

EDITORIALS

I. Psychophysiology and psychiatry

Sternbach (1966) defines psychophysiology as a discipline which ‘typically employs human subjects whose physiological responses are usually recorded on a polygraph’. It is this emphasis on the applicability of psychophysiological techniques to *man* which makes their use in the psychiatric context particularly appropriate. A statement by Stern (1964) that ‘any research in which the dependent variable is a physiological measure and the independent variable a “behavioural” one should be considered psychophysiological research’ contrasts this discipline with physiological psychology, where physiological variables are manipulated by stimulation or lesions and the effect on behaviour is studied. Although the use of psychophysiological methods dates back to the nineteenth century and the foundations of the discipline as we know it today were laid by such pioneers as C. W. Darrow, R. C. Davis, and M. Wenger in the period between 1920 and 1950, the main growth of interest has been evident in the last 20 years. This, in part, has arisen from developments in equipment and techniques during that period.

Measures which are obtainable from polygraph records, however, are entirely indirect indices of events and states and too-ready inferences about these events and states are temptingly easy to make. There are two main areas of difficulty associated with the indirect nature of psychophysiological methodology: these are centred around (1) measurement, and (2) interpretation. In the first, the intervention of a chain of a transducer, pre- and main amplifier, and recorder between the body and the eventual recording can introduce error, but the source and extent of this error can be recognized and, where possible, steps taken to minimize it. The second factor is, however, omnipresent and reducible only to a limited extent as knowledge is increased concerning the extent to which peripheral events are the reflection of central ones and how far each mutually modifies the other. In the present state of knowledge, progress is made by a constant interchange between those workers who apply the best available techniques to, for instance, psychiatric problems, those who attempt to improve and understand these techniques and the conditions under which they are applicable, and those who by surgical intervention, almost exclusively on animals, attempt to show in what ways peripheral measures are modified by changes in central state.

Before attempting to give examples of this interchange, it may be worth while briefly to review some of the measures which are typically used. By far the greatest proportion of psychophysiological work has been done with four main groups of variables. Firstly, cardiovascular measures include the electrocardiogram (ECG) with the derived index of heart rate (HR), and the plethysmogram, measured by photoelectric, pneumatic, or radio-frequency impedance methods, giving rise to measures of blood volume and blood volume pulse. Continuous monitoring of blood pressure for polygraph recording has met with restricted success and many workers still prefer traditional methods. The second area in which equally large amounts of work have been undertaken is that concerned with the electrical activity of the skin, where the earlier terminology of PGR and GSR is being replaced by the more informative terms SCR and SCL for skin conductance response and skin conductance level, and SPR and SPL for skin potential response and skin potential level. The third area, of particular interest in the psychiatric field, is that concerned with the activity of skeletal musculature measured by the electromyogram (EMG). Finally, there are those measures concerned with cortical activity; the aim of EEG recording by the psychophysiologicalist is often different from that of the clinical electroencephalographer and measures such as the averaged evoked response (AER) and the contingent negative variation (CNV) which are derivable from EEG techniques are of particular interest. This quadripartite division omits a wide variety of other measures such as respiration, electro-oculography, pupillography, and salivation, which also have wide potential interest and applicability.

An example which is particularly valuable in illustrating the present position of psychophysiology in relation to psychiatry and their mutual dependence upon other areas of knowledge is illustrated by work on orientation. The orientation response (OR) is an indication of the way in which man or animal responds to the state of his environment and the changes in it. It has clear behavioural connotations, its psychophysiological patterning is defined with reasonable agreement between different workers, and, in addition, the central mechanisms involved are the subject of active research. The example is also pertinent at the present time because it represents an area of growth and controversy.

As generally understood (Lynn, 1966), the orientation response (OR) is shown when there is a deceleratory HR response, an SCR, plethysmographic evidence of vasodilatation at the head, and vasoconstriction elsewhere in the periphery; there would also be expected to be signs of phasic electrocortical activity such as desynchronization of ongoing EEG alpha activity. Such features of the response pattern would be expected to occur to the presentation of novel stimuli of fairly low intensity. High intensity stimuli would be expected to involve a defensive reaction in which, for instance, HR acceleration would be seen. Habituation to a repeatedly presented stimulus would be expected, as the novelty of the stimulus waned.

That HR deceleration is a component of the OR is substantially supported by a body of literature reviewed by Graham and Clifton (1966). This component of the OR is also of major interest because of a line of investigation most closely associated with the work of the Lacey (for example, 1970), the interpretation of which is not without controversy (see Obrist, Webb, Sutterer, and Howard, 1970). This work shows that when a subject is presented with a stimulus to which he attends but which does not demand the involvement of decision mechanisms, HR deceleration is the typical response. On the other hand, when the subject is presented with stimuli on which some central processing has to take place, such as data on which a calculation has to be performed, then HR acceleration is typically shown. The idea of environmental intake-orientation versus environmental rejection-defence types of response can thus be conceptualized. (The incidental fact that both these HR changes are normally accompanied by an SCR provides a source of embarrassment for those who maintain a unitary view of arousal.) Patterns of HR and SCR can thus be used to classify subjects as having environmental intake or rejection types of response.

Dykman, Reese, Galbrecht, Ackerman, and Sunderman (1968) carried out an intensive investigation on four groups of patients, 'neurotics, organics, schizophrenics and personality disorders', whose responses they were able to compare with those of normal subjects obtained in an earlier study. The results are complex, but there is a strong tendency for the patients as a whole to show a more 'rejecting' pattern of response than normals, and this to be particularly so among chronic schizophrenics classified as having no affective symptoms.

There is little disagreement that the limbic system is involved in the orientation response (Douglas, 1967; Kimble, 1968). This is exemplified by the finding of the presence of hippocampal theta activity during orientation (Grastayan, Karmos, Vereczkey, and Kellenyi, 1966) and the parallel finding on an HR deceleration to stimulation of the septal area at a point which also serves as a trigger for hippocampal theta (Bromley and Holdstock, 1969). Bilateral lesions of the amygdala tend to reduce or eliminate the SCR component of the orientating response (Bagshaw and Benzie, 1968), while there is a reduction of the habituation of the HR component of the orientating response with lesions of the hippocampus (Sanwald, Porzio, Deane, and Donovan, 1970).

MacLean (1970), for example, has suggested involvement of the limbic system in the psychoses, and the work that he reviews, and that cited above, when taken together imply that we might expect to find similar deficits of orientation among groups of psychotics with similar diagnostic classifications. This hope is not fulfilled if the studies of Bernstein (1964) and Zahn, Rosenthal, and Lawlor (1968) on habituation of the SCR are compared. Bernstein's sample contained a group of chronic 'regressed highly disorganized schizophrenics' and their results may be compared with those of Zahn's patients, who all carried 'a long standing diagnosis of schizophrenia'. In the case of Bernstein's material the pattern is for habituation to take place in almost the first trial and thereafter the level of

responding to be low, while in Zahn's patients, on the other hand, there was hypernormal resistance to habituation of the SCR. Stimulus conditions do not seem to account for the disparity between the studies, although the electrode technique used by Bernstein raises questions. An interesting extension of this type of study by Gruzeller (1970) suggests that there may be two types of schizophrenic patient presenting different types of response, one showing little habituation and the other virtually no responding. These correspond respectively to what would be expected with hippocampal malfunction and the other amygdaloid malfunction. The main clinical characteristic of the former class of patient is the presence of some residual affect; a finding which does not run counter to the observation that patients with morbid anxiety habituate less readily than normals (Lader and Wing, 1966). While this account is brief and to be taken only as illustrative, it does make the point that it is by the integration of facts from empirical experiments on patients, data from physiological-psychological work involving lesions in animals, and findings from psychophysiological studies on subjects that progress appears likely.

A second example of a less-well-developed area may also be cited. Mednick and Schulsinger (1968) provide data which showed that when tested in 1962, those children who were six years later to develop schizophrenia were then characterized by a faster rate of recovery to baseline of their skin resistance responses to auditory stimuli than those who have not since become schizophrenic. Quite independently of this finding, Edelberg (1970) published work carried out over some time on the 'recovery limb' of the skin conductance response and showed that faster recovery was produced under conditions of goal-directed task behaviour than at rest. Ax and Bamford (1970) have supported Mednick and Schulsinger in showing that a faster than normal recovery limb is characteristic of a group of chronic schizophrenics. Edelberg's suggestion is that rate of recovery of the SCR may reflect activity of a sweat reabsorption mechanism; Edelberg's data suggest that water absorption may be involved. However, another possibility raised by the work of Fowles and Venables (1968; 1970) is that sodium absorption could be implicated. A decision between the possible hormonal mechanisms involved in either of these explanations would be of considerable potential value. This final example illustrates a further point of development in the field of psychophysiology—that of the greater utilization of the information available in currently used measures. Up to the time of the work quoted above, with a few exceptions—for example, Darrow (1932)—no attempt had been made to use the speed of SCR recovery as the useful index that it now appears to be. In a similar way, psychophysiologicalists have not previously been interested in the EKG other than as a means of providing a measure of HR. It now appears, however, that the amplitude of the T-wave of the electrocardiogram, insofar as it can reflect the level of plasma potassium, may be a measure of potential usefulness (Christie and Venables, 1971).

While some developments in equipment and techniques may, as suggested earlier, carry the risks of uncritical usage and interpretation, there are other developments the usefulness of which in the psychiatric field more than outweighs such risks. Of these, perhaps the most worth while are telemetry, freeing the patient from the laboratory situation—for example, Walter, Cooper, Crow, McCallum, Warren, Aldrige, van Leeuwen, and Kamp (1967)—the instrumentation tape-recorder allowing records to be stored in an electrical form for later analysis, and the laboratory computer—for example, Weiss and Siegel (1967)—making possible more sophisticated analyses of the data than was previously the case.

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2. How many psychiatric beds?

At the end of 1954, there were 150,000 patients in the psychiatric hospitals and units of the United Kingdom—344 for every 100,000 people in the population. This was the turning point. After increasing steadily throughout the century, the number of beds began to go down. On 31 December 1968, there were only 120,000 beds; 248 per 100,000. Nearly three-quarters of the patients were long-stay—that is, they had been resident for more than a year, while just under 70 beds per 100,000 were used by shorter-stay patients (Department of Health and Social Security, 1970). Most attempts to estimate how many beds will be needed in future are grounded partly on the observation of statistical trends and partly on value judgments as to how far the trends should be allowed, or provoked, to go. There is, however, an imponderable factor, concerning the definition of the term 'bed', which must also be considered.

So far as statistical trends in conventional bed numbers are concerned, the calculation has three components: the number of beds at present occupied by patients who have been in hospital longer than a year (the accumulation from the past); the number of beds needed for patients who will become long-stay in the future; and the number of shorter-stay beds.

The first component can be ignored if the estimate is projected sufficiently far ahead, say 25 years, since nearly all the present long-stay patients will by then have died or been discharged. In order to make a satisfactory estimate of the second and third components, it is necessary to have detailed information concerning the age, sex, diagnosis, and length of stay composition of the mental hospital population on annual census days, and long-term follow-up data on cohorts of admissions. National statistics do not yet provide such information. Psychiatric case registers do supply it and useful