THE SCHIZOPHRENIA SCALE

	SE (%)	SP (%)	PVP (%)	PVN (%)	Eff	χ^2
1	81	52	58	77	0.65	26.83 ^d
2	73	80	75	78	0.77	65.58 ^d
3	66	90	84	76	0.79	78.66 ^d
4	58	92	86	73	0.77	67.33 ^d
5	47	95	89	69	0.73	55.43 ^d
6	38	97	91	66	0.70	45.88 ^d
7	30	98	91	63	0.67	36.02 ^d
8	23	99	96	61	0.65	28.06 ^d
9	12	100	100	58	0.60	15.72 ^a
10	8	100	100	57	0.58	10.94 ^d
11	4	100	100	56	0.57	5.37 ^d
12	1	100	100	55	0.55	1.33 ^a

SE: sensitivity; SP: specificity; Eff: efficiency; PVP: positive predictive value; PVN: negative predictive value

a: $P > 0.05$; b: $P < 0.05$; c: $P < 0.01$; d: $P < 0.001$

TABLE III: ANALYSES OF VARIOUS CUT-OFF SCORES FOR THE DEPRESSION SCALE

	SE (%)	SP (%)	PVP (%)	PVN (%)	E	f	f	χ^2
1	87	48	60	80	0.66			35.50 ^d
2	78	68	69	77	0.73			52.71 ^d
3	66	75	71	71	0.71			41.92 ^d
4	50	86	76	66	0.69			37.02 ^d
5	43	91	80	63	0.68			37.54 ^d
6	32	94	82	60	0.64			27.52 ^b
7	24	97	88	58	0.62			23.52 ^b
8	9	98	78	54	0.55			6.04 ^d
9	2	100	100	53	0.53			2.96 ^a

SE: sensitivity; SP: specificity; Eff: efficiency; PVP: positive predictive value; PVN: negative predictive value

a: $P > 0.05$; b: $P < 0.05$; c: $P < 0.01$; d: $P < 0.001$

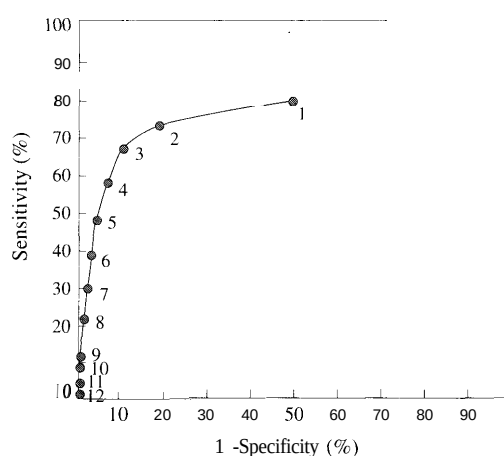


Fig. 1. Receiver-operating-characteristic curve in differentiating schizophrenia patients from controls.

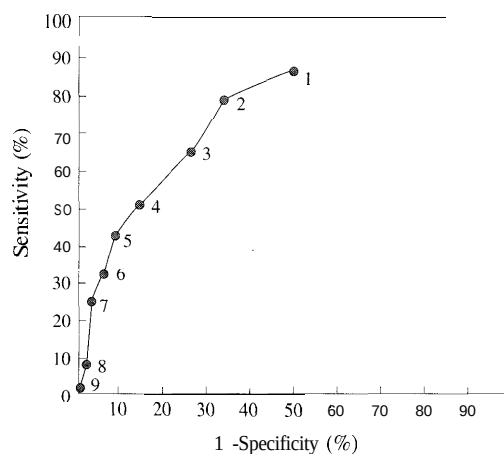


Fig. 3. Receiver-operating-characteristic curve in differentiating major depressive disorder patients from controls.

3 for the Mania Scale with sensitivity of 56% and specificity of 81%.

Discussion

Our study has shown that the 29-item inventory for

TABLE IV: ANALYSES OF VARIOUS CUT-OFF SCORES FOR THE MANIA SCALE

	SE (%)	SP (%)	PVP (%)	PVN (%)	Eff	χ^2
1	84	42	57	74	0.62	19.57 ^d
2	72	63	64	72	0.68	29.58 ^d
3	56	81	72	67	0.69	35.48 ^d
4	37	90	77	61	0.65	24.87 ^d
5	22	97	86	58	0.61	20.50 ^d
6	12	98	87	55	0.57	9.67 ^c
7	5	100	100	54	0.55	6.20 ^b
8	1	100	100	53	0.53	1.42 ^a

SE: sensitivity; SP: specificity; Eff: efficiency; PVP: positive predictive value; PVN: negative predictive value

a: $P > 0.05$; b: $P < 0.05$; c: $P < 0.01$; d: $P < 0.001$

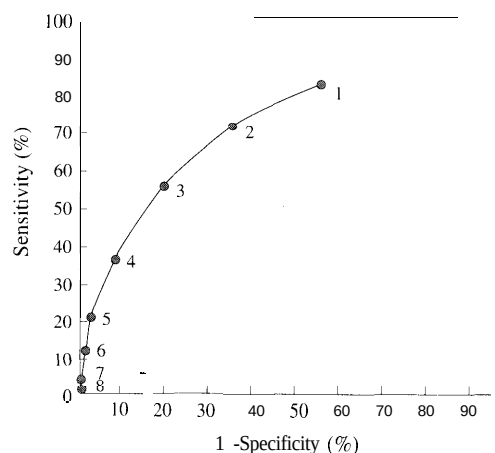


Fig. 2. Receiver-operating characteristic curve in differentiating manic patients from controls.

major mental disorder had satisfactory internal consistency, reliability and validity. Moreover, we found that the scale was fully understood and accepted by people of various ages, gender and educational level. The simple method of scoring and being able to complete the questionnaire within 5 to 10 minutes were the advantages. It seems likely that the inventory will be useful in the first stage of the screening process of non-adaptive military recruits. Our study suggested that people scoring above a threshold of 3 on the Schizophrenia Scale, 2 on the Depression Scale, or 3 on the Mania Scale are most likely to have an episode or a history of major mental disorder and should therefore be further assessed by a second stage intensive examination to confirm whether a major mental disorder was or is present.

Though a score of 3 on the Schizophrenia Scale, 2 on the Depression Scale and 3 on the Mania Scale were suggested as the best cut-off scores, however, the appropriateness of the various cut-off scores for the 29-item inventory is variable, depending on the nature of the sample, the purpose for which the tool is being used and the changing manpower needs of the military. If the

purpose is to include a maximum number of possible cases, then the cut-off score will be lowered to minimise false negatives. In order to ensure a definite case group that minimizes the prevalence of false positives, a high cut-off score will be required.

The 29-item inventory is not a substitute for clinical assessments, and a score just below the cut-off should not be taken to indicate the absence of any major mental disorders, especially if there are other reasons to consider. Moreover, the validity of this inventory in this study was examined in a clinical setting. Revalidation of this inventory for use in military screening settings must be carried out prospectively before wider use is recommended.

Previous studies on early screening for military non-adaptability have identified broken family, emotional deprivation, poor frustration tolerance and poor previous adjustment to school and work as factors relevant to military non-adaptation.^{8,9,15} Therefore, collecting such data to increase the predictability of the screening process should be considered and investigated. In addition, motivation for military duty is associated with success in basic military training in the air.¹⁶ Other psychometric instruments for identification of non-adaptability should be included and a brief intervention of remotivation can be further designed and examined.

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REFERENCES

1. Danielson J R, Clark J H. A personality inventory for induction screening. *J Clin Psychol* 1954; 10:137-43.
2. Jensen M B. Adjustive and non-adjustive reaction to basic training in the Air Force. *J Soc Psychol* 1961; 55:33-41.
3. Lachar D, Sparks J C, Larsen R M. Psychometric prediction of behavioral criteria of adaptation for USAF basic trainees. *J Community Psychol* 1974; 2:268-77.
4. Bloom W. Air Force Medical evaluation test. *USAF Medical Service Digest* 1977; 28:17-20.
5. Bloom W. Air Force Medical evaluation test (AFMET) identifies psychological problem early. *USAF Medical Service Digest* 1980; 31:8-9.
6. Bloom W. Change made lessons learned after mental health screening. *Mil Med* 1983; 148:889-90.
7. Wright L C. The behavioral analysis service. *Mil Psychol Bull* 1990; 8:5-6.
8. Butters M, Retzlaff P, Gibertini M. Non-adaptability to basic training and the Millon Clinical Multiaxial Inventory. *Mil Med* 1986; 151:574-6.
9. Crawford S L, Fiedler E R. Development and current status of USAF mental health screening. *Mil Med* 1991; 156:596-9.
10. Lu R B, Ho S L, Yang Y M, Lin M J, Yeh J Y, Ko S, et al. A screening study of the mental state of the recruits. *J Med Sci* 1989; 10:155-62.
11. Ko Y H. Ko's Mental Health Questionnaire. 2nd ed. Taipei: Chinese Behavioral Sciences Corp, 1981.
12. Lu R B. Combat psychiatry [review]. *Med Digest* 1986; 2:40-5.
13. American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorder. 3rd ed-revised. Washington DC: American Psychiatric Association, 1987.
14. Endicott J, Spitzer R L. A diagnostic interview: the schedule for affective disorders and schizophrenia. *Arch Gen Psychiatry* 1978; 35:837-44.
15. Mirin S M. Ineffective military personnel I: A psychosocial perspective. *Arch Gen Psychiatry* 1974; 30:398-402.
16. McCraw R K, Bearden D L. Motivational and demographic factors in failure to adapt to the military. *Mil Med* 1988; 153:325-8.

APPENDIX I: MENTAL HEALTH INVENTORY

The aim of this questionnaire is to understand your recent physical and mental condition and serves no significance whether your answer is right or wrong. Please give your answer according to your current condition. The information you supply will simply be used for reference, and will be kept confidential.

Please read carefully the following sentences (totaling 29). Check under the answer of "Yes" if the subject corresponds mostly to your present condition; and check under the answer of "No" if the subject does not meet your present condition. Please answer each item listed: Thank you for your cooperation.

Name: _____

Age: _____

Birth

Date: / /

Day

Mo

Y

Education: _____

Occupation: _____

Sex: _____

Date of completing this form: / /

Day

Mo

Y

Yes No

- — 1. People often say that they cannot understand what I am talking about.
- — 2. Recently I am too vigorous to calm myself down.
- — 3. Recently I cannot help shifting from one idea to another rapidly.
- — 4. Some unreasonable ideas or words repeatedly and frequently appear in my mind and can't be eliminated.
- — 5. People can definitely know what is in my mind.
- — 6. I am somebody who is able to influence the whole world.
- — 7. I feel that my own private affairs are constantly being televised, aired and reported on the newspaper.
- — 8. There was a period of time in the past when I could not sleep almost every day.
- — 9. I don't feel that my thoughts are being controlled by someone using electric waves or telepathy.
- — 10. I can often hear some voices even though I cannot find the speaker.
- — 11. I usually can hear some voices that cannot be heard by others.
- — 12. I don't think that heroes are great at all because I am much greater than them.
- — 13. I lose interests in doing everything, even in activities which I enjoyed before.
- — 14. People often say that I shift my ideas from one subject to another in a completely unrelated way.

Yes No

- — 15. Recently my mind often goes blank in the middle of a thought or idea and then I cannot recall what I was thinking or trying to say.
- — 16. I am not easily annoyed or provoked by external stimuli.
- — 17. No famous people have fallen deeply in love with me.
- — 18. I feel depressed the whole day.
- — 19. I seldom bathe and I don't care. But others think I am nasty.
- — 20. Some thoughts are often being implanted in my mind by other people or forces.
- — 21. I always feel I want to end my own life.
- — 22. I feel that there is always someone trying to harm me.
- — 23. I can converse clearly with God, gods, or ghosts while others can't.
- - 2 4 . My appetite is kept steady.
- — 25. I always feel that I seem to have done something wrong.
- — 26. For a period of time, I was spending money, going shopping, and blindly making friends without considering the consequences.
- — 27. I feel that I have been enticed into traps without any reason.
- — 28. I don't think that I am superfluous and worthless.
- — 29. I often wake up very early for no reason and then cannot go back to sleep anymore.