A CROSS-CULTURAL APPROACH TO CLASSIFICATION IN SCHIZOPHRENIA AND OTHER MENTAL DISORDERS*

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The purpose of this paper is to analyze the problems presented by cross-cultural studies in the diagnosis of mental disorders and to delineate an approach which may permit fairer cross-cultural comparisons. Beginning with the basic assumption that mental disorders are the joint product of deviations from the norm in the patient’s biological equipment as well as in his environmental experience, an attempt will be made to obtain indices of mental disorder based on deviations in both of these components. Hopefully, they will not be occluded or exaggerated by differences in the social-cultural-environmental milieu of different groups nor by the potentially different diatheses of people in varying geographical locations. In the course of such an undertaking, the relative contributions of biology and environment to the etiology of mental disorders can perhaps be more clearly highlighted.

Two assumptions underlie this approach. The first is that at the present time incipient mental disorders are detected and diagnosed largely on the basis of observed deviation from social-cultural expectations. Since such expectation is highly dependent on social-cultural norms, cross-cultural comparisons of mental disorders are fraught with much difficulty. To the extent that cultural expectations differ from country to country, deviations from such frameworks cannot be compared directly. The techniques most useful for detecting these deviations are largely the inventorying of overt behavior either through

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observational and/or interviewing methods. How to minimize the differential influence of sociocultural factors in the application of these techniques is our first problem.

The second assumption is that in addition to the culture-bound indicators of mental disorders there may exist culture-free or culture-fair indicators of vulnerability on which comparisons can be based regardless of the social-cultural milieu. The culture-fair are to be sought first in the cross-culturally invariant deviations from expectation (if any exist) which characterize mental disorders. The culture-free indicators must be relatively independent of previous experience and may be either (1) biochemical (2) neurophysiological, or (3) behavioral. The search for the biochemical indicators is a major undertaking now in full swing, but thus far has not yet yielded results which are diagnostically useful. The neurophysiological approach is less well known and its results too are still very tentative. Such techniques as evoked potentials and EEG patterns fall into this category. The behavioral approach is to be distinguished from the uncontrolled observational or clinical approach discussed previously by the fact that while the observational approach is largely naturalistic and uncontrolled (although it can be made systematic), the behavioral approach is based on the laboratory technique of controlled stimulation. (It should be further noted that continued success of the biochemical and neurophysiological approaches is highly dependent upon the further development of behavioral techniques). One promising approach is to focus on the initial component of the response of the patient to stimulation in the various sense modalities. The first 1,000 milliseconds following stimulation can become the testing ground for the culture-free or culture-fair indicators, on the presumption that the learned behaviors from the social-cultural environment may not be able to express themselves quickly enough to influence the response until after the brief initial phase has passed.

Although the culture-dependent techniques are better developed and better known (interviewing, projective tests, conceptual tests, etc.), there are already quite a number of techniques in the culture-free area which can be exploited. Both areas, however, suffer from a common shortcoming—the absence of accepted systematic standard techniques for their investigation. If we could systematize and objectify the techniques already in use, we could improve diagnostic methods considerably by reducing the irrelevant “noise” introduced into the diagnostic procedures. This is the immediate purpose of this paper in contrast
with the long-range purpose of discovering better techniques for discriminating the mentally ill from the mentally well.

Culture-dependent techniques can be improved in the following manner: The mental status part of the mental examination can be made more objective by the use of a systematic interviewing schedule and accompanying inventory for recording both the verbal and the motor behavior of patients. Similar techniques can be developed for evaluating the other parts of the mental examination—the social adaptation of the patient, the anamnensis, and ward behavior. Specific methods for developing each of these will be discussed.

Culture-free indicators have to be sought in laboratory experiments in which the speed, accuracy, and temporal or spatial integration of responses to specified types of stimuli can be measured and contrasted in patients and controls.

Finally, methods have to be developed for integrating the data emanating from such studies, so that the natural lines of cleavage in the patterned data (if such are found) can be discovered. On the basis of these cleavages, the population of mental patients can be fractionated into homogeneous subgroups which will either parallel the old diagnostic categories in part or in whole, or establish new categories for further evaluation.

The need for cross-cultural investigations arises from the fact that the data on hospitalized mental patients show tremendous differences among countries and even within regions of the same country. The variability in incidence and prevalence rates has many sources. Some of these sources of variation are inevitable today, resulting from our lack of knowledge of etiology. Others inhere in the diagnostic task itself, since in the last analysis diagnosis is based on human decisions that are never flawless. But there are some sources of variation which are avoidable under properly controlled (e.g., culture-fair) conditions.

A catalog of the sources of these variations would include (1) cultural differences in the initial detection of mental illness, (2) theoretical assumptions regarding the nature of mental illness, and (3) the specific methods of arriving at the diagnosis.

**Cultural Factors in the Initial Detection of Mental Illness**

The detection, rather than diagnosis, of mental disorders is made largely by laymen—the patient himself, his family, friends, neighbors, the community and its public officials (policemen, sheriffs, etc.). In
the U.S. and especially in the U.K., because of the National Health Service, the general practitioner plays the role of a secondary screen, before the psychiatrist is brought in. Thus, at least the initial detection of mental illness is based largely on those aspects of the patient's behavior which deviate from expected social-cultural norms. As a result, social-cultural forces tend to bias the apparent prevalence of mental illness. While estimation of the true prevalence of all illnesses suffers from this difficulty⁶ there are certain criteria by which the presence or absence of most nonpsychiatric illness can usually be established independently of the patient's behavior (action, feelings, attitudes, emotions and thoughts). In most mental disorders, however, the patient's behavior is the sole basis for making diagnoses. To the degree that such deviant behavior constitutes the basis for suspected mental illness, environmental factors (cultural, social, and physical) may inhibit or facilitate bringing certain types of patients to the psychiatrist for diagnosis. This is one reason why different cultural groups may show different rates of diagnosed mental illness, and this source of variability is definitely attributable to environmental influences. Furthermore, environmental factors may play a large role in determining what label to place on the patient when he comes to the attention of the diagnostician.

An example of the cultural differences in initial detection or in diagnosis or in both is afforded by data recently provided by a cross-cultural study at McGill University.⁴² They sent questionnaires to the network of psychiatrists and social scientists with whom they had established contact through their semiannual review publication. This questionnaire contained a list of 26 symptoms or signs, inquired about the main locale in which the respondent worked and made his observations, the cultural group which predominated in his practice or field work, and included a variety of other questions. The results indicated that the following items were never reported as infrequent in schizophrenics: (1) social and emotional withdrawal, (2) auditory hallucinations, (3) delusions (in general), and (4) flatness of affect. These four symptoms reportedly occur transculturally but in the remaining 22 items out of the 26, definite associations were found between frequency of reported appearance of a symptom and some broad sociocultural grouping. Thus, delusions of destruction and religious delusions are quite infrequently reported except in Christians and Muslims. Visual hallucinations apparently appear most often in African and near Eastern groups and delusional jealousy is most common in Asians,
irrespective of religion. Depersonalization seems to be most frequent in urban populations while delusions of grandeur are most frequent in rural populations.

Since this study was based on a questionnaire, it is not clear whether the traits under examination differ in frequency among the different sociocultural groupings or whether social-cultural factors biased the answers to the questionnaire.

The role of the general practitioner in referring patients in the U.K. was studied by Rawnsley and Loudon. Substantial variation in rate of referral among practitioners was found which could not be accounted for by specific social and demographic factors, selective recruitment of psychiatric patients, clinical severity, diagnosis, age, civil state, or occupation. General social and attitudinal factors on the part of the general practitioner and the community were largely responsible for the variation in referral rate.

**Theoretical Assumptions Regarding the Nature of Mental Illness**

The theoretical models for the mental disorders that now vie for acceptance are so many that this is hardly the place to review them. We shall limit ourselves to a few and illustrate their implication for diagnosis. One school of psychiatry denies any specificity to mental disorders, maintaining that there is only one kind—the failure to adapt or adjust to the environment. Diagnosis is either impossible or of no value in this system.

At the opposite end of the spectrum is the school that maintains that psychiatric diagnoses are based on pathognomonic factors or syndromes of such factors which are universally characteristic of each category of disease in all environments. While there is substantial agreement in this school regarding the universality of symptoms of psychosis, especially the frank psychoses, the agreement regarding neurosis, character, and personality disorders is far from unanimous.

Between these two extremes there are various compromises. In the middle of the range may be found the point of view which assumes that until indexes that are independent of culturally determined behavior become available (as was the case for general paresis, mongolism, PKU, etc.), we shall have to depend on behavioral deviations from social-cultural norms for our diagnoses. Since these deviations are so highly dependent on the environmental context which provides their
frame of reference, different environments may well elicit different
types of deviation, and cross-environmental comparisons may be
impossible.

If we exclude the first school of thought, which denies the usefulness
of diagnosis entirely, the two other points of view both agree that there
is more to mental illness than the deviations from the expected norms.
There must be in addition some vulnerability, perhaps in the neuro-
physiological substrate, which characterizes those who develop mental
illness. If this neurophysiological substrate is relatively free of differ-
ential social-cultural effects it may be useful as an independent criterion
in the diagnosis of the mental disorders.

SPECIFIC METHODS OF ARRIVING AT DETECTION AND DIAGNOSIS

Even if the environmental forces elicited the same or similar types of
deviation from a patient regardless of his country of residence or
socioeconomic level, we could not achieve diagnostic comparability. The
individual factors in the patient’s behavior are weighted so differently
by the family, the community, and the diagnosing psychiatrist that a
consequent increase in the variability of detection and diagnosis must
result. Insofar as the social-cultural norms differ from country to country
and even within different regions of the same country, it is to be
expected that deviations from such shifting standards cannot be directly
comparable. Even the self-reports (or absence of reports) of inner
feelings that are elicited by the psychiatrist are culturally influenced
and interpreted by both the patient as well as the examiner, which
again may lead to increased variability across cultures.

One of the sources of variability in diagnosis reflects the differences
in diagnostic procedures and labels attached to the same patients by
different examiners even within the same culture and sometimes even
within the same hospital.

The unreliability of psychiatric diagnoses has been documented in
a multitude of studies. As an example of such studies one can point
to the recent investigations of Beck et al. They found that agreement
on diagnosis was reached in only 54 per cent of the cases, but that there
was almost perfect agreement for a specific symptom (depth of depres-
sion), an indication that for observations of behavior good agreement
exists. Two-thirds of the disagreements seemed to be chargeable to the
nosological system itself, which in addition to its lack of clear
criteria requires impractically fine distinctions (e.g., between psycho-
physiological reaction and conversion reaction) and which force
decisions between neurotic symptoms and personality disorder when
both are present. The remaining third of the discrepancy was attrib-
utable to variability in procedure on the part of the examiners.

Kreitman has reviewed the studies in which different observers
examined the same patients or comparable groups of patients. He
found only 5 studies of this type in the literature, a testimony to the
fact that careful studies of reliability of diagnosis are rare. In all but
one of these studies, the examinations that were compared were
repeated examinations. In only one study were the patients observed
simultaneously by the same group of observers. The percentage of
agreement varied with the different diagnostic groupings. When broad
groupings were used, agreement ranged from 89 per cent to 59 per
cent for the psychoses as against 46 per cent to 24 per cent for the
neuroses. For the more specific diagnoses, the agreement was lower.

Pasamanick examined the diagnoses allotted after ward assignment
to groups of female patients quite homogeneous in age, residence,
educational status, type of admission, and marital status, who had
been admitted to the same hospital and had been randomly assigned
to the different wards. The greatest discrepancy in diagnosis between
the wards was for neurosis and character disorders. The organic
disorders seemed to have drawn the highest agreement in all the studies.

The basic rationale for investigation is that the detection and
diagnosis of mental disorders today depend to a significant extent on
aspects of behavior of the individual which deviate from social-cultural
norms. These deviations constitute the symptoms on the basis of which
the diagnosis is made. Some of these symptoms may be found to be
universally characteristic of patients across all cultures, others may
be more culture-dependent. In the case of those categories of illness
whose characteristics seem to be independent of culture, there should
be no difficulty in identifying similar disorders in different cultures.

For those disorders which are manifested in behaviors that are culture-
bound, it will be very difficult to identify similar disorders in different
cultures since their characteristic behaviors will, of course, be different.
The first step in the direction of preparing tools for improving
diagnosis is to develop objective measures for detecting deviations from
expected behavior in the particular cultural milieu in which the patient
finds himself. For this purpose systematic interviewing with objective
recording of behavior during the interview and with objective evalu-
ation of the content of the interview is necessary if comparable results are to be obtained for different interviewers.

However, there may be more to mental disorder than this externally observable deviation in behavior. Unless we find the additional factors which underlie the external behavior, we will never be able to make comparisons across cultures except for those illnesses which have behavioral characteristics that are universal. What can these additional factors be? Apparently, if one made the assumption that underlying the externally observable behavior there is a graded vulnerability which differentiates those who develop the illness from those who do not, it might perhaps be possible to obtain indicators of this vulnerability which are culture-free or culture-fair. By culture-free measures we mean those which characterize a vulnerable individual but which remain immune to environmental influences. If such techniques are not discovered, we could settle for culture-fair measures, by which we mean measures that, though subject to the influence of cultural forces, nevertheless still permit the detection of vulnerability across cultures.

What is the nature of this vulnerability? It may have a hereditary basis, or it may develop as a result of trauma-producing experiences very early in life or perhaps even in intrauterine existence. This is no place to argue the question as to the origin of the vulnerability, but it is necessary to recognize that some assumption regarding vulnerability is important for analyzing the development of deviant behavior of the type we call mental disorder.

We have two choices before us. If we assume that this vulnerability is produced by environmental stresses and strains, then it might be possible to subject individuals to a variety of stimuli of a mildly noxious sort to determine their response to such stimulation. It would be ideal, of course, to perform such studies on neonates so as to determine which individuals seem to be more sensitive to stress-producing loads. This, however, is a hazardous procedure, and furthermore we do not know whether the immediate response to the stress-producing load will be indicative of future responses, since it is the repeated presentation of such stimuli which may be basic to the development of vulnerability. On the other hand, to try to determine a genetic basis for this susceptibility is again a problem which is beyond us at the present time. For this reason, we might avoid the problem of the etiology of these conditions and simply test in the early adult schizophrenic for signs of deviation in some culture-free
or culture-fair response that would indicate his vulnerability. Whether this deviation is the cause or the result of the illness cannot be determined now. However, if longitudinal studies reveal the presence of these deviations in individuals long before their clinical symptoms appear, we may have more faith in the possibility that they are not produced by the illness.

One area for the investigation of such indexes is the biochemical analysis of the body fluids. This is now rather widely investigated and is hopefully yielding results that will be of interest. A second approach is to try to examine the neurophysiological response system which may yield indicators of vulnerability. In this study we propose to make a thorough sampling of those techniques that might differentiate the vulnerable from the nonvulnerable. Hopefully this technique would not be as subject to the influences of cultural forces as are the behaviors which are now used for diagnostic purposes. A third approach is behavioral and focuses attention on the initial components of the response to specific stimulation in the various sense modalities. The first 1000 milliseconds following stimulation offer an opportunity for obtaining culture-free indicators of mental illness since the cultural influences may not be able to make themselves felt until after the initial component of the response is finished.70

The model we have in mind consists of four elements: (1) the input of the stimulus, (2) encoding of the information and its propagation to the higher centers, (3) interaction with stored memories of previous experience, and (4) emission of response. Mental disorder may interfere with one or more of these four components or with all of them. Elkes18 has suggested that the encoding of the input and the interaction between the propagated information and stored memories may be at fault in schizophrenia. In an attempt to relate the model to culture-free indicators, it is clear that culture-free deficiencies can occur at any one of the interfaces between the processes or in the processes themselves, but the content component—stored memories—since these are so very much the product of past experience, is perforce culture-bound.

One may raise a question regarding the stability and regularity of each of these four components in normals. It is well known that considerable individual differences exist with respect to the reception, encoding, and retrieval of information in the nervous system and that the intraindividual variability in this respect is also considerable. Furthermore, it is a well-established observation that for both inter-
individual and intraindividual variability patients exceed normals. We might extend our model to include the postulate that each portion of the central nervous system, since it is never static even in the idling state (when no external stimulus impinges), has its own rhythmic cycle of activity. Therefore, successively impinging stimuli, even though they be identical, must produce different responses depending on the duration of the particular cycles which they hit and on the particular phase of the rhythmic cycle which is impinged upon. This may explain the basic variability in the usual responsiveness of an organism. If all cyclical activity had the same duration and stimuli impinged in phase, perhaps the variability would be reduced considerably. If we now postulate further that one of the characteristics of the mentally ill (especially schizophrenics) is greater fluctuation in their rhythmic cycles (less similarity from cycle to cycle in duration and intensity of discharge), we may attribute the differences between patients and normals not to any of the four basic components discussed earlier, but to the inordinate variability of the rhythm of their cyclic activity in the idling state. This may also be at the bottom of the oft-reported variability in schizophrenic reponses. This is a rather loosely structured model requiring considerably more specification before it can be subjected to test, but it does not present any apparent impossibilities.

One essential step in applying the proposed model based upon rhythmic cycles is the provision of methods for assessing the idling state—the initial state of the organism before any stimulus is applied. The measures that generally have been used to study the idling state are of three different types: (1) autonomic, such as the heart rate, galvanic skin response, and pupillary response; (2) skeletal somatic, as, for example, electromyographic recordings; and (3) cortical, as reflected in the electroencephalogram.

The nonspecific system probably exerts an influence on all of these, but in the intact organism it cannot be measured directly and must be inferred from its influence on the other three. We need not be concerned as some are about the lack of correlation between the measures of these three types of systems, since their cycles may be out of phase and the ordinary loads which each system carries (e.g., the heart) even in the idling state differ considerably from system to system. All we need to require of our measures is not correlation across individuals but systematic patterning of the measures in the three systems across successive occasions in the same individual.

It would be well, however, to obtain a single measure which would
represent the organism's idling state. One may speculate, for example, whether the variety of rhythmic cycles which characterize the firing of the different sets of cells in the three systems may not, with the help of the other bodily cycles (metabolic rates, etc.), give rise to an organismic time-clock which characterizes the organism and which may constitute the basis for the difference in time judgments which have been observed between patients and normals. Organismic time may turn out to be some type of average of the individual cycles characterizing the various systems of the body. If organismic time can be used as a measure, the individual differences in this measure may well be related to the first 1000 milliseconds of an individual's response, and in this way serve to bolster the possibility that it is in this brief time period that the differential between patients and normals is likely to be found.

The concept of organismic time may be regarded as an intermediary between sidereal time and subjective time experience. Thus, there are three time clocks to be taken into consideration in the analysis of behavior: (1) sidereal clock, independent of the organism (measured in seconds); (2) organismic clock, dependent on the rate of cycling of the internal milieu (measurable in orgs); and (3) a subjective clock related somehow to the organismic clock (measurable in chrons).

What support can be provided for the hypothesis that the subjective time sense (in chrons) may be based on some aspect of physiological functioning in the various parts of the organism (organismic time measured in orgs)? Over 40 years ago Piéron suggested the possibility that if the speed of organic processes (measured in orgs) is modified by variations in temperature, mental time (subjective time measured in chrons) will increase or decrease proportionately.* Following Piéron's suggestion, François and Hoagland demonstrated that by elevating an individual's body temperature it is possible to modify his behavior so that he counts or taps at a faster rate. Carrel and Lecomte du Noüy postulated that the reason why wounds take longer to heal in the aged is attributable to the slowing down of organismic processes in their milieu intérieur, and this in turn leads to

*It must be noted, however, that the variations in temperature referred to here are the variations in the internal milieu. Simply varying external temperature is not enough, since the initial effect of an external change may introduce compensatory homeostatic changes in the internal milieu, and it is the temperature of the internal milieu that we are concerned with.
the impression in the aged that sidereal time is speeded up, since fewer orgs and corresponding chrons occur per second of sidereal time. Fischer, Griffin and Liss found that organismic time (their term is neuronal time) is accelerated in nervous tissue characterized by the higher metabolic rates, as evidenced by the greater dye-sorption in such areas. LSD-25, according to them, raises the body temperature and leads to more rapid counting and tapping per second. Lhamon Goldstone and Goldfarb at last year’s symposium reported that the less chronic schizophrenic patients, presumably the more agitated, demonstrated the greatest overestimation of clock time, and therefore the fastest organismic time (as did subjects who received stimulants). The chronic schizophrenic patients and the schizophrenic patients in remission showed less overestimation of time than normals, and therefore their organismic times presumably would be slower than that of the normals and than that of the less chronic schizophrenic patients.

The important point here is not to analyze in detail the results of time judgment studies, but to use them as an example of how to relate behavioral measures (time estimation, in this case) to organismic time, especially in psychopathology. There seems to be no general statement possible about the relationship between changes in organismic time and changes in behavior. To clarify the relationship, however, it is necessary to distinguish between two types of response involving time duration that are inversely related to each other and thus are related in opposite ways to changes in organismic time. Responses of the first type consist of the perception of environmental change, per se, and these are postulated to be inversely related to changes in organismic time. For example, perceived environmental changes would appear slower as organismic time becomes faster. Responses of the second type are not perceptual, since they are not responses to specifiable environmental changes. Instead, they are conceptual responses that are dependent upon memory storage of previous environmental changes. Tapping behavior following the instructions to “tap once every second,” when the subject has no clock as a referent, would be an example. Responses of this type are believed to bear a direct relationship to organismic time and would therefore speed up as organismic time became faster.

The importance of distinguishing between these two types of response can be illustrated by analyzing some recent studies of velocity
perception done by Held and White\textsuperscript{24} and by Carlson and Feinberg,\textsuperscript{12} using very similar measurement techniques. These investigations are of particular interest because Held and White studied sensory deprivation effects (which have been related to psychotic behavior) and Carlson and Feinberg compared schizophrenics and normals. In these studies Held and White interpreted prolonged response time results as indicating that their subjects underestimated the velocity of a moving object which, in terms of our formulation, would be related to a speeding up of organismic time. However, Carlson and Feinberg found that upon repeated testing over 13 weeks, their subjects also gave longer response times, which they suggest might be due to the likelihood that repeated testing would be less demanding and eventually the task would become routine, and perhaps even boring. Under these conditions organismic time presumably would slow down, not speed up, as would be demanded by the interpretation of the longer response times proposed by Held and White. When we analyze the technique used by these investigators, we find that subjects had opportunity to utilize both classes of response we suggested earlier—the perceptual and the nonperceptual. They made perceptual judgments of the velocity of the moving object while it was in sight, as suggested by Held and White. They also had to estimate its velocity when it was out of sight. This nonperceptual (conceptual) time judgment came at the end of the trial, and we suggest that it was relatively more important in producing the longer response time than the perceptual component. In other words, rather than interpreting these results in terms of underestimation of the velocity of a perceived moving object, which would suggest a faster organismic time, we interpret them in terms of a prolonged response (an overproduction) by the subjects of the period of time required for the hidden moving object to arrive at the goal. (A similar suggestion was made by Carlson and Feinberg.) This interpretation then leads to the conclusion that in both studies a slower motor response time suggests a slower organismic time.

Ponomarev, a Russian investigator,\textsuperscript{47} supports our interpretation in a report concerning the effect of drugs on the response to a continuously visible moving object. Under these conditions Ponomarev found that caffeine, presumably a stimulant, produced longer or delayed response, while a bromide, presumably a sedative, produced shorter or premature responses. These apparently paradoxical results become more understandable if we remember that the response under consideration here is based upon a perceived rather than inferred change in the environment and that it bears an inverse relationship to changes in or-
ganismic time. Thus, if the caffeine makes organismic time go faster, the moving object should appear slower, and there should be an increase in the number of longer or delayed responses.

We have presented only a brief sketch of the concept of organismic time as it relates to behavioral changes and psychopathology. The organismic time construct, as presented here, is more or less similar to such general terms as excitation, activation, or arousal. It is expected that future development of the construct, however, will include not only the notion of change in organismic times, but also investigation of the magnitude of change, and the problem of the rate of organismic times, per se. There is considerable discussion in the literature about significant physiological and/or psychological time constants. The neuronal shutter theory, originally proposed by Meister, and subsequently mentioned by Lindsley and Ellingson, suggests that the 8-12 cps alpha frequencies of brain waves might serve as a shutter device that give a person periodic views (averaging 100 msec) of his environment. Subsequent investigations by Lansing, Callaway, and Dustman support the general idea of this theory by showing that the reaction time to light pulses can be significantly reduced if the pulses are presented at a particular phase of the alpha brain waves. Venables reported finding a periodicity in reaction times for nonpatients and schizophrenic subjects, and he also showed that although the two groups had the same absolute periodicities, they were out of phase of about 10 milliseconds.

We do not, however, have to wait for pure culture-free indicators. Even if they do bear a cultural impress, they occur so rapidly that the cultural-experiential impact cannot loom very high. For example, the startle pattern seems to be a transcultural response to a sudden noise, parts of which (e.g., the eye blink) occur within the first 40 milliseconds after stimulation on the average and seem to be relatively free of habituation. The entire startle response seems to be finished by about 1500 milliseconds after stimulation. While the psychopathological correlates of startle are not very striking, other types of responses that occur in the first 1000 millisecond range do seem to be promising and will be presented in this paper.

There is a hypothesis which finds favor with many American psychiatrists and psychologists that certain illness resulting from continued exposure to noxious stimulation may not exhibit initially any neurophysiological or biochemical signs. In such cases, a thorough survey of the historical development of the individual would have to
be undertaken in order to identify the experiences which lay behind the development of the disorder. The decision whether to adopt the assumption of initial vulnerability or to reject it must be made on the basis of strategy rather than possibility. The assumption that traumatic experiences per se produce the illness without the help of any original hypersensitivity or vulnerability is not as susceptible to experimental testing as is the assumption that the patient possesses certain vulnerabilities which have led to the illness.

The latter requires direct experimental exploration of some leads which already exist. The former requires a retrospective analysis of past experience or a longitudinal prospective study of potentially mentally ill individuals—a much more difficult if not impossible task. However, adopting the assumption that there is some vulnerability in each patient to begin with, we may discover some patients in whom no vulnerability seems to be present. These might be the individuals who upon closer examination would reveal a life history which was quite deviant and reflected many more traumatic experiences than those who do not develop the illness.

Let us assume that in a given environment there are a certain number of vulnerable types and a certain number of nonvulnerable types. It should be pointed out that by “vulnerable” we mean an individual possessing certain characteristics which, if he were exposed to specific pressures would lead to an illness. In other words, “vulnerability” and “nonvulnerability” are ad hoc concepts dependent for their status on demonstrable evidence that in some situations such people have proved vulnerable. This does not preclude the possibility of finding vulnerability in some of our current “nonvulnerables” if new situations such as radiation effects, etc., are discovered that transfer the previously “nonvulnerable” to the “vulnerable” class. Nevertheless, these types are distinguished from each other, in the ideal case, by comparing profiles of characteristics exhibited for a variety of culture-free measures. Since the measures we use have as their aim the establishment of a typology of susceptibility to various kinds of psychopathology, we must further assume that in another environment the distribution of types into two categories—vulnerable and nonvulnerable—may be reversed. Thus if type A has the inborn error of metabolism producing PKU (phenylketonuria), if environment I provides a diet containing phenylalanine, then A will develop mental deficiency. On the other hand, if the individual of type A lives in environment II, which is free of phenylalanine, a normal pattern of behavior will ensue.
Any one of the vulnerability types (A, B, C . . .) could possibly be associated with any one of the psychopathological or normal behavior patterns, depending on the social-cultural-physical pressures. Conversely, anyone characterized by one of the possible psychopathological patterns could possess one or another of either the vulnerable or nonvulnerable substrates. An individual can fall into one of four categories: (1) vulnerable in environment I and exhibiting psychopathology—the mentally ill; (2) not vulnerable but temporarily exhibiting psychopathology—the pseudomentially ill; (3) vulnerable but not exhibiting psychopathology—the latent case; and (4) not vulnerable and not exhibiting psychopathology—the mentally well.

The visibility or detection of the individuals who are vulnerable as well as of the overtly psychopathological depends to a large extent on the environment in which they live. Since the tolerance of communities for eccentricity varies considerably from environment to environment, the number of detected individuals belonging to the vulnerable and psychopathological class will also vary. Thus, the alleged greater tolerance for eccentricity in the U.K. and the lesser tolerance for drug addiction and alcoholism in the U.S. may explain in part some of the discrepancies in incidence rates. If objective indicators of vulnerability and deviant behavior become available as a result of the proposed study, future population studies can be made more comparable across social-cultural environments.

One may ask why we have chosen the United Kingdom and the United States for our first comparative study. The reasons are as follows: first, the common language; second, the basic disparity in the social-cultural-environmental factors; and third, the available cooperative efforts already in existence. These two countries are sufficiently far apart in social-cultural environments to produce discernible differences in incidence of two major psychoses (manic-depressive psychosis and schizophrenia) and yet not so far apart that we would be likely to run into patently noncomparable diagnoses such as running amok, delire passionel, etc. Let us now turn to the available culture-dependent and culture-free techniques.

THE CULTURE-DEPENDENT TECHNIQUES

A. Observational and Interview Techniques

If we accept the assumption that mental disorders are now detected and diagnosed on the basis of social-cultural deviations, it becomes
necessary to develop techniques and instruments for objectively measuring such deviations. The clinical interview which now constitutes the basis for diagnosis is an unstructured free-floating interview which varies from clinician to clinician and which is unsuited to the purposes of scientific investigation.

Unless a systematic procedure is introduced for collecting information, diagnoses will vary from observer to observer even for the same patient. In order to increase agreement among observers four controlled procedures are being developed: (1) the Mental Status Schedule, (2) the Social Adaptation Schedule, (3) the Structured Clinical Interview, and (4) the Ward Behavior Inventory.

The application of rating scales to the classification of mental patients has a long history despite its relatively recent development.

Father Moore was one of the first to rate the behavior notes in case history material. He factor-analyzed the results, arriving at dimensions not unlike those which Kraepelin had developed earlier through clinical observation. The Malamud-Sands scale was the next one to be developed. Since then, Lorr and Wittenborn have provided scales for psychiatrists for rating the behavior of mental patients.

1. Mental Status Schedule. This technique consists of an interview schedule for the mental status examination and a matching inventory of 248 dichotomous items descriptive of small units of pathological behavior. The schedule contains questions arranged in a definite sequence designed to provide for follow-up of incomplete responses. Most the questions are open-ended so as to encourage the patient to reveal his own mentation. Properly administered, the interview has the “feel” of the clinical evaluation. However, unlike the usual clinical interview the provision of a specific schedule of questions, a fixed order of presentation, and a uniform coverage of the same areas of psychopathology with each patient make it more likely that the differences observed will be due to actual differences among patients rather than to different interviewing procedures. This technique yielded reliabilities of the order of .90 or more when several groups of patients were evaluated independently by three psychiatrists. Moreover, it has distinguished significantly between the amount of psychopathology shown by inpatients, clinic outpatients, and former inpatients on follow-up.

2. Social Adaptation Schedule (in preparation). This technique follows the form of the Mental Status Schedule in that the patient is examined by means of a structured interview and observations ar
recorded on an inventory of dichotomous items descriptive of small units of pathological behavior. However, it differs from the examination of the mental status in that the focus is not on symptomatology but on the presence of disturbed functioning as seen mainly in disturbances in social adaptation. The patient is examined for evidence of disturbed functioning in any of the following areas of adaptation: (1) use of leisure time, (2) friendship patterns and involvement in social activities, (3) work adjustment, (4) sexual and marital adjustment, (5) school or vocational training and (6) level of aspiration. The technique has been designed so that it can be used to supplement the examination of the mental status or can be used on a separate occasion as an independent instrument.

With regard to the anamnesis, we have not yet developed an instrument for this area. It is important, however, to realize that obtaining information on the entire spectrum of a person's developmental history is a research task of the first magnitude. In the experimental approach to this problem it is necessary to develop techniques which will focus on particular critical periods in the history of the individual. It is proposed to begin with a focused interview dealing with the question of the status of the patient a year before he came for help and, by focusing on this particular period, arrive at more objective information. A second focus might be the adolescent friendship patterns of the patient, since in some current research we have found this phase development important in prognosis, especially with regard to type onset. A third focus might bear on early childhood, especially based on history obtained from the family. In all of these aspects of the anamnesis, at least two members of the family ought to be interviewed for cross-checking purposes. While this may sound impractical for everyday use, it should not be beyond the range of a research project. In fact, the Katz Adjustment Scales are based upon questioning relatives of patients. Hopefully, the more intensive methods used in this research can form the basis for more practical approaches in the future.

3. Structured Clinical Inventory. This instrument is similar in form to the Mental Status Schedule but differs from it in purpose. Instead of focusing on mental status evaluation, it focuses on the general social and psychological adjustment of the patient and is intended primarily for use by the social scientist. Emphasis is placed on evoking immediate and salient pathology rather than on probing for a wide range of specific information as with the Mental Status Schedule.
4. Ward Behavior Inventory. This instrument capitalizes on the observational opportunities afforded nurses and ward attendants in everyday contact with the patients. The WBI consists of 150 items rated true or not true. All the items describe observable behaviors as seen during a 48-hour span of observation. Neither retrospective material nor dynamic inferences are included. Total scores reflect global pathology and provide evidence of change in response to treatment. The Ward Behavior Inventory has proved itself reliable when raters are properly trained and motivated. Reliability coefficients ranged from .40 for untrained raters to .84 for well-trained and well-motivated observers. Follow-up studies indicate that the global pathology score correlates at a low but significant level with outcome in terms of length of time out of hospital. WBI scores of 107 patients followed for 1 year had a correlation of .23 with an Outcome Index (1961). Several drug studies have proved the instrument sensitive to change. Among these are the NIMH 9-hospital collaborative study of phenothiazine therapy conducted by the Psychopharmacology Service Center and an unpublished study of the efficacy of a psychic energizer for seniles. Future work with the WBI will focus on analysis of patterns of items and identification of cluster of patients possessing similar symptomatology.

B. Conceptual Techniques

1. Verbal Behavior. Another conceptual or experience-bound involves verbal behavior experiments in which the output of the interviewee is manipulated through reinforcement techniques to yield measures of self-referred affect. Apparently schizophrenics differ from normals only in one aspect of verbal behavior in these experiments—in their tendency to extinguish more quickly after reinforcement is discontinued.

A measure of comprehensibility of schizophrenic speech has become available through the use of the "cloze" procedure. This technique demonstrated that the speech of schizophrenic patients is less predictable than that of matched normal subjects. This was shown to hold for early as well as chronic schizophrenics.

Interviews with patients and informants close to the patient have been used to obtain information on performance and interaction within the household and in other primary social groups, for the classification of patients in terms of social role.

Standardized interview procedures have been used to obtain samp...
of speech behavior to be analyzed in terms of certain measures of vocabulary and grammatical structure for comparison with normal individuals of the same sublinguistic (dialect) background.

2. Thinking Disorder. A series of conceptual tests has been developed to detect deviation in the thinking processes of the schizophrenic. The Metalog Test,\(^{10}\) which measures ability to shift from one to another meaning of a given word, and a variety of sorting tasks have been utilized in the investigation of schizophrenia with special reference to overinclusiveness, anomalous grammatical structure, etc.

The use of psychological tests as adjuncts to diagnosis dates back to Kraepelin's clinic. For the most part, the tests in use today, e.g., intelligence tests, vocabulary, sorting tests, projective tests, etc.—depend heavily on social-cultural influences. A review of these tests would constitute a review of the armamentarium which clinical psychology has developed. As an example of one of the techniques which has proved useful in the diagnosis of psychotics, one can point to the work of Payne.\(^{45}\) By utilizing a variety of conceptual tests Payne was able to differentiate three main aspects of thought disorder in psychotic patients: abnormal slowness or "retardation," "over-inclusion," and "concreteness." The schizophrenic group stood highest in overinclusion, but did not differ from a depressed group in "retardation," while "concreteness" did not show up as a characteristic of any psychotic illness.

**Sociological Variables**

In connection with an ongoing study of the residents of an old age home, techniques have been developed for the investigation of the degree of isolation experienced by an individual and its significance for subsequent adjustment to a home for the aged.\(^{65}\) Similarly, techniques for the measurement of persuasibility, conformity, and integration into the home have been developed. These techniques are perhaps the most significant for discovering the types of social-cultural deviations which relate to mental disorders. In the aged it was found, for example, that the senile dementia cases proved to be quite conforming while the functionally ill were very low in conformity.

In the same vein, patients with senile dementia made a favorable evaluation of a home for the aged while patients with functional psychiatric disorders evaluated the home negatively. On a measure of integration into the activities of the home and on a scale of anomie
both types of mental patients rated lower than the normal residents. Neither group differed from the normals in persuasibility. With the techniques such as these we can discover the specific dimensions in which various types of the mentally ill deviate from social-cultural norms.

D. Anthropological Variables

While a comparison of American culture with such a closely similar culture as the British will probably not reveal differences as dramatic as comparison with an exotic culture, it is nevertheless important to identify differences that may contribute to the discrepancies in the rates of the mental disorders. At all events, since at least the detection of mental illness is highly influenced by cultural forces, care must be taken to determine the equivalence between the two countries with regard to such general customs as greeting, bereavement, courtship, and other characteristics of social interaction.

In order to develop a measuring instrument which will be useful cross-culturally it will be necessary to find the concrete behavioral equivalents in the two cultures which characterize the categories found useful in detecting psychopathology. It will be necessary also to evaluate the relative importance within the different cultural systems of the corresponding concrete behaviors. To these ends careful anthropological investigation will be required. In attempting to establish normative baselines it would also be useful to assess the particular sociocultural milieu of the patient and the nature of the social groupings in which the patient has been a member. Questions should be formulated on the patient’s household—its members, their activities, their child-rearing practices, their contact with the patient, with each other, and with others outside the household; on the patient’s employment in terms of social structural considerations—coworkers he was in contact with, the nature of his and their contact, etc.; and similarly with respect to other major involvements of the patient. With all of this, there should also be obtained a description of overall behavior—not merely of the symptomatic behavior, but of the ordinary behavior of the patient. Such information should be obtained from several informants.

The patient’s entry into the hospital should be systematically observed, perhaps in terms of a simple interaction framework, which can be used also by observers of his initial interview and of his behavior on the ward. Another approach, which should be seen as complement-
tary rather than alternative, is the direct intensive study of several selected subcultural groups for the careful establishment of behavioral, structural, and evaluative norms relevant to the mental patient's behavior and to his incorporation in a community. As a supplement to these approaches, it might be useful to explore the possible value of such techniques as the semantic differential in comparing mental patients with culturally similar normal subjects. Such comparisons would yield information regarding attitudes, personal value systems and conceptual frameworks in which the patients deviate from the normals.

The degree of rapport or interaction between patient and diagnostician can be gauged objectively by utilizing the cloze technique discussed previously. If a sample of speech obtained from the psychiatrist were given to the patient with every fifth word deleted and the patient required to supply the missing words, and similarly if the patient's speech production were treated in the same way and given the psychiatrist to fill in, some measure of the degree of rapport between the two could be obtained. If more than one psychiatrist were involved, different degrees of understanding between patient and diagnostician could be related to the evaluation.

**Culture-Free or Culture-Fair Techniques**

In order to simplify the presentation of the variety of techniques available for evaluating pathology in ways that are culture-free or culture-fair, a table has been devised (table 1) which presents the variety of responses the subject is capable of, and the types of stimulation which may be used to elicit these kinds of behavior.

It can be readily seen that as one ascends the columns of the table one begins to get involved more and more with culturally determined responses, but even the lowest rung on the ladder—the physiological—is not always entirely free of social-cultural influences. However, it seems plausible that the effect of hyperventilation on the EEG, for example, is less dependent upon culture than is speed of reading on the Stroop Cards. Some of the behavioral techniques which we have developed and which fall in this category of being less dependent on social-cultural norms are (1) pupillography, (2) cross-modality reaction time, and (3) some measures of temporal resolution in vision and audition.

Most clinically oriented workers wonder how functions so far removed from overt behavioral deviations can help in diagnosis. This
<table>
<thead>
<tr>
<th>LEVEL OF OBSERVED BEHAVIOR</th>
<th>IDLING STATE VARIABLE</th>
<th>APPROPRIATE ENERGY FUNCTION</th>
<th>INAPPROPRIATE ENERGY FUNCTION</th>
<th>STIMULUS VARIABLES CONFIGURATIONS VARIABLE FUNCTION</th>
<th>SIGNAL VARIABLES VARIABLE FUNCTION</th>
<th>SYMBOLS VARIABLE FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conceptual</td>
<td>—</td>
<td>Reverie and fantasy</td>
<td>Uniformly diffused light</td>
<td>Inversion of gravitational attraction</td>
<td>Subjective account of experience</td>
<td>Aircraft forms or silhouettes</td>
</tr>
<tr>
<td>Psychomotor</td>
<td>—</td>
<td>Spontaneous movement</td>
<td>Painful stimulus</td>
<td>Arm withdrawn</td>
<td>Electroshock</td>
<td>Star-shaped maze</td>
</tr>
<tr>
<td>Perceptual</td>
<td>—</td>
<td>Spatial and temporal orientation</td>
<td>White noise</td>
<td>Orientation to direction of sound</td>
<td>Pressure stimulation above retina</td>
<td>Phosphene</td>
</tr>
<tr>
<td>Sensory</td>
<td>—</td>
<td>Background noises; cortical gray</td>
<td>Light of graded intensity</td>
<td>Threshold response</td>
<td>Electrical stimulation of thermal receptors</td>
<td>Warmth or cold sensation</td>
</tr>
<tr>
<td>Physiological</td>
<td>—</td>
<td>BMR; basal EEG; basal PGR</td>
<td>Increase in carbon dioxide concentration</td>
<td>Change in rate of respiration</td>
<td>Pressure on carotid sinus</td>
<td>Change in heart rate</td>
</tr>
</tbody>
</table>

TABLE 1.—Examples of Measurable Activities as Functions of Stimulus Variables
has been trenchantly pointed out by Cartwright, Kirtner, and Fiske in a recent report.\textsuperscript{14} They say, “The business of neurosis and recovery exists and is exhibited only in the contexts of the self, family, friends, employers, and clinical practitioners. . . . A desirable conceptual variable in the domain of neurosis and recovery through psychotherapy would likely have at least one principal quality: observers in different roles can systematically agree or disagree about it. A second prerequisite would be that of inherent meaningfulness. All observers might easily agree that, following a sudden loud noise, a patient’s galvanic skin response has changed in a certain direction and amount. But what such a change might signify would be unclear. In particular, its relevance to daily functioning in ordinary interaction with others is in doubt. Yet it is precisely for such daily functioning that the appropriate conceptual variables must have inherent meaningfulness.”

It is apparent that an insatiable curiosity motivates these writers. We still don’t know why the Wasserman test works, nor how aspirin brings about its effects. Why we should demand more from neurophysiological techniques before they are accepted as diagnostic aids in the mental disorders is beyond our comprehension.

The culture-free measures can serve two functions. First, though no measures can be said to be completely culture-free, the way in which culture might affect such measures as pupillary response to light stimuli is indirect, unlike the direct way in which culture influences primarily conceptual measures such as vocabulary. The major way in which culture will tend to influence the culture-fair tests is likely to lie not in the function under measurement, but in the subject’s approach to the testing situation—e.g., in the subject’s understanding of the purpose of the test, in the degree of fear experienced, in his motivation, attention, cooperation, etc.—in other words, specifically in those variables which also tend to contaminate comparisons of schizophrenics and normals even when they come from the same cultural background. But it is these very contaminations that the experimental culture-fair techniques have been constructed to minimize.*

Secondly, to the extent that it is possible to minimize cultural influences on such measures, the findings may reflect the presence of

\*Such designs include obtaining complete functions rather than isolated points of measurement for each individual, comparisons of slopes of functions rather than level, the measurement of functions under idling state conditions and under load conditions, and finally, the use of the range of variation within a population as a basis for assessing observed deviation.
"organic" factors (vulnerability) relatively independent of social-cultural etiology in at least some part of the mentally ill population. One may then use similarity in response on the psychophysiological measures as part of the pattern of behavioral characteristics which may prove to be invariant across sociocultural boundaries.

This culture-fair substrate underlying the behavior of groups of mentally ill patients may also be used to investigate the possible differential effects of culture on behavior. If the underlying organic factors are identified, the individuals who are characterized by these factors and who exhibit behavior pathology can be compared with those who do not, to determine the types of differential interaction between physiological and cultural factors which led to pathology in one group but not in the other group.

This interaction between physiological and cultural factors is only one aspect of the interaction possible in our heuristic table in which the physiological, sensory, perceptual, psychomotor, and conceptual responses are elicited by energy or symbol stimuli.

In actual experience, these heuristic elements do not occur in isolation any more than chemical elements occur in the pure state in nature. For example, the experience of fear involves the entire spectrum of responses from physiological to conceptual. Following the usual analysis, the sight (sensory and perceptual) of a fear-inducing object usually leads to an immediate appraisal of its dangerous character (conceptual based on stored memories) and is accompanied by viscer (physiological) excitation and may lead to flight (psychomotor). It has been possible to demonstrate experimentally that in order to obtain a "true" emotional experience, all of these levels of response are essential. Thus, merely inducing the physiological component through the injection of adrenaline will not evoke a true emotion nor will the induction of an emotional mood by means of moving picture episodes lead to a true emotion when the physiological component is blocked. The required interaction between sensory and conceptual responses is attested to by the recently developed detection theory of Tanner and Swets in which a manipulation of expectancy (a conceptual component) can vary the threshold. The placebo effect, especially in pain studies, has been shown to be a reflection of conceptual expectancy. Even in animal experiments, such as Harlow's monkeys or Birch's rats, the role of stored memories in determining the response to stimulation is well known. The role of the interaction between ph.
siological and conceptual components in therapy, especially in behavior therapy, is now the focus of attention.\textsuperscript{69}

While the conceptual component, representing the stored memories of previous experience, seems to enter into most responses so that there is always the chance that cultural effects will contaminate our search for culture-free or culture-fair techniques, it may be possible to reduce the conceptual component to a minimum, if not to exclude it entirely. Examples of such responses are the higher activation levels of early schizophrenics, which Mednick\textsuperscript{59} and others postulate. The linking of body fluids to psychoses may present another culture-free or culture-fair differential.

Our theoretical and methodological interests in the short-time domain of 1000 milliseconds or less leads us to compare schizophrenic and normal subjects by considering experimental studies which employ brief periods of time for their independent and/or dependent variables. Probably one of the best-documented experimental differences between schizophrenic and normal subjects is that patients display longer and more variable reaction times. In addition, there are a number of reaction time studies which, while demonstrating the longer reaction times of patients, also provide some interesting additional data.\textsuperscript{59} We already have mentioned Venables' report\textsuperscript{61} of periodicity of reaction times in which normals and schizophrenics demonstrated 100 millisecond periodicities which were out of phase with each other by milliseconds. Venables and Tizard\textsuperscript{64} reported a "paradoxical" reaction time effect in which for some patients reaction time decreased as the stimulus intensity increased, up to a certain stimulus intensity, but beyond this intensity reaction times increased. Unfortunately, this effect did not persist beyond the first day of experimentation and as far as we know a replication has not been reported.

Using another, more complex, type of psychomotor task, King\textsuperscript{29} demonstrated that schizophrenic and normal subjects differ in their ability to tap in synchrony with a repetitive click presented 1-3 seconds apart. These results show that normal subjects in such a task tend to anticipate or respond before the synchronizing stimulus is given,\textsuperscript{*} while schizophrenic subjects respond after the stimulus presentation. Similar differences between normal and schizophrenic subjects in a synchronization task was reported by Abell.\textsuperscript{1} In an even more complex, but somewhat related task, Carlson and Feinberg\textsuperscript{12} reported that

\textsuperscript{*}Also reported in Bartlett and Bartlett.\textsuperscript{2}
schizophrenics demonstrate a greater inability than normals to synchronize a circularly moving clock hand with a predetermined spot on a clock face. The patients tended to respond later than the nonpatients, so that for them the clock hand went further beyond the target than for the normal subjects. In a study of motion perception, Johansson, Dureman and Sälde\textsuperscript{26} described a technique that successfully differentiated a group of normal subjects from a group of psychiatric patients characterized as autistic and socially isolated. Their technique was based upon the observation that two objects moving in opposite directions are perceived as moving much faster than their actual speeds. Under these conditions the autistic subjects seemed to be less influenced by the illusion of the two moving objects since they judged their objective velocity more accurately than the normal subjects.

If patients differ from nonpatients in some physiological, time-processing characteristics, then one might expect differences between patients and normals in their capacity to receive and integrate temporal events in their environments. This would logically be true, especially if the environmental temporal components happen to be of the same time duration as the impaired or modified physiological temporal processes or mechanisms. Since our emphasis is upon intervals one second or less, it is necessary to consider environmental time constants of the same magnitude. Considerable data are available concerning such temporal parameters as pulse frequency, pulse duration, and the time between pulses. Behavioral phenomena such as critical flicker frequency, apparent movement, two pulse thresholds, auditory localization, and masking can all be characterized as temporal, environmental manipulations in the 1000 millisecond domain. If patients are found to differ from nonpatients in psychophysical investigations of these effects, and if adequate methodological precautions have been taken to minimize the nonsensory contributions to these psychophysical determinations, then such patient-nonpatient differences may provide us with a culture-fair or culture-free technique for detecting pathology.

An important "if" in the above formulation is in regard to the minimization of nonsensory components in the threshold determinations. For example, Clark, Rutschman, Link, and Brown\textsuperscript{15} recently argued that numerous previous studies of critical flicker frequency in which patients were found to have lower CFF thresholds than normal subjects simply reflected a criterion difference—a difference between normal and patient subjects in their willingness to say they saw the flickering light as fused. A recent CFF study by McDonough\textsuperscript{28} is note-
worthy in that it reports that reactive schizophrenics demonstrated higher CFF thresholds than normals. It is more difficult to explain a higher CFF threshold for the patient group as being due to a criterion difference, and thus these results, if replicated, are suggestive of actual perceptual differences between patients and normals.

A number of studies of apparent motion have shown that schizophrenics require longer periods of time between light pulses than normals to produce a motion effect.\textsuperscript{51-54} It has been shown also that schizophrenics require longer exposures of a stimulus display for recognition\textsuperscript{20} and for the correct differentiation of groups of dots which are spatially ordered.\textsuperscript{27}

King\textsuperscript{30} failed to find differences between schizophrenics and normals in the time between two pulses of light that produced for the subjects the appearance of a single flash. Venables,\textsuperscript{63} however, used the same two-pulse technique with an added noise background and found that while the noise did not influence the normal subjects two-flash performance, it changed the thresholds of the schizophrenic subjects. Venables\textsuperscript{62} also related the two-flash thresholds to changes in skin potentials. He reported a negative correlation between skin potentials and two-flash threshold for schizophrenic subjects and a positive correlation of the same variables for normal subjects. Venables suggests these findings for the patients as being related to a parallel arousal of autonomic and cortical activity attendant with a lack of control of cortical activity by the regulatory activity of the reticular formation.

In support of the idea of patient-normal differences in cortical excitability and responsiveness are investigations by Shagass and Schwartz.\textsuperscript{56, 57} These workers recorded evoked potentials to two discrete, electrical stimuli presented to the wrist and separated by brief periods of time. From these electrophysiological data they plotted the resulting “recovery” functions for the effects of the first stimulus upon the amplitude of the evoked potential to the second stimulus. Schizophrenic subjects were found to require a longer temporal separation between pulses than normal subjects for the amplitude of the second evoked potential to return to its baseline, suggesting that they display less cortical excitability and responsiveness than normals.

With the aid of objective measures of both varieties—the culture-bound as well as the culture-free—a new approach can be made to the development of more homogeneous diagnostic groupings. At the present time, much of the research in psychopathology suffers from the great heterogeneity which characterizes today’s diagnostic classi-
fications. Even when there is full agreement on the part of a diagnostic team regarding such diagnoses as schizophrenia or neurosis, the individual patients in each category are far from a homogeneous group, even with respect to the variables which presumably characterize each category. Bleuler has pointed to this fact by substituting for Kraepelin's "dementia praecox," the term "groups of schizophrenias." The heterogeneity in the category of neurosis is too well known to require documentation.

Heretofore, the technique applied to the statistical classification of patients has been factor analysis, either direct or inverse, of the correlations obtained from a sample including rotation to simple structure. Such techniques are elegant and quite suitable if the underlying population from which the sample is drawn has a multivariate normal distribution. Were this the case, there would be no need to search for better classifications, because our population is already homogeneous. However, if we start with an assumption of homogeneity and wind up with a conclusion of heterogeneity, the only justifiable procedure is to reject factor analysis as inapplicable. For this reason, once heterogeneity is established, we discard factor analysis and base our new analysis on the test profile of each patient expressed in standard scores. The usual method of correlating profiles (inverse factor analysis) takes into consideration only the shape of the profiles and neglects entirely the distance between profiles. For this reason, we deal with two measures of distance—discrepancy in shape and discrepancy in level—and group together all patients who show the greatest similarity with respect to these two measures. In this way, under certain assumptions (normality of multivariate distributions as well as zero correlation within each subgroup) a fractionation of the sample into homogeneous subgroups becomes possible.

**Summary**

The behavioral changes which accompany the development of mental disorder have been classified into two major divisions: culture-bound and culture-free or culture-fair. Present day methods of detecting and diagnosing mental disorder are largely based on culturally deviant types of behavior so that there is a need for developing culture-free or culture-fair techniques. Even the culture-bound techniques, however, suffer unduly from variations in their application which produce diagnostic variability that could be reduced by proper controls. Meth-
ods for introducing such controls are provided through such techniques as standard interviews and inventories of behavior that can be objectively scored and evaluated. Experimental methods have been developed for studying verbal behavior itself, the carrier-wave of our culture. These can be applied to differentiating diagnostic groups. Advances in the development of culture-free techniques are not as great. Yet, certain derivatives of reaction time studies, pupillography, evoked potentials to ulnar stimulation, etc., promise well to provide us with serviceable tools. When these objective methods are applied to populations of mentally ill, the new techniques for fractionating populations into homogeneous subgroups may yield new classifications of the mentally ill which will be more homogeneous and more suitable for future investigations.

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3. Reference 3 does not appear in the text.
15. CLARK, W. C., RUTSCHMANN, J., LINK, R., AND BROWN, J. C.: Comparison of


