Application of a Screening Test for Depression in the Health Counselling Center

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This paper outlines the process of development and the clinical usefulness of a screening test for depression. First we developed a draft questionnaire consisting of 13 items, each of which had three answers—(1) often, (2) sometimes, (3) none—, with reference to certain kinds of rating scales. After each answer was quantified by the sigma method, each item was statistically analyzed among 75 depressive patients and 250 almost healthy subjects visiting the AMHTS (Automated Multiphasic Health Testing and Services) center. Then 12 items effective for discriminating between the two groups were computed by discriminant analysis to produce depression scores which varied from 0 to almost 100 in proportion to the severity of depression.

This questionnaire was applied to all consultees visiting the AMHTS, and revealed that almost 1% of them showed higher scores than the threshold score. Psychiatric interviews with the subjects suspected of depression indicated that all of them were in the transient maladapted state although only ten out of 16 were referred to a psychiatric outpatient clinic for further examination and treatment.

The validity of this questionnaire was also confirmed by the fact that 86% of 50 additional depressive patients showed higher scores than the threshold score.

(Key Words: depression, screening test, rating scale)

INTRODUCTION
It has recently been found that mild cases of psychiatric disorders are increasing in number. The same is true in cases of depression (4,7). Some patients with mild depression or masked depression (5) complain of only physical symptoms such as headache and fatigability instead of psychiatric symptoms such as a depressive mood. Therefore, it is possible that mild depression motivates some patients to consult our Health Counselling Center to check their physical condition. Depression, especially mild depression, is a mental disorder with good prognosis if treated adequately and it should be discovered as early as possible.

This paper outlines the process of development, clinical significance and usefulness of a screening test for depression at the Health Counselling Center of Tokai University Hospital.

METHOD
There are numerous check lists and rating scales for depression which are widely used. In this study we selected 13 items for our questionnaire (Table 1), which are most frequently encountered among famous and popular check lists such as Hamilton's rating scale (3), Zung's Self-rating Depression Scale (SDS) (8), Kiloh's rating scale (5), Beck's self rating scale (2) and the SRQ-D (Self-Rating Questionnaire for Depression) (1). Each item had three answers, i.e., (1) often, (2) sometimes and (3) none, from which one was chosen.

This questionnaire was distributed to two

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Table 1 Screening Test for Depression.

<table>
<thead>
<tr>
<th>Question</th>
<th>Response Options</th>
</tr>
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<tbody>
<tr>
<td>1.</td>
<td>Do you feel down-hearted and blue? (1. often 2. sometimes 3. none)</td>
</tr>
<tr>
<td>2.</td>
<td>Are you more irritable than usual for no reason?</td>
</tr>
<tr>
<td>3.</td>
<td>Are you more unwilling to meet people than before?</td>
</tr>
<tr>
<td>4.</td>
<td>Have you lost interest in your work, hobbies, etc.?</td>
</tr>
<tr>
<td>5.</td>
<td>Do you feel you would be better off dead?</td>
</tr>
<tr>
<td>6.</td>
<td>Are you concerned about one idea such as your physical condition?</td>
</tr>
<tr>
<td>7.</td>
<td>Do you have any kind of sleep disturbance?</td>
</tr>
<tr>
<td>8.</td>
<td>Do you feel your appetite is less than usual?</td>
</tr>
<tr>
<td>9.</td>
<td>Do you notice that you are losing weight?</td>
</tr>
<tr>
<td>10.</td>
<td>Do you get tired more easily than before?</td>
</tr>
<tr>
<td>11.</td>
<td>Do you feel heaviness in the head or have headaches?</td>
</tr>
<tr>
<td>12.</td>
<td>Do you have stiff shoulders?</td>
</tr>
<tr>
<td>13.</td>
<td>Do you feel a decrease in sexual drive?</td>
</tr>
</tbody>
</table>

groups of subjects. One group (control group) consisted of 250 subjects who consulted the AMHTS (Automated Multiphasic Health Testing and Services) center, and the other (depression group) of 75 patients who had been given medication and psychotherapy for depression at the outpatient clinic of psychiatry in Tokai University Hospital. Each item was statistically analyzed between the two groups after the answer selected for each item was quantified by the sigma method. Then all items were computed by discriminant analysis (see APPENDIX) to produce scores which varied from 0 to almost 100 in proportion to the severity of depression. This score is called the depression score in this study.

This questionnaire was applied to all subjects who visited the AMHTS from January 1986. From July 1986 all consultees who revealed depression scores higher than the threshold score (35 or 40) have been interviewed by one of the psychiatrists (T.H. or H.O.) to determine whether they were clinically depressive or not.

This check list was distributed to an additional 50 psychiatric inpatients and outpatients whose diagnoses met the criteria for major depression in DSM-III (Diagnostic & Statistical Manual of Mental Disorders, third edition, 1980). None of these patients were included in a group of 75 depressive patients who contributed to the earlier step of this study.

RESULTS

Out of 13 items in our questionnaire, 12 showed significant differences between the two groups. The item with no significant difference was #12 in Table 1 (regarding stiff shoulders). The 12 items were computed by discriminant analysis to produce depression scores. Distributions of depression scores in the two groups are shown in Fig. 1. Figure 1 (a) indicates that more than 90% of the subjects visiting the AMHTS had scores of less than 20 and that even the highest score was below 40. On the other hand, depression scores of depressive patients were distributed widely from less than 10 to more than 80, as shown in Fig. 1 (b).

Figure 2 shows the distribution of depression scores of 4,805 subjects visiting the AMHTS from January through June 1986. Among them, 44 (0.92%) consultees had depression scores of more than 40, and the threshold score from July through September was determined as 40, so that 21 out of 2,572 consultees were identified as suspected of depression. From October through December, the threshold score was lowered to 35, and 16 out of 2,233 subjects were asked to have an interview with a psychiatrist. From the psychiatric interview, ten out of the 16 suspected cases were diagnosed as having mild or moderate depression and were referred to a psychiatric outpatient clinic for further evaluation and treatment.

Figure 3 shows the distribution of depression scores of 50 psychiatric patients with major depression (DSM-III). This group was found to be more homogeneous than the former depressive patient group. Forty-three patients (86%) had scores higher than 35.
DISCUSSION

The aim of this study was to develop a screening test for depression which can be applied routinely to all subjects who visit the Health Counselling Center. Therefore, an attempt was first made to gather many kinds of rating scales and check lists which are widely used and to prepare an appropriate draft with reference to them. Although we adopted 15 items at first, it was revealed that 12 of them were useful for discriminating depressive patients from almost healthy subjects. They included an item asking about sexual drive, but it was pointed out by some consultees that this item was not easily answered. This was probably due to cultural differences because this item was adopted from rating scales developed and used in foreign countries.

There are some problems in the procedure to produce depression scores. The first problem results from the fact that the number of depressive patients was much smaller than the control group. The second problem is that the group of depressive patients was not homogeneous, which meant that this group included patients with endogenous (psychotic) depression, neurotic depression, involutional melancholia and depressive reaction. This explains the scattered distribution of depression scores in the depression group (see Fig. 1 (b)). The establishment of such heterogeneity in the depression group was also derived from the different criteria used by collaborating psychiatrists. The final problem is the fact that all cases in the control group were not identified as normal or not depressive, because they were not all interviewed by psychiatrists. This led us to adopt discriminant analysis instead of the other simpler analysis. If all of the subjects in the control group were identified as normal by psychiatric interviews, a simpler and more direct method would be possible.

When this procedure was applied to the AMHTS, the number of subjects identified as depressive was unexpectedly low (see Fig. 2). However, all of them were found to be in a severely stressful situation, and should be considered psychiatrically as in the transient maladapted state. For such cases, not only medical (physical) advice but also counselling from a psychiatric point of view, if possible, might be helpful.

The validity of this questionnaire was also confirmed by the fact that 86% of the 50 depressive patients showed higher scores than the threshold score. Although this group was clinically more homogeneous, 14% of them revealed lower scores. This is attributed to the fact that they answered "no" to the question con-
cerning suicidal tendencies which is weighed heavily in producing a depression score. Conversely when a subject answered "sometimes" or "often" to this question, his or her depression score became higher and exceeded the threshold score. In psychiatric interviews, all patients in the transient maladapted state said with a smile, "I'm too busy. I'm in a very stressful situation. Sometimes I feel that if I could disappear of die, it would be better."

In conclusion, application of this screening test in the Health Counselling Center should be very meaningful. Consultees have to undergo many kinds of medical examinations in a limited time, and in this sense, our questionnaire is not time-consuming, which is the most prominent feature for this medical setting.

Also, consultees at the Health Counselling Center should be checked not only physically but also psychiatrically. Psychiatric disorders which might be frequently encountered and should be discovered in this unit are depression and the transient maladapted state rather than neurosis, psychosis, personality disorders or dementia.

However, before this screening test is used routinely at the AMHTS, further measures including modification of some expressions among the test items and the development of an analytical method to produce depression scores, are required.

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REFERENCES

APPENDIX

Discriminant analysis

Discriminant analysis is used to detect from which population a sample comes. In this report, the population and the sample are a so-called healthy group and a subject who visits the AMHTS, respectively.

Let \( x \) be a sample from the so-called healthy group, where:

\[
x = (x_1, x_2, \ldots, x_m)',
\]

and where \( x_j \) is the \( j \)-th (\( j = 1, 2, \ldots, m \)) item datum of the sample. We assume that \( x \) has a multivariate normal distribution expressed as:

\[
x \sim N(\mu, \Sigma),
\]

where \( \mu \) and \( \Sigma \) are the mean vector and the variance-covariance matrix, respectively. They are written as:

\[
\mu = (\mu_1, \mu_2, \ldots, \mu_m)',
\]

\[
\Sigma = \begin{pmatrix}
\sigma_{11} & \cdots & \sigma_{1m} \\
\vdots & \ddots & \vdots \\
\sigma_{m1} & \cdots & \sigma_{mm}
\end{pmatrix},
\]

where \( \mu_j \) and \( \sigma_{jk} \) are the expected value of the \( j \)-th item and the covariance of the \( j \)-th and \( k \)-th (\( j \) or \( k = 1, 2, \ldots, m \)) items, respectively.

We obtained the random sampling data of \( n \) subjects from the so-called healthy population as:

\[
X = \begin{pmatrix}
x_{11} & \cdots & x_{1m} \\
\vdots & \ddots & \vdots \\
x_{n1} & \cdots & x_{nm}
\end{pmatrix},
\]

where \( x_{ij} \) is the datum of the \( i \)-th (\( i = 1, 2, \ldots, n \)) subject and the \( j \)-th (\( j = 1, 2, \ldots, m \)) item. The estimates of \( \mu \) and \( \Sigma \) are calculated as:

\[
\hat{\mu} = \bar{x} = (x_1, x_2, \ldots, x_m)',
\]

\[
\hat{\Sigma} = V = \frac{1}{n-1} \begin{pmatrix}
\bar{s}_{11} & \cdots & \bar{s}_{1m} \\
\vdots & \ddots & \vdots \\
\bar{s}_{m1} & \cdots & \bar{s}_{mm}
\end{pmatrix},
\]

where \( \bar{s}_{jk} \) is the variance of \( x_{ij} \).
\[
\frac{1}{n-1} \cdot S_i
\]
where \( \bar{z}_j = \frac{1}{n} \cdot \sum_i x_{ij} \),

\[
v_{jk} = \frac{1}{(n-1)} \cdot \sum_i (x_{ij} - \bar{z}_j)^2
\]

\( (x_{ik} - \bar{x}_k) \)

and

\[
s_{jk} = (n-1) \cdot v_{jk}.
\]

When we obtain the data of a subject who visits the AMHTS, a screening test to determine whether he or she belongs to the so-called healthy population or not can be carried out. Let \( y \) be the data vector of the subject, where:

\[
y = (y_1, y_2, \ldots, y_m)',
\]

and where \( y_j \) is the datum of the \( j \)th (\( j = 1, 2, \ldots, m \)) item. When the null hypothesis is that he or she belongs to the so-called healthy population, the statistic which has an F-distribution is obtained as:

\[
F = \frac{n \cdot (n-m)}{(n+1) \cdot m} \cdot (y - \bar{x})' S^{-1} (y - \bar{x})
\]

\(~ F(m, n-m), \)

derived from Hotelling's \( T^2 \) test. Using the F-table we can calculate the upper probability of the F point. The upper probability is the false probability when he or she does not belong to the so-called healthy population, i.e., the probability that he or she belongs to the population. If \( F \) is great (i.e. the upper probability is small), it means that he or she does not likely belong to the so-called healthy population.