

Special Articles

SCREENING-OUT THE NEUROTIC

H. J. EYSENCK

Ph.D. Lond.

From the Psychological Department, The Maudsley Hospital

THE experiences of the war of 1914-18 demonstrated the desirability of excluding potential neurotics from the Armed Forces, and in both world wars many different schemes were proposed for effecting such a "screening-out." But the stream of neurotics passing through neuropsychiatric hospitals showed that a selection procedure which had proved successful in the field of intelligence and special abilities failed to grapple with the more intangible problems of emotion, adaptability, and character.

These problems still claim our attention now that the war is over. The likelihood of universal military service, the need to have large forces under arms for a long time to come, and the importance of husbanding man-power in industry generally make essential the development of suitable methods of selection on the temperamental side.

The aim of these methods should not be merely the negative one of preventing the neurotic from being chosen for a position for which he is unsuitable and in which he will break down; a more positive aim might be the selection of neurotics for suitable treatment or for guidance into jobs having a low "stress" value. It is clearly necessary to have valid and quick methods for identifying the neurotic or the potential neurotic; what use may be made of the information gained depends on factors outside the competence of the psychologist or the psychiatrist.

There are two main approaches to this problem: the psychological and the psychiatric. These two approaches have at times been held to be antagonistic, and there are undoubtedly considerable differences between them in methodology and underlying philosophy. Yet, in spite of disagreements, which have at times become vocal (Rodger 1943, 1944, Gillespie 1944), it seems clear that psychology and psychiatry have complementary functions, and have everything to gain by understanding each other's points of view.

The disputes which seem to divide psychologists from psychiatrists are often due to a failure to effect such an understanding. Thus psychiatrists often claim that for screening purposes the traditional psychiatric interview cannot be dispensed with, and that objective techniques have no place as yet in this field. On the other hand, psychologists often draw attention to the subjective nature of the psychiatrist's work and claim that tests developed along traditional lines can fill this important gap.

An extreme development of the psychiatric position is seen in the American practice of having large numbers of recruits seen for five or ten minutes by a psychiatrist who pronounces on their mental fitness on the basis of this brief interview (Wittson et al. 1943). An extreme development of the psychological position would consist in the classification of recruits as "neurotic" on the basis of objective tests alone.

"Screening" is essentially a dual task. In the first place, the extremely large number of recruits or applicants has to be sifted to find as many of the problem cases as possible. As a second step, it has to be decided whether each man is likely to adjust satisfactorily or not. This final decision must be left to the psychiatrist, but the preliminary sifting can be done by means of objective psychological tests. In other words, the screening should contain two filters, the wide-mesh psychological filter, and the finer psychiatric filter.

EFFICIENCY OF PSYCHOLOGICAL FILTERS

It is possible to compare the efficiency of different psychological "filters" by statistical indices (Hunt et al. 1944, Eysenck 1945). These indices are constructed on the principle that, if a test can distinguish validly between a group of neurotics and a group of normals, its efficiency is a function of the percentage of correct neurotic identifications and of the percentage of "false positives"—i.e., normals diagnosed as neurotics. A simple but useful formula is the following:

$$\text{Screening index} = \frac{P - N}{100}$$

where P is the percentage of neurotics correctly so diagnosed by the test, and N is the percentage of normals wrongly diagnosed as neurotic by the test. The index varies between the limits of 1 (perfect discrimination) and 0 (no discrimination at all).

With this formula we can compare the efficiency of various psychological "filters," provided the populations tested are roughly similar. This condition appears to be fulfilled in a number of researches, one of which summarised work with three objective psychological tests and one American questionnaire (Eysenck 1945), another used individual interviews given by specially trained women of the W.R.N.S., and interpretations of their findings by psychiatrists (Curran and Roberts 1945), while the third made use of the "Maudsley medical questionnaire," a psychoneurotic inventory which I constructed on the basis of item analyses performed on a number of previous inventories (Eysenck 1947).

In all these researches the validating criterion of "neuroticism," against which the efficiency of the test was measured, consisted in the previous referral of the person concerned to a neurosis centre. The criterion of normality, on the other hand, was simply the failure of the person to be referred to such a centre. In other words, the normal group in each case almost certainly contained several actual or potential neurotics who would sooner or later find their way to a neurosis centre.

The results of comparing the six tests (interviewing, two questionnaires, and three objective tests) are as follows:

Tests	Screening index
Maudsley medical questionnaire ..	0.75
Dark vision test	0.63
Suggestibility test	0.55
Interview	0.38
American questionnaire	0.36
Ranking Rorschach	0.32

It will be seen that three of the psychological tests are superior to the interview, while the other two are only slightly inferior. All six tests show an efficiency rating which suggests that even in their present undeveloped form they might be useful in detecting potential neurotics. Since the tests in combination are likely to prove much more informative than they are in isolation, the figures present a strong prima-facie case for further work along these lines. It may also be noted that though the figures quoted cannot pretend to great accuracy in view of the fact that different populations were used in the different researches, they suggest that an objective test, such as the suggestibility test, or a questionnaire, such as the Maudsley one, which can be given in a few minutes to several people at a time, and which does not require great skill in administration or scoring, may be superior to the relatively complicated interviewing technique described by Curran and Roberts (1945).

Proof that a test discriminates between normals and acknowledged neurotics is not proof that the test would pick out the potential neurotic before his breakdown. Our evidence on this point is only presumptive. Thus, in my work at Mill Hill Emergency Hospital, I found that

the tests mentioned succeeded in differentiating the more seriously from the less seriously ill, agreeing well with the psychiatrist's opinion (Eysenck 1947). I also found that in "normal" groups these tests differentiated between the well-adjusted and the less well-adjusted. And in a large-scale experiment on R.A.F. recruits it was found that there was considerable agreement between a psychiatrist's report on the subjects' mental health and likelihood of breakdown, and the subjects' scores on the Maudsley medical questionnaire.

But the need for direct evidence on this point cannot be gainsaid. Such evidence can only be provided by large-scale follow-up studies, and it is one of the main purposes of this paper to draw attention to the need for such an extension of research.

SUMMARY

Attention is drawn to the importance of "screening" methods in military and industrial affairs, and to the necessity of coöperation between psychologists and psychiatrists in this field.

Data are presented to show that objective tests, questionnaires, and other modern techniques are comparatively successful in discriminating between "neurotics" and "normals," and it is suggested that a strong prima facie case exists for the inception of large-scale follow-up studies to investigate the effectiveness of these procedures in screening-out the neurotic.

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IMPERIAL CANCER RESEARCH FUND

1946-47

In his summary of the work done during the past year in the laboratories of the Imperial Cancer Research Fund, Prof. W. E. Gye, F.R.S., the director, reports developments in most of the main lines of investigation.

In the chemical field Mr. H. G. Crabtree, M.Sc., has continued his studies of the relation between carcinogenic action and sulphur metabolism. He has already shown that the induction of tumours by the application of carcinogenic hydrocarbons may be retarded by the simultaneous application of compounds interfering with sulphur metabolism, and has demonstrated that there is a parallel between the degree of anticarcinogenic and sulphur-inhibiting activity. If carcinogenic activity depends on the interaction between carcinogen and some sulphur-containing constituent of the cells, then it might be possible by the application of some endogenous sulphur-containing compound to compete with the normal interaction and so nullify it. In an attempt to bring this about Crabtree applied various thiol compounds at the same time as 3:4-benzpyrene. Several mono-thiol compounds were tested without effect. Two di-thiol compounds were tested: toluene-3:4-dithiol and 2:3-dimercapto-propanol (B.A.L.). Both these compounds are chemically extremely reactive. Unfortunately the first proved very toxic and could be used only in relatively small dosages, which were inactive. The compound known as B.A.L. could be given in quite high doses, but again no support for the hypothesis behind the experiment was forthcoming: there was no interference with the carcinogenic action of the benzpyrene.

Another aspect of the relation between cancer and sulphur metabolism is revealed by the fact that normal metabolites of the carcinogenic azo-dyes inhibit the activity of sulphhydryl enzymes. This relation seems to be in the opposite sense to that between the hydrocarbon

carcinogens and sulphur metabolism. When the two types of carcinogen were applied at the same time to mice there was no additive effect—in fact, there was some inhibition of the action of the hydrocarbon in one case, but here the azo-compound used (*o*-aminoazotoluene) was somewhat toxic.

Dr. L. Foulds's researches have provided some illustration of the hereditary factor in cancer. He has investigated the action of 2-acetoaminofluorene in different mouse strains by including the compound in the diet. The tumours which resulted differed in their site according to the sex and strain of the mice. In R3 mice tumours of the bladder were produced in males but not in females. This sex difference is not universal, since Armstrong and Bonser did not find it in CBA mice. The treated R3 females developed mammary cancers, as they do spontaneously, but the treatment appeared to accelerate their appearance.

Sidelights on the virus aspect of cancer are provided by Dr. B. D. Pullinger's study of the parts played by oestrogen and milk factor in the development of nodular hyperplasia of the breast which appears in all females of the R3 strain of mice. A subline of this strain free from milk factor was established by rearing an original family with a foster-mother from a cancer-free line. Virgin females of this subline and of normal R3 mice were spayed when 56 days old and were given one or two applications of oestrogen. After these applications there was a progressive development of the mammary glands followed by a regression. This regression in the subline free from milk factor proceeded until at autopsy their mammary were composed of shrunken ducts without any foci of acinous proliferation, while in the normally reared females there were scattered foci of adenomatous proliferation indistinguishable from those seen under normal conditions of cyclic oestrous phases or pregnancy. The result proves that the appearance of nodular hyperplasia is dependent on the milk factor.

The endocrine factors are implicated in Dr. E. S. Horning's researches. Before the war Horning had initiated an investigation into the possibility of inducing tumours of the prostate by local injections of methylcholanthrene. Tumours were readily produced but they were either sarcomas or squamous-cell cancers and quite unlike those seen clinically. The type of tumour depended on the strain of mice used: all sarcomas were produced in R3 mice and sarcomas and squamous-cell cancers in Strong A mice. Last year Horning took up this study again and was able to produce other types of prostate tumour by a development of Peyton Rous's finding that grafts of embryonal tissue mixed with carcinogen made in homozygous mice grow and develop cancerous properties. Horning found that strips of adult prostate tissue wrapped round a crystal of methylcholanthrene and implanted subcutaneously in homozygous normal mice of the same strain will readily develop into tumours. Again the type of tumour apparently depends on the type of mouse used. In Strong A mice almost all the tumours were glandular cancers, which were transplantable and showed various degrees of secretory activity. All the tumours in C3H mice were spindle-cell sarcomas. These tumours are under active investigation and obviously the method offers great possibilities for the study of the development of glandular tumours and of the direct and indirect effects on them of hormones and other agents.

Another application of the Peyton Rous technique has been made by Prof. Ida Mann, who produced cancers of the lens epithelium by mixing such tissue from young mice with methylcholanthrene and implanting the mixture into other mice of the same strain (C3H). This proves that the immunity of the lens from malignant change is not due to any immunity of the tissue itself, but probably lies in its situation in the body and its absence of blood-supply.

There have been several changes in the staff during the past year. Mr. R. J. Ludford, D.Sc., Mr. E. S. Horning, D.Sc., and Dr. L. Dmochowski have taken up appointments elsewhere. Newcomers are Dr. James Craigie, F.R.S., who should be a strong reinforcement to virus investigation; Mr. P. C. Williams, B.Sc., as endocrinologist; and Dr. C. C. Spicer as geneticist.