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A02
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Directions to Authors

Three numbers of the Journal are published every year, in January, May and September and contributions for publication should be sent to the Editor not later than 1st November, 1st March and 1st July respectively.

Contributors are requested to be clear and concise. The length of the articles should not exceed 15 printed pages. The manuscript should be in a final form for the press. The introduction and reviews of literature should be restricted and closely pertinent.

The manuscript should be typewritten on one side of the page only, with double spacing, and wide margins, including titles, foot-notes, literature citations and legends. Symbols, formulæ and equations must be written clearly and with great care. Too many tables, graphs, etc., should be avoided. Each table should be typed on a separate sheet with its proper position marked in the text in pencil. *Two typewritten copies of the article should be sent.*

Literature citations :—All references to literature cited in the text should be presented together at the end of the paper in alphabetical order of authors' names. Each reference should be given in a standard form as follows :—

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 - (4) titles of Journals abbreviated according to *World List of Scientific Periodicals*, 1934, and underlined,
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Drawings should be on white board in Indian ink. As many of the illustrations as possible should be grouped together so that they may be reproduced as a single unit. Photographs should be in glossy prints with strong contrasts. They are best submitted in the exact size in which it is desired to have them reproduced. Full page drawings and photographs should be made so as to allow reduction to a maximum size of 8" x 5". The name of the author, figure number and the title of the article should be written in pencil on the back of each figure.

Twenty-five reprints are supplied free to authors. Extra reprints may be had at cost price, but these should be ordered when sending the article for the publication.

Communications should be addressed to Dr. G. D. Boaz, Editor, Journal of Psychological Researches, University Examination Buildings, Madras-5, India.

The Madras Psychological Society

ANNUAL REPORT FOR THE YEAR 1960

The General Body Meeting was held on 18th January 1960. In that meeting the Report for the previous year was read and accepted. The statement of accounts for that year was also adopted. The following office-bearers were elected for the year 1960 :—

President,	... Dr. G. D. Boaz.
Vice-Presidents	... Prof. Indra Sen. Dr. B. Ramamurthy. Prof. C. T. K. Chari.
Secretary	... Mr. E. G. Parameswaran.
Treasurer	... Mr. M. A. Faruqi.
Internal Auditor	... Mr. Syed Sattar Mian.
Executive Committee	... Dr. T. E. Shanmugam, Dr. C. S. Krishnaswamy, Miss Irene Manuel, Mrs. Lyzander, Mrs. Savithrikrishnan, Mr. V. R. Kanniah, Mr. Syed Sattar Mian, Dr. Dhairiyam, Mr. M. Nooruddin, Prof. C. R. Paramesh, Mrs. Vimala Sharma.

During the course of the year the following changes took place in the list of office-bearers.

Prof. C. R. Paramesh and Mrs. Vimala Sharma resigned their places in the Executive Committee. In the meeting of the Executive Committee held on 21st March 1960, Mrs. M. Shenoy and Miss T. A. Sundari were nominated in their place.

In the month of August, Mr. E. G. Parameswaran resigned the Secretaryship, since he was leaving for Canada on study leave. Miss P. E. Devaraj, Professor of Philosophy and Psychology at W.C.C. was elected Secretary in his place. Mr. T. F. Wilson was elected to the Executive Committee in the place of Miss Devaraj.

Activities for 1960

In January, Dr. Konorski, Member of the Academy of Sciences, Poland, visited Madras. On that occasion, the society arranged a lecture by Dr. Konorski on "Recent Developments in Neurophysiology". The lecture was largely attended and was appreciated by the members of the society.

In August, the society got up a party to wish a good journey to and useful sojourn in, Canada to Mr. Parameswaran. The party also served to welcome Miss Devaraj as the new Secretary in place of Mr. Parameswaran.

Conference

The Seventh Madras Psychology Conference was held in October. This Annual Conference usually proves of great interest and value to those interested in psychology. Students and teachers from several colleges participated. Mr. Artur Isenberg, consultant to the Southern Languages Book Trust, spoke on "The insecurity of modern man". Dr. Shanmugam, Reader in Psychology at the University of Madras spoke on "Uses and abuses of Psychology". Two discussion groups, led by the two speakers were set up; a large number of delegates participated in the discussion. In the evening, an excellent programme of entertainment was supplied by some students of psychology.

In the same month George Passey, visiting Professor of Psychology at the Gujarat University gave a talk on the cultural and statistical aspects of abnormality. Dr. B. Ramamurthy presided.

Madras Psychological Society Lecturerships

As members are aware, the society has paid Rs. 5,000 to the Madras University to institute a biennial Lecturership. The Syndicate has accepted the request and has also accepted the terms and conditions recommended by the society.

Journal

The Journal of Psychological Researches has been coming out regularly. Its popularity has increased. Most of the Indian Universities are on the subscribers' list. Several copies of the journal go to England and America on a complimentary or exchange basis. The symposium on "The concept of mind" which we are publishing serially has elicited good interest among the readers.

Membership

So far, we have had more than seventy-five members on our roll. Actually, however, only some of these are active members in the sense that they show their interest by way of paying the subscription regularly. It is requested that members come forward with the subscriptions in January every year. All members, however, are extremely co-operative and always extend a helping hand to the office-bearers in their work. It would be impossible for the society to carry on its activities without the help and encouragement of the psychology lecturers of the various colleges and the University Psychology Department. I take this opportunity to place on record the gratitude of the society to each one of them.

MADRAS
5th April 1961

(Sd.) MISS P. E. DEVARAJ
Secretary

STATEMENT OF ACCOUNTS FOR THE YEAR 1960

PART I. Statement of accounts of the Seventh Madras Psychological Conference held on 23rd October 1960 :

		Rs. nP.	Total Rs. nP.
<i>Income :</i>	(1) Delegate fee from 140 delegates Rs. 2.50 each.	350 00	350 00
<i>Expenditure :</i>	(1) Postage	11 75	
	(2) Conveyance and labour charges	43 24	
	(3) Lunch and Tea	302 29	
	(4) Loudspeaker hire	20 00	
	(5) Printing Badges and Programme	64 26	
	Total	441 54	441 54

PART II. Income and Expenditure of the Society for the year 1960 :

		Rs. nP.	
<i>Income :</i>	(1) Subscription	96 00	
	(2) Life Membership	50 00	
	(3) Refund on a bill realized from M/s. Thompson & Co.	30 54	
	Total	176 54	176 54
<i>Expenditure :</i>	(1) Printing	35 09	
	(2) Stationery including photos and photo album	35 61	
	(3) Labour and Conveyance etc.	31 11	
	(4) Bank's commission on cheques	2 80	
	(5) Replacement of Brain Model damaged in the previous Exhibition	67 05	
	(6) Typing and clerical charges	10 00	
	Total	181 66	181 66

PART III. Accounts for the Journal of Psychological Researches for 1960 :

		Rs. nP.	
<i>Income :</i>	(1) Subscription for 1958 and 1959	90 00	
	(2) Subscription for 1960	468 00	
	(3) Subscription for 1961	10 00	
	(4) Income from advertisements in the <i>Journal</i>	175 00	
	(5) Subsidy from Annamalai University for 1959	150 00	
	Total	893 00	893 00
<i>Expenditure :</i>	(1) Printing of the <i>Journal</i>	1,166 06	
	(2) Stationery and Printing.	8 37	
	(3) Conveyance, Labour and clerical	24 37	
	(4) Bank's commission on cheques	00 50	
	Total	1,199 30	1,199 30

PART IV. Postage account for 1960 :

	Rs. nP.	
(1) Inland and foreign postage for the correspondence and for mailing the <i>Journal</i> of Psychological Researches	247 91	247 91

PART V. Consolidated statement of accounts for the year 1960 :

	Rs. nP.	
(1) Opening Balance from previous year	3,426 06	
(2) Income in Part I (Conference)	350 00	
(3) Income in Part II (Society)	176 54	
(4) Income in Part III (Journal)	893 00	
Total	4,845 60	4,845 60

Expenditure :

(1) Expenditure in Part I (Conference)	...	441	54
(2) Expenditure in Part II (Society)	...	181	66
(3) Expenditure in Part III (Journal)	...	1,199	30
(4) Expenditure in Part IV (Stamps)	...	247	91
Total	...	2,070	41 2,070 41

Closing Balance for the year 1960 ... 2,775 19

Rupees Two Thousand Seven Hundred and Seventy-five and nP. Nineteen

Statement audited by
Mr. Syed Sattar Mian, M.A.,
Lecturer in Psychology,
New College, Madras.

Statement prepared by
M. A. Faroqi,
Hon. Treasurer,
26th March 1961.

Internal Auditor's Statement

Audited the accounts of the Madras Psychological Society for the year 1960 and found them to be satisfactory. The following books and documents have been examined : (1) Balance Sheet for the year 1959, (2) Receipt book for the Society No. 6 (receipt Nos. 595 to 599 incl.) and Receipt book No. 3 (receipt Nos. 201 to 213 incl.), (3) Receipt books for the *Journal* No. 1 (receipt Nos. 67 to 99) and No. 2 (receipt Nos. 100 to 125 incl.), (4) Vouchers for (a) the Seventh Conference, (b) the Society, (c) the *Journal*, (5) postage account book for 1960.

Remarks : There have been too many membership dues during the year. Means for augmenting the funds of the Society may be found out. The income and expenses may be balanced as far as possible and a good reserve built.

MADRAS
26th March 1961.

(Sd.) SYED SATTAR MIAN.

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The Concept of Mind: A Behaviouristic Approach

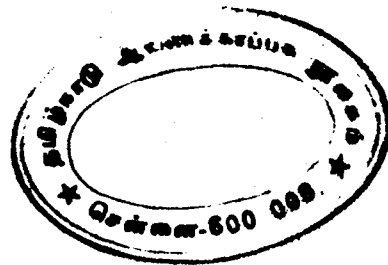
H. J. EYSENCK

Institute of Psychiatry, University of London

It would probably be true to say that there are two main views about the nature and the main task of psychology; these two views ramify and extend to a considerable number of subsidiary issues which at first sight might not be thought to have much to do with the main topic. One view asserts that we are (or should be) concerned with the study of mind and mental events; this view has historical precedence and finds expression in the very word "psychology", *i.e.*, the study of the soul or psyche. The other view asserts that we are (or should be) concerned with the study of behaviour and observable behavioural events; this view also has a respectable ancestry going back at least to Descartes, the French materialists, and many early physiological investigators. Pavlov and Watson in our own time have probably been the best-known protagonists of this view.

The "mind" view has often been associated with "verstehende" attitudes to the problems of personality, *i.e.*, the idiographic approach, emphasizing individual uniqueness, stressing the holistic aspects of personality, and disparaging the "atomistic" point of view. The "behaviour" view has often been associated with "erklärende" attitudes to the problems of personality *i.e.*, the nomothetic approach, emphasising universal laws, stressing the analysis of behavioural sequences, and disparaging the "mentalistic" point of view. Quite generally, tough-minded scientists of the biological school have preferred to deal with various aspects of behaviour; tender-minded philosophers and psychiatrists have preferred to deal with mental concepts and constructs. The behaviourist tends to feel safest in his laboratory, analysing S-R sequences in which the presentation of stimuli is very finely controlled, and in which responses are recorded with great accuracy. The mentalist tends to feel safest in an interview situation in which he can freely explore the individual quirks and peculiarities of the person in front of him. These differences are sometimes expressed by saying that the experimentalist studies trivial things with great exactitude, while the mentalist studies important things impressionistically, and without scientific rigour.

The point of view taken in this paper is quite simple, and not in the least original. It is maintained that behaviour is the only publicly available datum which the psychologist can analyse, and that consequently any attempt to deal with psychological events in a scientific manner must inevitably lead to some form of *behaviourism*. It is maintained that introspection may suggest hypotheses regarding the causation and explanation of behavioural events, but that introspection cannot by itself prove scientific hypotheses to be correct; it must be regarded as a form of epiphenomenon which, though undoubtedly existing, requires explanation in behavioural terms.



It is further maintained that even with respect to those "important" things which the mentalist claims to study, the behaviouristic method is in fact superior whenever a comparison is attempted between the two methods. In brief, the mentalistic approach is believed to be out of date, relatively useless from the practical point of view, and impossible to make into a scientific system. The objections of the mentalist to the behaviouristic approach are believed to be philosophically erroneous, factually inaccurate, and demonstrably inapplicable as far as practical problems are concerned.

In the pages to follow these points will be argued at length. Here let me only note the consequences which follow from the behaviouristic point of view as far as the concept of mind is concerned. If we use this term in any fundamental, casual sense, as giving rise to consequences over and above those studied by the behaviourist, then we can only say of it what the great Laplace said of the concept of God when quizzed by Napoleon about its absence from his famous mathematical model of the Universe: "Sire, je n'ai pas besoin de cette hypothese!" The behaviourist also has no need of such an hypothesis as that embodied in the concept of "mind" as conceived by idealist philosophers; he will not deny the existence of introspectible consciousness as a datum, but will deny disembodied "mind" the right to interfere in a causal sequence of energy exchange such as takes place whenever a person or an animal carries out an action. The objection is sometimes made that it is *inconceivable* that behaviour, i.e., the interaction of atoms and molecules organized into nerves, muscles, glands, etc., should give rise to consciousness, which appears to be different in kind altogether. This does not appear to be a reasonable objection; much of the behaviour of sub-atomic particles is *inconceivable* to common-sense notions derived from the behaviour of relatively large objects constituted of millions and billions of elementary particles; nonetheless science has no difficulty in discovering laws which subsume events at the nuclear level. Similarly, it has been argued that it is *inconceivable* that inanimate matter should give rise to the apparently so different phenomena of life, yet it has proved possible to the biochemist to reproduce these phenomena artificially in his laboratory. What is *inconceivable* to one generation is often the commonplace of the next; no argument derived from such notions deserves to be taken seriously.

Mentalists often point with scorn to the failure of behaviourists to give experimental proof of certain subsidiary notions within their system. Thus Watson has argued that thought is nothing but sub-vocal speech, but attempts to discover a one-to-one correspondence between thought and recorded muscle twitches of the organs of speech have not been very successful. This admittedly fails to support this hypothesis, but it does not strengthen the mentalistic view. Failure to prove a deduction from a theory is not identical with disproving the theory, or with proving its opposite. As an example from classical physics, consider Copernicus's hypothesis which puts the sun in the centre of the planetary system. If this hypothesis is correct, and if the earth does in fact travel around the sun, then it follows logically that observation of the fixed stars should disclose the phenomenon known as parallax, i.e., a displacement of these stars relative to each other when their position is deter-

mined at different times, i.e., according to the hypothesis, from different positions on the circuit around the sun. The geocentric hypothesis does not predict such a phenomenon, and for several hundred years after Copernicus's death no evidence was in fact found for the occurrence of parallax. (This was due to the very great distances involved, which reduced the phenomenon to such small magnitude that existing methods of measurement simply were not fine enough to detect it.) Physicists did not discard the heliocentric hypothesis because of this failure, nor did they regard the opposite hypothesis as proven; they assessed the total evidence available, as well as the theoretical fruitfulness of the two hypotheses in generating verifiable predictions, and accepted Copernicus's theory long before the occurrence of parallax was actually observed.

In a similar vein it can be argued that the first feeble attempt to establish Watson's theory with quite inadequate instrumentation was doomed to failure; much more refined and powerful methods are clearly needed. Failure, in such cases, leaves the question open; success conclusively settles it one way or another. Even taking the whole question at a rather lower level, it can immediately be seen that the behaviouristic position generates a prediction which, in principle at least, is testable, and which is likely to throw a great deal of light on the whole phenomenon of thinking and speaking, and the relation between them; the mentalistic view does not generate any hypotheses, and is scientifically valueless. Nor should it be forgotten that Watson's hypothesis has in fact received powerful support from Jacobson's (1929) electromyographic studies, in which he showed that the *thought* of a muscular movement was invariably associated with a measurable innervation of the muscles involved; when no movements were observed, the subject was asleep. His work, and its elaboration into a fruitful method of psychotherapy by Wolpe (1958) and others, indicate the value of behaviouristic hypotheses as opposed to the utter sterility of the mentalistic approach.

Another criticism which is frequently made of the behaviourist position relates to the alleged inapplicability of laws and data gathered and elaborated in the laboratory to life outside. It is said, for instance, that laws of conditioning are obtained in soundproof laboratories, with precise control of timing and sequences of stimuli, and with elaborate recording of responses; none of these conditions are in fact found in the world outside. This is of course true, but it misconceives profoundly the function of the laboratory, and the applicability of scientific laws. The laws of electricity discovered in the laboratory under precise conditions of control obtain just as strongly in the outer world, where also these controls may be said to be missing. The electric discharge we know as lightning, the generation of electricity in the giant dynamo, the emission of electrons from the surface of the sun—all these can be explained and predicted in terms of laws discovered in the laboratory. Similarly, the laws of conditioning discovered in the laboratory can be used to make predictions about sequences of behaviour outside the laboratory; it has been found again and again that such predictions can in fact be verified. Furthermore, it has been found possible to explain large bodies of observational data discovered *outside* the laboratory in terms of behavioural laws elaborated

inside the laboratory. An example of this will be given presently. The whole objection is typical of philosophically-minded psychologists not familiar with the use scientists make of the laboratory, and the possibilities of extrapolating findings from inside to outside. There are of course dangers, but the critic always has it in his power to devise an experiment to disprove the hasty or ill-considered extrapolation, and to send the psychologist responsible for it back to the laboratory. To reject the very possibility of discovering general laws, valid outside the laboratory, is to fly right in the face of fact.

As the first example to illustrate the usefulness of the behaviouristic approach to psychological problems I have chosen a field which has often been suggested as being particularly difficult and indeed almost incompatible with such an approach, namely, that of motivation and drive. Most readers will be familiar with the profound failure of the efforts made by mentalistically inclined psychologists to carry out a valid form of assessment or measurement in this area. The behaviourist would start with two basic assumptions: (1) the measurement of drive and motivation must be in terms of behaviour and (2) the measurement of drive must occur in terms of a general system of scientific laws in which *drive* occurs as one variable, and in which all the other variables can be measured. Such a system is provided by Hull (1943). Together with certain additions and implications of this system provided by Kimble (1950), Eysenck (1957) and Gwynne Jones (1958), we may state the main relevant concepts briefly and dogmatically in the following sixteen statements: (1) Massed practice produces reactive inhibition (I_R). (2) I_R grows as a linear function of duration of practice. (3) I_R is a negative drive which cancels out part or all of the positive drive (D) active in the testing situation. (4) When $I_R = D$, performance stops and an involuntary rest pause ensues. (5) During this I.R.P., inhibition, being a fatigue-like produce, dissipates. (6) When I_R falls sufficiently below D , performance begins again. (7) I_R is accumulated again until another I.R.P. is enforced. (8) Once the *critical level* has been reached where I.R.P.s interrupt performance, these rest pauses will occur regularly until a programmed rest pause allows all or nearly all of I_R to dissipate. (9) I.R.P.s act as reinforcements for the state of *not working* on the experimental task, and thus, produce conditioned inhibition (sI_R). (10) sI_R is a habit and does not dissipate during rest. (11) When $sI_R = sH_R$, performance stops for good (Kendrick, 1960). (12) Introduction of a lengthy, programmed rest pause allows I_R to dissipate. (13) This dissipation is shown in performance as *reminiscence*, i.e., an improvement in performance after the rest pause, as compared with the level of performance just preceding the rest pause. (14) Due to the absence of I_R after the rest pause, I.R.P.s do not occur, sI_R is not reinforced and extinguishes. (15) This extinction is shown by a marked up-swing in performance. (16) This up-swing lasts until enough I_R is accumulated again to reach the critical level.

It will be seen from this brief statement that when the programmed rest pause is sufficiently extended to allow all, or nearly all of I_R to dissipate, then *reminiscence* is a good measure of I_R . But I_R is a direct measure of D at and after the moment when the critical level has been reached. It follows that *reminiscence*,

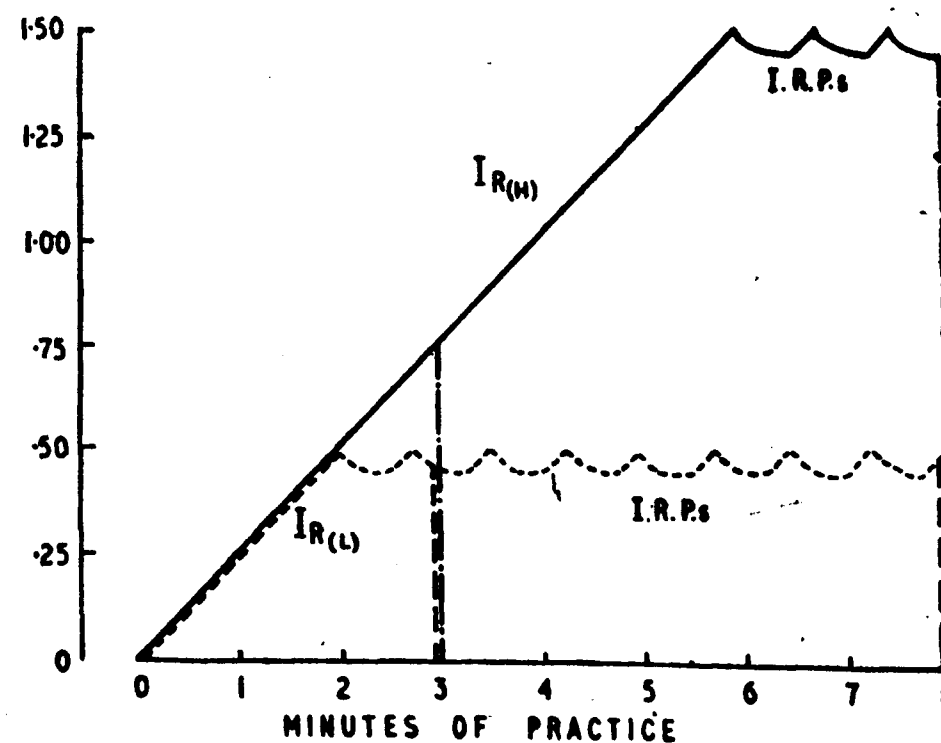
under these circumstances, may be regarded as a direct measure of motivation or D , and it can be predicted that *high drive levels should give rise to greater reminiscence scores* than low drive levels. The work of Kimble (1950), Wasserman (1951), and Claridge (1960) bears this out, as well as certain further predictions, such as that sI_R should occur later in learning under high than under low motivation.

In pursuit rotor learning, some of these interconnected hypotheses relevant to the measurement of D may be shown in diagrammatic form (Fig. 1). The abscissa shows successive minutes of massed practice, while the ordinate shows degree of I_R (and consequently also of *reminiscence*, and, at the critical level, of drive). The actual quantification is in terms of *reminiscence scores*, i.e., time on target during the first 10 sec. pre-rest performance. (This method of scoring is independent of level or performance; this is reasonable as long as performance is well short of its asymptote. Where this is not true, some adaptation of Hull's formula.

$$sH_R = M - Me^{-iN} \quad (\text{Hull, 1943, p. 119})$$

might have to be used. No such complication seems justified with the pursuit rotor, where performance remains at quite a low level during the time periods usually involved in psychological experiments.)

DRIVE



(Fig. 1)

The line slanting upwards from the lower left to the upper right corner represents the growth of I_R for both the high drive and the low drive groups. In the actual experiment (Eysenck and Maxwell, to appear) these groups consisted of industrial apprentices tested under conditions under which they either believed or did not believe that the test was part of an entrance examination for an engineering apprenticeship; they were highly motivated to enter this apprenticeship scheme as it provided them with an opportunity of becoming skilled mechanics.

The low drive group is estimated to reach its critical level ($I_R = D$) after two minutes, while the high drive group does not reach it until 6 minutes have elapsed. (These values were chosen on the basis of previous work.) If we now divide our high and low drive groups into two each, and allow these groups to take a 6 minute rest pause after 3 and 8 minutes of practice on the pursuit rotor respectively, then it can be seen that the following predictions can be made: (1) reminiscence for the low drive group should be the same after 3 as after 8 minutes of practice. (2) reminiscence for the high drive group should be much higher after 8 than after 3 minutes of practice. (3) reminiscence for the high drive group should be slightly higher than for the low drive group after 3 minutes of practice. (4) reminiscence for the high drive group should be much higher than for the low drive group after 8 minutes of practice. The results strongly bear out these predictions. Taking the low drive group first, we found that their reminiscence scores are .54 after 3 minutes of practice and .51 after 8 minutes of practice. Reminiscence scores of the high drive group are .80 after 3 minutes of practice and 1.51 after 8 minutes of practice. Analysis of co-variance discloses that these results are significant beyond the .001 level. It appears therefore that the motivation or drive of the subjects of this experiment is mirrored with considerable accuracy in certain aspects of their behaviour, and that we can measure drive in terms of reminiscence. This result is important for two reasons. In the first place it demonstrates clearly that behaviouristic measures are adequate for the determination of measurement of even such elusive qualities as motivation and drive; it also demonstrates the predictive power of the general system of learning theory from which this prediction was derived.

Another example may be taken from the general field of social, moral or ethical behaviour. It has frequently been pointed out that human beings behave "as if" their behaviour was governed by some form of "conscience", "inner light", or "super ego". These are mentalistic concepts which have no explanatory value at all. They simply serve to highlight the problem and to give it a name. They do not tell us how this "conscience" originates, or how people appear to have different amounts of it, or how we can manipulate it experimentally. Much the same is true of the psycho-analysts' "super ego". We are given a long and involved story implying introjection of parental behaviour patterns, but we are never told precisely how this happens or why it happens more strongly in one case than in another. No experimental deductions can be made from such a theory, and there is no obvious way of verifying it—or of disproving it.

Let us now consider an alternative, behaviouristic approach to this problem. Mowrer has made out a strong case in favour of the hypothesis that socialized behaviour is ultimately dependent upon the simple process of conditioned response formation. According to this theory, acts of an overtly aggressive or sexual nature on the part of the child are immediately punished by parent or teacher in a manner which produces pain. It follows from the laws of conditioning that the stimuli associated with this response and its associated autonomic consequences, will become *conditioned stimuli* which on a later occasion will produce these autonomic responses (anxiety) automatically and without the necessity of any outside figure actually administering punishment. This process of specific conditioning to certain situations, aided by the process of stimulus generalization, ultimately produces a situation in which anti-social acts arouse conditioned feelings of anxiety strong enough to deter the individual in question from giving way to temptation. I have very much over-simplified this account in the interests of brevity, but whether the theory is right or wrong, it does do two things. In the first place it gives an account of this somewhat mysterious concept of "conscience" in terms of the well-known laws of conditioning and learning, so that social behaviour can actually be deduced from these laws without requiring the intervention of any mysterious mentalistic concepts. In the second place it makes possible a variety of testable deductions which can be used to assess the adequacy of the theory. One such deduction for instance would relate to a group of neurotic people called *psychopaths*, who are characterized by anti-social behaviour in almost pure culture; these people almost seem to prefer behaving in an immoral fashion, however slight the gain, and however certain and severe the consequence might be. They are often called "moral imbeciles" because although their intelligence may be average or even superior, and although they know the type of action which society expects of them, yet nonetheless they appear incapable of acting accordingly. Our theory would demand that psychopaths of this type would be people who form the required conditioned responses only with great difficulty, and such a hypothesis can of course be tested in the laboratory by submitting suitable samples of psychopaths to an experimental conditioning procedure, and comparing the results with those obtained from matched groups of normals and non-psychopathic neurotics. The results of such experiments strongly bear out the hypothesis (Eysenck, 1957, 1960a).

Other examples of the usefulness of the behaviouristic approach can be given from other areas where hitherto mentalistic concepts have almost exclusively been used. Thus it has been possible to construct a rational system of diagnosis and treatment in the field of the neurotic disorders on the basis of the modern learning theory, and it has also been possible to demonstrate the great power and effectiveness of the system in comparison with psycho-analytic and other types of mentalistic approaches (Eysenck, 1960b). I do not believe that anyone who studies the evidence will find it possible to deny that wherever it has been tried in a systematic fashion, the behaviouristic approach has made possible considerable advances, and has justified the attempt to treat human behaviour in a thoroughly scientific fashion (Eysenck, 1952, 1957).

The philosophically inclined reader will no doubt feel that this pragmatic criterion cannot possibly provide a satisfactory criterion for solving the philosophical problems of mind and matter; it may indeed remind him of Dr. Johnson's famous attempt to discredit idealistic philosophy by kicking a stone and saying "I disprove it thus." With such an objection I would not wish to quarrel. I am not here concerned with philosophical disputations but merely with a consideration of the most fruitful methods of investigation to be adopted by psychology as a science. This purely pragmatic approach seems to me to lead to the inevitable conclusion that behaviouristic investigations are superior to other kinds of investigation in making possible prediction, explanation and control of behaviour. The concept of "mind" cannot with advantage be introduced into the formulæ which we reach, and which we use to describe and explain behaviour. In a similar manner modern physics has eliminated philosophical notions of "matter" in its formulations. A science must be allowed to choose its proper concepts without being bound by inapplicable notions of commonsense or old-fashioned battle-cries of philosophers. It is on these grounds that I would suggest that if the concept of "mind" is to be used at all, then it should be left to the philosophers to argue about; it has no place in psychology.

Another objection which is sometimes made to this general approach to the problem of "mind" is that it in fact reduces *psychology* to nothing but a part of *physiology*; "reductionism" is considered a great defect of all biological attempts to deal with human behaviour. I cannot feel that such an objection is well taken. The boundaries between sciences are not natural boundaries, but merely man-made divisions created for administrative purposes; genetics, neurology, psychology, physiology, psychiatry, biochemistry, pharmacology, endocrinology and many other disciplines are concerned with different aspects of human behaviour, and any restriction to one only of these science is artificial in the extreme. I would be quite prepared to believe that in the long run physiology and neurology will have advanced sufficiently to account causally for all those phenomena which psychology is studying at the moment; I am equally prepared to believe that such a feat may be beyond their scope. Long-range forecasting is not a rewarding occupation in science, as even short-range forecasts are apt to be hopelessly wrong in the majority of cases; I am more concerned with the present position, which appears to be that physiology and neurology can give us some limited help with the problems which concern us, but that beyond this we are very much on our own.

Perhaps I may illustrate my conception of the relationship between psychology and physiology by referring to classical physics and atomic physics. Classical physics has built up an account of the behaviour of large aggregates of atoms, such as planets and stars, sticks and stones; and it has embodied these accounts in the form of laws, such as those of gravitation and thermodynamics. These laws are just as useful now as they ever were, although they do admit of certain minute inaccuracies which suggest that they cannot properly be extrapolated beyond the confines of our planetary system, and are not perfectly accurate even within that. Nonetheless, for the majority of the practical applications of physics, these

are the laws we are in fact using, and if they are to be superseded, then this can only be done because these laws have furnished the basis for all such subsequent work. We can now go beyond classical physics and trace the causal chain one step further back; thus we can explain the laws of thermodynamics in terms of atomic and sub-atomic events. But this "reductionism" does no *invalidate* the laws of thermodynamics, nor does it make them useless; it simply leads to a better understanding of their implications, and keeps us from undue extrapolations.

In a similar way we are at present working out the molar laws of behaviour, of learning, and of personality; in due course these laws themselves will probably be derived in turn from physiological ones. But this prospect should not deter us from our course; what may or may not happen in a few hundred years cannot affect the situation here and now. At the moment there is no way in which well-authenticated laws of psychology, such as the Yerkes-Dodson law, could be derived from physiology, and consequently the psychologist has every right to forge ahead and attempt, as Hull did, to create a system of interconnected laws, theorems, postulates and facts in terms of which to organize his account of human behaviour.

After all, even though it should in principle be possible to carry out a reduction of psychological laws to physiological ones, just as in principle it is possible to reduce the laws of classical physics to those of sub-atomic physics, nevertheless in practice this may not be feasible. Physicists have no trouble in selecting those sets of laws which are most appropriate for their particular purposes, and the astronomer and the sub-atomic research worker manage to live in perfect harmony although they often use different concepts and even different laws. Similarly there is no obvious reason why *molar* and *molecular* conceptions should not go on existing side by side in psychology-physiology.

My main complaint would be that there is too little, rather than too much interdisciplinary research. Take but one example of the tremendous potential usefulness of such co-operation. I have mentioned the "involuntary rest pauses" which play such an important part in Hull's theoretical system. It is true that this is a molar concept, entirely situated in the behavioural field, but it must also be clear that underlying it there must be some physiological fact which in principle should be amenable to measurement. (This is the fundamental principle enunciated by T. H. Huxley: "No psychosis without a neurosis", i.e., no mental event without an underlying physical-physiological one.) Recent work by Bjerner (1949) has indeed shown that whenever involuntary rest pauses were observed at the behavioural level, E.E.G. and other physiological records indicated a change in cortical activity towards a state resembling sleep. It would seem that the most promising avenue of advance in this important and intensely interesting field would be one combining the psychological and the physiological approaches.

This example may appear to have taken us a long way from the consideration of "mind". This is not so, however, as one moment's consideration of the implications of the experiments just discussed will show. There has been much

discussion in the mentalistic literature of such concepts as "attention" and "lapses of attention." Equally, there has been little agreement even on matters of terminology, and nothing has emerged in the way of general laws and measurable phenomena. The behaviourist and the physiologist, working along their own different paths, would appear to have opened up this whole field to experimental study. "Involuntary rest pauses" are in fact the underlying reality of what the mentalist calls "lapses of attention", and physiologically measurable rhythms of brain activity are in turn the physical basis of the behavioural acts, or at least, indices of this physical basis. Much work remains to be done; indeed, this whole field has only quite recently been subjected to critical experimentation. Yet even with the small amount of work done so far, how much more has been achieved than was ever done by the introspective, mentalistic workers in the many years they spent in dealing with this problem!

The time has come to summarize this discussion. In the first place, it has been suggested that the whole argument concerning "matter" and "mind" is a metaphysical one, and an out-dated one at that. Just as "Matter" has suffered an eclipse as a meaningful concept at the hands of the physicists, so has "Mind" at the hands of psychologists. Nineteenth century philosophy does not much concern twentieth century scientists, except perhaps for its historical interest.

In the second place, it has been suggested that the subject-matter of psychology is behaviour, not "mind" or "soul", and that for the analysis of behaviour "mind" is a hypothesis which can easily be dispensed with. It does not enter into any of the equations we write, and it adds nothing to our analysis of behaviour. This is believed to be a factual statement; if it could be shown to be erroneous, then the argument would fall to the ground.

In the third place, it has been argued that the basis of behaviour is not "mind", but the physiological and neurological events occurring in the central nervous system. Physiology and psychology are indissolubly united, and it may even turn out eventually that psychological events can all be reduced to physiological ones. However, even if this could in principle be achieved, in practice psychology and the molar laws of behaviour which it gives rise to would still form an indispensable part of science.

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The Method of Ranks in Sociometric Scaling

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While Sociometric concepts hold great interest to the investigator in group dynamics, the conventional sociometric test rarely satisfies the conditions of good measurement. For instance, it does not ensure that the member responds to all the others, although sometimes this requirement is met by having him rank all members. In most experiments, an index of the overall valence of the group for each individual will be needed. Except when the interest is in the valence of a sub-group relative to a larger group (e.g., 5,7) this is not possible to achieve. The sociometric criteria possess unknown intensity values and scale separations. A few investigators have attempted to determine in advance and objectively, the weight to be attached to the different criteria. Schachter (6) determined the relative valences of his criteria by a self-nomination technique. K. Back (1) and Bovard (2) used scales developed by the method of equal appearing intervals. Scaling of sociometric stimuli does not appear to present problems different from attitude scaling, though this remains to be verified from further theoretical and empirical work. The present paper describes an attempt to prepare a sociometric scale by the method of ranks. The specific items have relevance only in the context in which they were developed; but it is hoped that this will illustrate the method.

Purpose : The aim of the scaling procedure was to develop a six-item sociometric test for use in conjunction with a seventeen-item post-experimental questionnaire on group structure. The subjects in the group dynamic study were students from Preuniversity classes, age 15—17 years, assigned at random to groups of 5—6. They were generally unacquainted with each other before the experiment. The scale was designed with these facts in view.

Collection of items : Twelve Post-graduate students in Psychology were requested to write the sociometric items. The aim and procedure of scaling and the nature of subjects for whom the scale was meant were explained to them. A few illustrative items were provided. They were especially instructed to include a variety of relevant activities and different degrees of intimacy. About one hundred items were obtained in this way.

Preliminary Analysis : These items were examined for repetition and some of them had to be rejected on this count; others were re-written to alter the degree of intensity. Many of the "negative" items were merely duplicate of the positive items with "not" or "never" introduced. These items were rejected retaining only those whose positive forms had to be rejected for other reasons. Some items

had to be eliminated because of the non-relevance of the criteria to the experimental situation.

The method of ranks was preferred for scaling because of the difficulty experienced by 'judges' in preliminary trials with the method of equal-appearing intervals.

The Procedure : After examining for repetition, relevance, clarity, etc., the number of items was reduced to thirty-four. These were typed on small pieces of paper and given to sixteen judges for ranking. All the 'judges' were graduates in psychology, many of them research students. [The usual assumption in attitude scaling that the attitude of Judges does not affect scale values (4) is made here]. Their task was to rank the items so that the items that indicated smaller degrees of interpersonal attraction were on top and those indicating higher degrees of intimacy were at the bottom of the pile. They were instructed to inspect the whole pile a number of times to make further adjustments. The inter-correlations (ρ 's) show a range from .48 to .88 with a median of .78.

Assumptions : An examination of the basic requirements for scaling by the method of ranks with particular reference to the sociometric items on hand will follow.

Normality : An important assumption involved is the hypothesis of normality in the item-universe and at least near-normality in the sample of items. This is justified in the present case by the method of item collection. Some support is derived from the frequency distribution of the items on the seven point scale of equal-appearing intervals which was discarded after trial with three judges.

TABLE I.

Frequency distribution of items on seven point scale of equal-appearing intervals.

	Scale Points							
'Judge' :	1	2	3	4	5	6	7	Total.
A	1	1	20	29	20	6	1	78
B	2	2	23	35	14	...	2	78
C	1	4	14	25	25	6	3	78
Total :	4	7	57	89	59	12	6	234
Per cent :	1.7	3.0	24.3	38.0	25.2	5.2	2.6	100

Table I shows that the distribution is symmetric. This is by no means conclusive because of the small number of persons and lack of external information about the

interval structure of the base line. It may also be mentioned in this connection that scaling based on the method of comparative judgments does not demand the assumption of normality.

Range : It is necessary to assume that the present sample of items covers range of intensities for which the scale is intended. It was hoped to meet this requirement, as far as possible by suitable instruction at the item-collection stage.

Variation & Correlation : In the comparative judgment treatment, an assumption of approximately similar variability in response at different stages of the stimulus is involved. Correlation between response at different levels of the stimulus intensity is assumed to be equal after Mosteller (quoted by Guilford 3, p. 150)*

Statistical Treatment : Guilford (3) has described the two approaches to scaling of ranked stimuli. Though essentially distinct, they yield scale values that are almost identical. In the present case this has been verified at each stage.

Scaling by Centile Positions : Essentially, this consists in finding a proportion (P) for each of the N items from the median Rank (R) applying the formula

$$P = \frac{(N - R + .5)}{N}$$

P gives the proportion of the area under the normal distribution below middle of the interval occupied by the stimulus. From this we can obtain the corresponding z-value. The z-value of a given item is *negative* or *positive* depending on whether the high intensity item gets the *first* or *last* rank. The z-scores could be used as scale points but a convenient linear transformation is usually affected.

Comparative Judgment approach : The ranked items were also scaled by Guilford's composite-standard technique (3, p. 186). This technique is especially meaningful in the present case as the smaller number of stimuli permitted the 'judges' to compare each stimulus with the group as a whole as well as with the neighbouring stimuli. The treatment gave P's ranging from .056 to .981 corresponding to median ranks 33.5 and 1.0 respectively. The proportions (P) corresponding to these two items obtained by the normalized-rank method are .081 and .990.

The two methods yielded z-scores that were practically similar for each stimulus item. Normally, the z-scores should add to zero and possess a standard deviation of 1.0. Due to errors, gaps in the data, etc., the actual mean and S.D. (comparative judgment treatment) are +.005 and 0.915 respectively. These are employed in the transformation instead of 0 and 1.

* The validity of these assumptions for the method of ranks will be examined separately with different types of data.

Selection of Items : The linear transformation to obtain a mean of about 5 and S.D. of 2 is effected by the equation

$$S = 5.53 + 2.19z$$

where S is the scale value and z is the sigma score of an item.

Six items were selected to constitute the final scale on the basis of S values. The choice is also influenced by the content, etc. Two additional items were employed in the questionnaire for the study of internal consistency. The items along with their scale values are given below :

TABLE II.
Sociometric Items and scale values.

Item	z	S
a. I would not like to work with him next time ...	- 2.075	1.0
b. I would like to go with him to a picture ...	- 0.090	5.3
c. I would like to discuss my personal problems with him ...	+ 1.590	8.0
d. I would like to discuss about this experiment with him ...	- 1.335	2.7
e. I would like to share the same room with him in a hostel ...	+ 0.548	6.4
f. I would like to have him sit next to me next time.	- 0.337	4.8

Scoring : In the sociometric part of the questionnaire, each member of the group is asked to check two statements that best describe his feeling towards each of the other members. The sociometric attraction of a member A, to another, B, is given by the average scale value of the statements checked by A with reference to B. The average of scale values of all items checked by a member gives his score on cohesiveness.

Summary : Application of the relatively simple method of ranks to scaling of sociometric items is illustrated. When the sociometric test is only part of

a larger data collection scheme the economy of effort is especially welcome. The stability of the scale will be increased by employing a larger number of 'judges', particularly 'judges' comparable to the subjects for whom the scale is intended.

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Qualities Desirable for Success in Engineering Students and Profession

(Part II: Students' Sample)

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In an earlier investigation (1) the qualities perceived as relevant to success in engineering students and profession by a sample of 40 teachers of engineering were ascertained. The same basic concepts, design and procedure were adopted for a study of the expectancies of a randomly selected sample of 30 under-graduate and post-graduate students of engineering belonging to the same institution where the previous study was conducted.

Results

For each of the traits, the average rating for each of the categories of "students" and "profession", their standard deviations, and the correlation coefficients (product moment) between ratings in the two categories were computed. In Table 1 the traits are arranged according to the size of their respective correlation coefficients.

TABLE 1
Expectancy Students' Sample
Correlation between ratings of traits for students and profession
arranged according to the size of correlation

Rank	Traits	M (s)	SD (s)	M (p)	SD (p)	r	G
1	Good memory	5.76	0.80	5.13	1.19	.95	A
2	Asking pertinent questions	4.93	1.32	5.03	1.38	.92	A
3	Reading outstanding materials	3.16	1.67	3.20	1.40	.87	AI
4	Ability to criticise technical matters	4.50	1.38	5.26	1.29	.86	A
5	Manners and appearance	4.93	1.44	5.46	1.60	.80	PS
6	Religious faith	1.16	1.73	1.46	1.93	.79	I
7	High intelligence	4.83	1.70	5.06	1.31	.74	A
8	Int. in inter. affairs	1.86	1.73	2.83	1.77	.72	I
9	Dexterity in hand equipment.	5.30	1.24	5.40	1.17	.71	A
10	Initiative	5.33	1.18	5.36	1.51	.69	P
11.5	Imagination	4.36	2.30	4.96	1.44	.67	P
11.5	Interest in national issues	3.13	1.59	4.33	1.67	.67	I
13	Self-assertiveness	3.16	1.85	3.76	1.94	.64	I
14.5	Interest in fund philosophy	1.40	1.33	1.83	1.40	.63	I

TABLE 1—(Contd.)

Rank	Traits		M (s)	SD (s)	M (p)	SD (p)	r	G
14.5	Interest in artistic act	...	1.40	1.28	2.56	1.48	.63	I
16	Reading related matters	...	5.36	1.35	5.60	1.42	.62	A
17	Practical orientation	...	5.10	1.70	5.50	1.56	.61	AI
18.5	Drive and energy	...	5.73	1.14	5.63	1.24	.60	P
18.5	Quickness in action	...	4.86	1.79	5.66	1.62	.60	AP
20	Good leadership	...	4.36	2.07	5.56	1.60	.59	PS
21	Athletic interests	...	2.70	1.67	2.90	1.81	.58	I
22	Singleness of purpose	...	4.36	2.27	4.50	1.64	.56	P
23	Co-operation	...	4.76	1.31	5.63	1.04	.55	S
24	Alertness in learning	...	5.80	1.30	4.93	1.35	.51	A
25.5	Industry and perseverance	...	5.10	1.71	5.30	1.52	.50	AP
25.5	Clarity of expression	...	5.73	1.04	5.80	1.07	.50	A
27	Emotional balance	...	4.86	1.62	5.50	1.30	.49	PS
28	Responsibility	...	4.96	1.72	6.06	1.26	.47	P
29	Aptitude for research	...	4.40	1.40	4.30	1.39	.45	AP
30.5	Interest in people	...	2.43	1.01	3.96	1.65	.42	IS
30.5	Neatness in recording observations	...	4.86	1.08	4.70	1.21	.44	A
32	Political ideology	...	0.90	1.27	2.00	1.86	.42	I
33.5	Quickness in decision	...	4.86	1.78	5.66	1.19	.40	AP
33.5	Theoretical understanding	...	5.73	.98	4.80	1.16	.40	A
35.5	Originality	...	4.96	1.58	5.20	1.51	.39	AP
35.5	Ambition	...	5.16	1.67	5.53	1.32	.39	P
37	Extra-curricular activities	...	2.96	1.59	3.40	2.00	.38	IS
38	Seriousness (sincerity)	...	5.96	1.62	5.96	0.98	.37	P
39	Sense of humours	...	2.90	1.81	3.80	1.90	.36	S
40	Tenacity	...	5.50	1.40	5.46	1.43	.35	P
41	Ability to please others	...	4.33	1.60	5.16	2.15	.34	PS
42	Dependability	...	4.66	1.93	5.43	1.69	.33	SP
43	Curiosity	...	4.83	1.54	4.23	1.48	.18	P
44	Honesty	...	4.53	2.29	5.00	2.00	.15	P
45	Close contact with teachers	...	4.30	1.71	1.80	2.08	.14	S

In the previous study the correlations were higher in personality, sociability and interest traits. No such trend was observable here. However, it is to be noted that the top four positions were occupied by the academic and mixed academic traits. The reason for this seems to be that academic qualities were usually given more importance by the students and tended to be rated high even for the profession. This phenomenon is examined in a closer manner in subsequent sections. The next few traits which had high correlation coefficients were "personality", "sociability" and "interest" traits. This was similar to what was found in the earlier investigation with teachers (1). Some other personality and sociability traits had low correlation. In general, these traits tendered to be,

rated more relevant for one category than in the other. This point will be further elaborated in a subsequent section.

TABLE 2-A

Traits rated consistently for relevance to success as a student of Engineering by thirty students of Engineering

Rank	S. No.	Name of traits		M	S.D.	G
1	7	Seriousness (sincerity)	...	5.96	0.98	P
2	5	Alertness in learning	...	5.80	1.30	A
3	34	Good memory	...	5.76	0.88	A
4.3	3	Drive and energy	...	5.73	1.14	P
4.3	29	Clarity of expression	...	5.73	1.04	A
4.3	35	Theoretical understanding	...	5.73	0.98	A
7	32	Tenacity	...	5.50	1.40	P
8	38	Reading related materials	...	5.38	1.35	A
9	33	Initiative	...	5.33	1.18	P
10	25	Ambition	...	5.10	1.67	P
11.5	10	Industry and perseverance	...	5.10	1.71	P
11.5	30	Practical orientation	...	5.10	1.70	A
13.5	4	Originality	...	4.96	1.58	P
13.5	8	Responsibility	...	4.96	1.72	P
15.5	24	Manners and appearance	...	4.93	1.44	PS
15.5	59	Asking pertinent questions to experts.	...	4.93	1.32	A
17.3	6	Quickness in action	...	4.86	1.79	AP
17.3	22	Quickness in decision	...	4.86	1.78	AP
17.3	36	Nearness in recording observations	...	4.86	1.08	A
20.5	1	Curiosity	...	4.83	1.54	P
20.5	11	High intelligence	...	4.83	1.70	A
22	28	Co-operation	...	4.76	1.43	S
23	41	Ability to criticise technical matters	...	4.50	1.38	A
24	40	Aptitude for research	...	4.40	1.50	AP
25	45	Ability to please others	...	4.33	1.60	PS
26	44	Close personal contact with teachers.	...	4.30	1.71	S
27	31	Reading outside materials	...	3.16	1.67	AI
28	17	Interest in national issues	...	3.13	1.59	I
29	43	Extra-curricular activities...	...	2.93	1.59	IS
30	12	Athletic interest	...	2.70	1.67	I
31	20	Interest in artistic activities	...	2.16	1.28	I
32	16	Interest in international issues	...	1.86	1.73	I
33	19	Interest in philosophical questions	...	1.40	1.33	I
34	14	Religious faith	...	1.16	1.73	I
35	13	Political ideology	...	0.90	1.27	I

TABLE 2-B

Traits rated consistently for relevance to engineering profession
by thirty Engineering students

Rank	Sl. No.	Name of trait	Mean	S.D.	G
1	8	Responsibility ...	6.06	1.26	P
2	7	Sincerity (Seriousness) ...	5.96	1.22	P
3	29	Clarity of expression ...	5.80	1.07	A
4.5	6	Quickness in action ...	5.66	1.62	AP
4.5	22	Quickness in decision ...	5.66	1.19	AP
6.5	3	Drive and energy ...	5.63	1.24	P
6.5	28	Co-operation ...	5.63	1.22	S
8	38	Reading materials related to subject ...	5.60	1.42	A
9	2.7	Good readership ...	5.56	1.60	PS
10	25	Ambition ...	5.53	1.32	P
11.5	23	Emotional balance ...	5.50	1.30	PS
11.5	30	Practical orientation ...	5.50	1.56	A
13.5	24	Manners and appearance ...	5.46	1.60	PS
13.5	32	Tenacity ...	5.46	1.43	P
15	26	Dependability ...	5.43	1.69	AP
16	42	Dexterity in handling equipments ...	5.40	1.17	A
17	33	Initiative ...	5.30	1.51	P
18	10	Industry and perseverance ...	5.30	1.52	P
19	41	Ability to criticise technical matters ...	5.26	1.29	A
20	4	Originality ...	5.20	1.51	AP
21	34	Good memory ...	5.13	1.19	A
22	11	High intelligence ...	5.06	1.31	A
23	39	Asking pertinent questions to experts. ...	5.03	1.38	A
24	9	Imagination ...	4.96	1.44	P
25	5	Alertness in learning ...	4.93	1.35	A
26	35	Theoretical understanding ...	4.80	1.16	A
27	36	Neatness in recording observations ...	4.70	1.21	A
28	31	Singleness of purpose ...	4.50	1.61	P
29	17	Interest in national issue ...	4.33	1.67	I
30	40	Aptitude for research ...	4.30	1.39	AP
31	1	Curiosity ...	4.23	1.48	P
32	18	Interest in people ...	3.96	1.69	I
33	37	Reading materials outside the subjects. ...	3.20	1.40	AI
34	20	Interest in artistic activities ...	2.56	1.48	I
35	19	Interest in fundamental philosophical questions ...	1.83	1.45	I

The S.D.'s of the ratings in either of the categories were taken to be a measure of the consistency of ratings of the traits. The traits were ranked according to the values of their S.D's. The last ten qualities obtained thus were discarded. The rest were rearranged according to the size of the respective average ratings. This gave three groups of traits, i.e., "high", "middle" and "low".

Ratings for students

Of the traits rated "high", those belonging to personality groups were regarded as important as the academic ones. Seriousness (sincerity), alertness in learning, good memory, drive and energy and clarity of expression were some of the highly rated traits. In this respect the students and teachers generally agreed with regard to the importance they attached to these traits. The middle group of traits consisted of an assortment of academic, personality, sociability, and mixed traits. Interest and mixed-interest traits mainly comprised the "low" group. Students in general did not perceive them as relevant to success in engineering, education. This may be due to the fact that the interests represent pleasure-seeking behaviour or mostly leisure-time activity having little to do with the successful completion of engineering career. The same was the case with teachers' rating of these traits.

It is to be noted that :—

(1) "Curiosity" and "high intelligence" have a relatively low position. Both of them fall in the middle group (rank 20.5). In the teachers' sample "curiosity" came at the bottom of the "high" group (10). "High intelligence had more or less the same position. (18.5).

(2) Another striking difference in the position of the academic traits is that of "clarity in expression". In the teachers' sample, this trait had the rank position 15, whereas in the present sample it was high, i.e., 4.3. This suggests the possibility that clarity of expression was looked upon as more relevant to success in education by the students than it was by the teachers.

(3) There is marked similarity in the position of seriousness (sincerity), alertness in learning, good memory and drive and energy in both the samples of teachers and students. They were all rated high.

(4) There is also similarity in the positions of the interest traits in both the sample. They were all rated low in relevance to success.

(5) Whereas sense of humour was rated high in relevance to success in the teachers' sample, in the present study, it was rejected due to inconsistency in ratings.

(6) Imagination was rated low by the teachers, but in the present case it was rejected due to inconsistency.

Ratings for the Professions

The average ratings for the professional success were found to be higher than those for the educational success. The values were so high that most of the traits

rated got included in the "high" group. As such, the earlier procedure of having 10 traits each in the "high", "middle" or "low" group was not possible. The values were so high as to permit their inclusion into the "high" group. It can be contended, therefore, that students of engineering tended to over-emphasise the relevance of the desirable qualities with reference to success in engineering profession. A possible explanation is that the students have little or no experience of the requirements of the professional field, and as such they tended to judge the relevance of any desirable trait for the profession in a rather exaggerated and unrealistic manner.

There was a prominence of the personality and mixed-personality traits here, which was in line with the pattern discovered in the earlier investigation using only teachers as the sample. The middle group was very small and consisted of personality, academic and interest traits. Here too the interest traits almost completely occupy the "low group", excepting one mixed academic trait, viz., "reading outside materials", which is also a kind of interest trait. It represents a "pleasure-seeking activity" and as such not viewed as relevant to success. A number of academic qualities appear among the traits rated relevant for professional success. This was rather striking. Since a student sees the importance of the academic traits for his own success, he tends to project this evaluation into the professional man. Thus, it is a kind of "spread phenomenon" where the importance attached to one category is carried over to the other.

It is to be specially noted that :—

(1) Responsibility, seriousness, drive and energy, industry and perseverance, quickness in action, good leadership and emotional balance, have been given positions similar to those in the earlier study.

(2) In the teachers' sample a number of academic traits occurred in the "low" group, which is not so in the present case.

(3) Honesty, which was placed in the "high" group in the teachers' sample, has been rejected in the students' sample due to inconsistency in rating.

(4) The teachers' rating had been inconsistent with regard to ratings given to "initiative". The students have consistently placed it in the "high" group.

(5) Dependability had been rated very high in the teachers' sample but has been placed comparatively lower in the students' sample.

TABLE 2-C

Expectancy students sample (N = 30) Commonly rated traits

	Name of traits	M_s (x_1)	M_p (x_2)	S-P	$S-P/$ $\sigma_{x_1-x_2}$	Group
7	Seriousness (sincerity) ...	5.96	5.96	0	.01	P
5	alertness in learning ...	5.80	4.93	+ .87	.22	A
5	Good memory ...	5.76	5.13	.63	.21	A
3	Drive & energy ...	5.73	5.63	.10	.03	P
29	Clarity of expression ...	5.73	5.80	— .07	.02	PA
35	Theoretical understanding ...	5.73	4.80	.93	.29	A
32	Tenacity ...	5.50	5.46	.04	.075	P
38	Reading related materials ...	5.38	5.60	— .22	— .54	A
33	Initiative ...	5.33	5.36	— .03	0.75	P
25	Ambition ...	5.16	5.53	— .37	— .76	P
10	Industry and perseverance ...	5.10	5.30	— .20	— .42	PA
30	Practical orientation ...	5.10	5.50	— .40	— .84	AT
4	Originality ...	4.96	5.20	— .24	— .05	AP
8	Responsibility ...	4.96	6.06	— 1.10	— 2.48	P
24	Manners and appearance ...	4.93	5.46	— .53	— 1.17	PS
39	Asking pertinent ques- tions to experts ...	4.93	5.03	— .10	— .25	A
6	Quickness in action ...	4.86	5.66	— .80	— 1.62	AP
22	Quickness in decision ...	4.86	5.66	— .80	— 1.81	AP
36	Neatness in recording ob- servations ...	4.86	4.70	.16	.48	A
1	Curiosity ...	4.83	4.23	.60	1.35	P
11	High intelligence ...	4.83	5.06	— .23	— .51	A
28	Co-operation ...	4.76	5.63	— .87	— 2.17	S
41	Ability to criticise tech- nical matters ...	4.50	5.26	— .76	— 1.96	A
40	Research ...	4.40	4.30	.10	.02	AP
37	Reading outside mate- rials ...	3.16	3.20	— .04	— .0	AI
17	Interest in national issues ...	3.13	4.33	— 1.20	.25	I
20	Interest in artistic acti- vities ...	2.16	2.56	— .40	.96	I
19	Interest in philosophical questions ...	1.40	1.83	— .43	1.08	I

Traits Rated for both Students and Profession

Out of the traits consistently rated in either of the categories, those which were common to both students and profession were chosen for comparison with regard to their total average ratings. Only 5 traits came to be significantly different, in accordance with Tchebycheff inequality where the difference was expressed in terms of the ratio of the difference of two given average ratings and the standard error of the difference. The 5 traits which were significantly different, 3 were taken because of their closeness to the critical value of 2. None of the traits was rated more relevant for success in students of engineering than they were for the profession. The five traits rated comparatively more relevant for success in profession, were, (in order of their differences) 'responsibility', 'co-operation', 'ability to criticise technical matters', 'quickness in decision' and 'quickness in action'.

A blank space was provided in each of the forms where S's were to write the traits which they felt should have been included in the list. One of the S's comments refer to success in Government services where the key to success was to 'curb his conscience and be submissive to authority.'

Some other suggestions referred to 'patriotism', 'tactfulness' and 'understanding the subordinates' as relevant to success in engineering profession and education.

Conclusion.

(1) Academic traits had higher correlation between ratings for success in students and profession.

(2) Personality and sociability traits had low correlation with regard to the categories of students and profession.

(3) Academic as well as personality traits were rated as more relevant to success in students of engineering.

(4) Interest and mixed-interest traits were considered not relevant in education as well as in profession.

(5) Traits considered important for success in profession consisted of personality, academic and sociability traits.

(6) Looking at the extent of significance attached to the traits with regard to success in education and in profession, none of the traits was rated more relevant for education than for profession by the student-sample. However, differences between the ratings was significantly higher for the profession in only five traits.

(7) Personality and interest traits had a tendency of being rated in the same manner by students as well as by the teachers of engineering. This was observed to be true in both the spheres of success under consideration.

Discussion

The present study indicates the importance of non-academic and personality traits for success in engineering education and profession. This conclusion is in line with that obtained in the previous study with teachers. It has important implications for the educators and the authorities responsible for selecting students for various fields of engineering.

In the selection-programmes and in the so-called personality assessment interviews, an emphasis is usually placed on interests and hobbies of the candidates. The present investigation shows that neither the students nor the teachers of engineering consider interests as relevant to success in education or for the professional man.

The results indicate that apart from academic competence at the time of selection for engineering courses, due consideration be given to certain qualities which are non-academic in character. Certain qualities, which have their roots in personality and motivational structure of the individual are looked upon as very relevant to success even for engineering courses.

There are some striking similarities between teachers and students while rating the traits for success in either spheres. It is interesting to note that these similarities occur more in personality and interest groups of traits than in academic or other traits-groups. Both students and teachers seem to agree in the importance of traits like 'seriousness (sincerity)', 'responsibility', 'drive and energy', 'quickness in action' or 'quickness in decision' for the profession and 'seriousness, (sincerity)', 'alertness in learning', 'good memory' and 'drive and energy' for success in students. Some remarkable differences, however, are seen in the ratings of a few academic traits between the two samples.

The teachers in the previous study had been observed to regard success in profession and education in a clearly differentiated manner. Some traits which were considered relevant to success in one category were not rated relevant for the other. The students, however, show a tendency of marked similarity in rating the traits in relation to both the categories. Teachers may be expected to possess a clearer conception of the requirements of the profession than the students who have little or no experience in the actual professional setup. This is expected to result in a more generalised perception of success in the latter. A student of engineering ultimately aspires to be a professional man. The personality of a successful engineer, therefore, coincides with his 'ideal self-image'. In such a case, it is only expected that the student conceives of the professional man as having more of the desirable qualities which he regards as vital for educational success. He thus tends to see the relevance of almost all the desirable qualities for success in the profession of engineering as well.

It remains to be proved whether successful and less successful engineers could be differentiated on any measure or measures of such traits or trait-groups shown

by this investigation. A selection procedure based on this approach could be an effective tool in screening the successful engineering students into an institution of study after such a group have been segregated on the basis of their academic records. If properly developed, a test of these non-academic and personality traits should also help in selecting engineers for various professional fields, where the competence of an engineer depends as much upon his personality as upon the amount of information regarding academic matters acquired by him during his student career. Development of such a procedure of selection requires an investigation on people who have already been successful in their profession.

The size of the present sample is not large enough for any firm generalisation. Also, it consists of students belonging to a particular institution. It will be revealing if the study is repeated in some other institutions of engineering as well as in Arts and Science Colleges. A project of this nature is underway.

A cross-comparison of the 'expectancies' in different branches of engineering would also yield useful results.

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A Motion and Time Study Experiment : Usefulness for Redesigning Workplace Layouts and Observer Reliability

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Introduction

Proper utilization of machine and man power is one of the major factors contributing to greater production in industrial organizations. To attain such proper utilization, empirical investigations of the prevailing practices are necessary. In a recent study made by the Hoover Limited (2) it has been shown that the improved productivity of the modern industry owes much to improved floor layouts, and that twelve per cent of the improved productivity can be attributed to this very factor.

In India work on time and motion study started in December, 1952, under the supervision of International Labour Organization and work is being carried on in the engineering industry in Calcutta, the textile industry in Ahmedabad and Bombay (1), as well as other places.

A Motion and Time Study Experiment

The present experiment has two objectives : (i) statistically significant reduction of movement of Rotaprint operators by rearrangement of the workplace layout and (ii) Determination of the inter-observer reliability for motion and time study. The experiment was carried out on the workplace used by a Rotaprint machine operator. The Rotaprint machine (Bradma of India Private Ltd.), is a mono-man operated electrically driven printing machine which gives sixty prints per minute. The printing matter is drawn with Rota ink or typed on the Rotaplate and then the plate is fixed on the blanket-covered roller after the Rota-solution has been applied. The other roller, which comes in contact with the Rotaplate to facilitate even distribution of ink, is drenched with ink and then the machine is started. It requires constant supervision by the operator to check whether the printing is properly made, which, in turn, requires adjustment of the machine and cleaning of the plate every now and then.

For motion and time study, all the operations involved in the Rotaprint work were classified into seven categories and to facilitate recording of all

the activities observed, they were represented by symbols which are presented below :

Symbol	Name	Used to represent
○	Facilitative Operation ...	Get ready, put away, or other facilitative operations done at one place.
⊙	Productive Operation ...	Doing something which affects the product at one place.
□	Quantity Determination.	Determining the quantity of an item.
◇	Inspection ...	Comparing an attribute of a product with a standard, or verifying the quantity present.
•	Movement ...	A change in location.
▽	Avoidable Delay ...	Idleness, waiting or moving, where moving not related to performance of the job.
▽	Unavoidable Delay ...	Waiting for supply, and machine.

In the present study, more emphasis was placed on the operation "movement" as the main object was to minimize it. Whenever the operator is required to change his place for work connected with the work under study, it is to be considered as movement. But if he changes his position for some reason not related to the work, it will come under "avoidable delay", provided the production has to be stopped for that activity.

The second object of the present study was to find out inter-rater reliability. Few, if any, psychometric studies of motion study reliability have been made. To find the reliability, at least two observers have to study the same operations simultaneously. As they are observing the same operations, it can be expected that at a particular time both of them would note down the same symbol on their motion chart. The same sequential arrangement of symbols would be expected on the motion chart records of both the observers and inter-observer reliability could theoretically be found out by comparing these two sequential arrangements of symbols for a stipulated period. But in the actual situation there is a serious drawback to this procedure. If one of the observers overlooks even a single operation of the operator, the whole symbol-sequence as noted in his charts will be different from that of the another observer, leading thus to an erroneous comparison. To avoid this difficulty the following method is proposed and illustrated : from

each day's data as collected by the two observers twenty-five observation-samples have been taken using a random number table and the agreement between symbols noted by the two observers at these particular times compared. The number of agreements and discrepancies for the symbols used may be indicated by "+" and "-" signs respectively. So the percentage plus signs will indicate the inter-rater reliability index. As the figure approaches 100%, greater reliability is indicated.

Design of Experiment

I. *Determination of reliability* : There were altogether three observers, referred to here as O₁, O₂ and O₃. They observed the same operator in pairs for two days, two hours daily, and the percentage agreement found out as described above.

II. *Examination of workplace layout* : Each observer studied the operator at work for two days, continuous observation being taken two hours on each day. The floor diagram of the workplace was sketched to scale after accurate measurement of the workplace. The data thus obtained were analyzed minutely to determine the nature of unnecessary movements, if any. After prolonged study of the floor diagram, it was suggested that if the machine could be rotated 180° and replaced 50 centimeters away from its original position, much of the movement of the worker would be eliminated. Some minor rearrangement of the tools and other materials was also suggested and a floor diagram of the proposed workplace was drawn maintaining the same scale as the previous one. The proposed changes were discussed with the Rota-operator and some of his suggestions were also incorporated in the proposed plan of the workplace. After the new plan was implemented, the worker was again observed by the observers, and the data thus obtained were compared along with the previous data and the difference between the two sets was tested for significance.

The observations were made using time and motion study charts, devised by the Industrial Psychology Section of the Indian Statistical Institute, along with watches to note down time spent performing each operation.

Results

As we have a two-fold objective, the data will be presented for each separately:

- (i) *Inter-observer Reliability* : In Table I the percentage agreement score between O₁, O₂ and O₁, O₃ is given. The method by which it was found has already been described. As the observers studied the work for two days, the average of these two values has been taken as the percentage agreement for the two observers ; which is 86% for O₁ and O₂ and 78% for O₁ and O₃. It will be recalled that to find inter-observer reliability, the percentage agreement was calculated for random samples of the symbols recorded by two observers recording simultaneously.

TABLE I

Inter-observer reliability derived from sample-data of observations
made by different observers : percentage agreement between observers

		Between O_1 and O_3 *		Between O_1 and O_2 *	
		Cases of Agreement (Total Cases 25)	Percentage Agreement	Cases of Agreement (Total Cases 25)	Percentage Agreement
1st day of observation	...	22	88%	20	80%
2nd day of observation	...	21	84%	19	76%

(ii) *Workplace layout* : Out of the seven symbols presented in text above, the symbol for the operation "quantity determination" was not used in the study of the Rotaprint machine as counting of printed material is automatically done by the machine. Table II presents the average frequency of symbols for movement, time devoted to movement, and distance moved by the worker in the old as well as in the new workplace arrangements. As observation was made in the old workplace arrangement by each observer separately, data collected by all three observers have been tabulated under the column "old workplace arrangement". In the new workplace arrangement the work was studied by two of the observers simultaneously, hence the data for each observer has been shown separately under the column-head "new workplace arrangement".

Though it was scheduled that the observers would be studying the operator continuously for two hours on each day of observation, observing this programme exactly was not possible, as sometimes it happened that the worker would finish his work much before the scheduled period of two hours was over, and sometimes the observers wanted to continue their observations as the work was still going in full swing, though the stipulated time limit was already passed. The total observation period also varied from one observer to another. For these reasons, as well as to facilitate statistical comparison of observations, the whole study period was divided into smaller time intervals of 20 minutes each. This was feasible as the work was repetitive in nature.

* (O_1 , O_2 , O_3 refer to the three observers.)

In order to find out whether there is any significant difference between the two workplace layouts in terms of frequency of operator movement, time spent on movement, as well as total distance walked by the worker, t-tests were applied (4) (p. 224). The values obtained along with the degrees of freedom and levels of significance, have been presented in Table II.

Discussion

From Table I, it is observed that average percentage of agreement between O_1 and O_3 is 86% and that between O_1 and O_2 is 78%. It is quite possible that some of the operations may be overlooked by one of the observers, or some may be of such a small duration that there is every possibility of its being overlooked by one of the observers. Noting down the exact time when an operation is started or finished is also another factor contributing to inter-rater reliability. The percentage agreement obtained in the present study may be considered satisfactory if all such practical difficulties are taken into consideration. The lack of perfect reliability, however, suggests that in industrial use of motion and time study, more than one observer is necessary.

Motion and time study engineers have pointed out the benefits of workplace rearrangement. In this study, it was desired to demonstrate statistically the significance of the reduction in movements brought about in the new work place layout. From Table II it can be seen that all three factors have significantly decreased in the improved workplace layout. This was found for all three observers. The improved workplace layout should lead consequently to an increase in production. This could not be found out in the present study, as the nature of the work performed is a determinant factor in the rate of production per hour and this was not similar in the old and the new arrangement of the workplace. In the old arrangement, the operator was running only one plate throughout the day, which needs less facilitative operation and consequently he could devote more time to productive operation. In the new arrangement he had to run more than one plate during the time of observation, which required more facilitative operation and inspection, and the time devoted to productive operations was automatically curtailed. In order to see whether there is any increase in production in the new workplace arrangement, we must observe the same type of work as we had previously observed in the old workplace layout.

Summary

The present study had a two-fold purpose :

- (i) To demonstrate statistically significant reduction in movement caused by the new workplace layout as suggested on the basis of motion and time study techniques.
- (ii) To find out inter-observer reliability or degree of agreement between observers in motion and time study method.

TABLE II

Significance of changes in frequency, time, and distance moved due to rearrangement of the workplace with means and t-tests

	Frequency of Symbols (movement)			Time spent on movement			Distance travelled by the worker		
	Observer 1	Observer 2	Observer 3	Observer 1	Observer 2	Observer 3	Observer 1	Observer 2	Observer 3
df.	24	16	18	24	16	18	24	16	18
Old workplace arrangement ...	4.33	4.33	4.33	136.08	136.08	136.08	52.08	52.08	52.08
New workplace arrangement ...	1.57	2.83	1.34	45.29	35.83	47.63	18.79	13.50	15.88
Difference in Mean between Old and New workplace arrangement ...	2.76	1.50	2.99	90.79	100.25	88.45	33.29	38.58	36.20
t	3.41	1.26	.95	3.12	2.20	2.37	3.02	2.65	1.91
Levels of Significance (more than) ...	.005	.50	.50	.005	.05	.05	.01	.02	.10

K. P. BHATTACHARYYA

A MOTION AND TIME STUDY EXPERIMENT :

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The operator of a Rotaprint duplicating machine was observed both in the old and in the new workplace layout by three observers using motion and time study charts and the data thus collected when statistically interpreted indicated :

- That the new workplace layout significantly reduced the frequency of movement, time spent in movement, and distance moved by the operator.
- That the percentage agreement between observers ranged from 78 to 86 per cent. This percentage was interpreted as an index of the inter-observer reliability.

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A Study of Reaction to Guilt Feeling

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The feeling of guilt may be described as a painful emotional experience resulting from the realization of a considerable distance between one's own conduct and the supergo (the introjected ethical and moral standards, norms and values). It springs from self-judgment and personal rating. Here a question arises : How do people react to their guilt feelings? The present study is an attempt to answer the above question.

Method : Two Pilot studies were conducted in order to prepare the questionnaire. The purpose of the first pilot study was to find out guilt producing situations, and of the second to find out the common reaction to the guilt producing situations.

A questionnaire of sixteen situations, given below made out of the pilot studies, was distributed to 55 students.

QUESTIONNAIRE

There are certain guilt producing situations to which different people react differently. Below are given some situations which you might have met ; if not please imagine yourself to be in the situation, and write down your personal reactions for each situation on the sheet of paper attached herewith. *Please be clear and concise.*

REMEMBER DO NOT WRITE YOUR NAME

1. When I behaved selfishly.
2. When I used improper piece of paper in the examination.
3. When I beat my innocent brother/sister or a poor man.
4. When I put others in trouble.
5. When I travelled without ticket.
6. When I remember my failure to help a man, even though I was in a position to help him.
7. When I had or intend to have a sexual intercourse with a boy or a girl.
8. When I exposed the weakness of my friend.
9. When I betrayed my friend.
10. When I behaved unmannerly, with my authority.
11. When I disobeyed my parents or teachers,

12. When I kissed or offered a kiss to a member of the opposite sex.
13. When I disclosed the secrets of a friend who has confidence in me.
14. When I created a disturbance in one's examination time.
15. When I did something against my promise.
16. When I stole money, book or anything.

Thank you

Result : A few subjects gave their reactions to guilt evoking situations in two or three words, whereas the majority gave reactions in one or more sentences. These reactions were categorized and given the appropriate psycho-analytic terms for example, anxiety, self-aggression and rationalization. A few examples of reactions reduced to psycho-analytic terms are given below :—

- Anxiety :**
1. Feeling uneasy.
 2. I felt very much distressed.
 3. I felt discomfort.
 4. I remained feeling tormented.
 5. I did not sleep.
 6. I felt nervousness.

- Self-aggression :**
1. Self-reproach.
 2. I blamed myself.
 3. I condemned myself.
 4. I developed a hatred for myself.

- Rationalization :**
1. I could not get time to purchase a ticket.
 2. There was a great rush and I disliked standing in a queue.
 3. I wanted to save money.
 4. I stole a book because I needed.
 5. She encouraged me and I kissed her.

Some of the reactions were placed in the same form as reported by the subjects. They are here, for example, given below :—

- Shame :**
1. Shame.
 2. I felt disgraced.
 3. It has a disgrace for me.

- Sorry :**
1. I felt sorry.
 2. I repented.
 3. I remorse.

- Irrelevant :**
1. I felt guilty.
 2. My conscience will never excuse me.
 3. I condemn homosexuality ; so far as hetrosexuality is concerned, it is a pleasant act.

TABLE
Reactions

	Anxiety	Self-Agg.	Ration.	Shame	Sorry	Irrelevant	Total
(1)	6	2	...	27	15	5	55
(2)	31	...	15	3	...	6	55
(3)	7	31	1	3	11	2	55
(4)	27	5	1	11	11	...	55
(5)	7	...	43	...	2	3	55
(6)	30	2	4	3	15	1	55
(7)	19	...	16	4	...	16	55
(8)	27	1	2	6	17	2	55
(9)	32	8	...	11	4	...	55
(10)	41	...	6	6	...	2	55
(11)	34	...	...	16	5	...	55
(12)	18	11	10	5	4	7	55
(13)	34	7	...	6	3	5	55
(14)	15	28	2	4	5	1	55
(15)	37	...	...	11	5	2	55
(16)	9	8	31	7	...	...	55
Total	374	103	131	123	97	52	880

Discussion : The study shows that people have reacted differently to guilt-evoking situations. Different reactions such as anxiety, self-aggression, rationalization, shame and sorry have been reported. There is considerable agreement in reaction among students. Reactions in different frequencies to different situations can easily be read from the table.

"Anxiety" has been found to be the commonest reaction. It was reported in every guilt producing situation by a considerable number of students.

"Rationalization" was reported in 11 situations having the highest frequency in 3 situations. (No. 5, 7, 16).

"Self-Aggression" was reported in 10 situations. It gets the highest frequency in two situations. (No. 3, 14).

"Shame" was reported in 15 situations. It received the highest frequency only in one situation (No. 1).

"Sorry" was reported in 12 situations. It did not get the highest frequency in any situation.

SUMMARY.

The reactions to guilt-evoking situations are many such as anxiety, self-aggression, rationalization, shame and sorrow. By looking at the table we find "anxiety" as the commonest reaction to guilt-producing situations. "Anxiety" here got the highest frequency in 11 situations out of 16 situations, and was reported in every situation. That there exists a guilt-anxiety relationship, seems to be demonstrated conclusively in this study.

Asthana's Adjustment Inventory: Re-studied

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Introduction

The Hindustani Adjustment Inventory (1) was originally developed to segregate the poorly adjusted pre-College students who might require special care and attention. The author clearly indicates the limitation of the inventory as an instrument for deeper analysis, i.e., its inability to diagnose the type of psychoneurotic disorder (2).

Originally, the inventory had 42 items of 'yes' 'no' type. But, in the follow-up study, the author found two items having a low validity score which he deleted in the final form. Thus, the inventory in its present form, consists of 40 highly valid items.

Present study

Since the inventory was originally developed and standardized for the screening of school-going population (XI and XII years), the present study was carried out to (a) see how far it is applicable to adult student group and (b) to provide norms for the college-going population.

The present sample consists of 108 students of an Engineering Institution. The selection of the sample was done on the random basis. The mean age of the sample was 20.3 years.

Procedure

After getting the inventory translated into English, it was given to the subjects who were required to answer each and every item by circling 'yes' or 'no' whichever applied to them. The items were, then, scored according to the modified scoring system, that is, assigning a score of 1 to negative answers and a score of zero to positive answers, except for two items 19 and 42, where the scoring was reversed. The sum of all the negative answers, thus, gave the 'adjustment score' for each subject.

Mean, median, SD., skewness, and percentiles were calculated for comparison with Asthanas' mean, SD and percentiles. The 't' test was applied to see whether any obtained difference was statistically significant. Frequency graph was also prepared.

Results and Discussion

The mean and SD of the present score distribution are found to be 23.21 and 6.60 respectively with a median score of 23.70. Though the present mean, median and SD slightly differ from Asthanas' mean, median and SD, the 't's show

*The author is very thankful to Dr. H. S. Asthana for allowing to re-study his inventory. The author is also thankful to Prof. Durganand Sinha & Ch. H. K. Misra for their valuable comments and suggestions.

that the obtained differences are not significant (Table 1) (3). That is, the differences may be assigned to sampling error. It shows that the 'general adjustment level' of the school and college students is almost the same. It also shows, on the other side, that the increasing age, and higher education do not affect the general adjustment level of the students significantly.

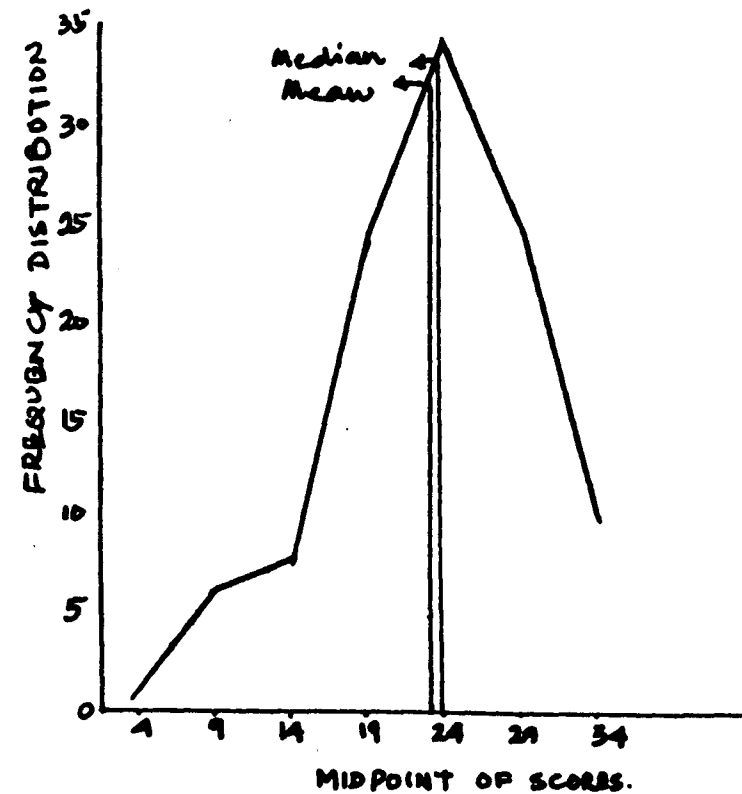


FIGURE 1. Showing Distribution of Adjustment Scores

The frequency distribution also shows the same trend as Asthanas' with a slight skewness (— .22) on the negative side.

TABLE I
Showing Means, SDs and Mdns. of two studies

	Asthana	Present	't'	df
Mean	22.58	23.21	.81*	311
SD	6.30	6.60	.55*	311
Median	23.00	23.70	.70*	311

* Insignificant.

It indicates that there is a slight more concentration of students, both of college and school grades, towards the higher adjustment side (Table 2).

TABLE 2
Showing Comparative Skewness

Asthanas'	Present	Diff.
— .20	— .22	— .02

The percentile distribution also gives almost the same profile as Asthanas' (Table 3).

TABLE 3
Showing Comparative Percentiles

Asthanas' sample : 205	Present sample : 108	Percentiles
30	31.30	90
28	29.15	80
27	28.10	75
26	27.00	70
25	25.25	60
23	23.70	50
21	22.10	40
20	20.10	30
18	18.55	25
17	17.85	20
13	13.85	10

The present percentile distribution shows that scores vary from 13.85, signifying a very poor adjustment, 23.70 showing a moderate adjustment, to 31.30 indicating a very high adjustment. The similar trend is there in Asthanas' percentile distribution.

Conclusion :

It is concluded that the increasing age and specialized training do not affect the 'general adjustment level' and, there is a slight tendency in students, both of school and college grades, to cling towards the positive side of the adjustment scale.

The investigation shows that the inventory, though it was originally developed for the screening of school-going population, can be used for screening of college-going population with good confidence.

A percentile distribution is also provided here which may be found helpful for ascertaining adjustment level of college-going students.

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Rorschach Ranking Conformity Test: A Revision and an Evaluation

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Introduction

Rorschach test has been turned into an objective, valid and reliable test of temperament, because of the high correlation between the 'lack of conformity' principle and neuroticism. In the original form, this test consists of a set of 10 ink blots, that are presented to the subject one by one and he is required to tell the examiner what they remind him of, or what they look like to him. In the end these reactions are analysed by the Rorschach expert, and it is claimed that this analysis reveals something of the total personality of the subject. According to Rorschach (1942) who is the pioneer and the originator of this test, the extreme subjectivity of the procedure, far from arousing misgivings is actually claimed as an advantage of this test. Evaluation of the Rorschach test in its original form has been made by Eysenck (1947) as follows :—

"... To many Rorschach experts, this test seems to fulfil in the realm of Psychology the functions which in physics fall to the cyclotron, the Wilson cloud chamber, the thermionic valve, and the spectroscope, all in one ; in other words, the test is used for a great variety of disparate measurements which make it seem likely that if any of the fields is accurately covered by the test, none of the other can very well be so covered. To many more cautious psychologists, the test appears as one whose reliability is low, whose validity has never been established with regard to most of the claims made in its favour and whose subjective nature does not attract the scientific worker."

Attempts have been made to remedy these defects, and to convert the test, into one which can be easily and objectively scored with the aid of refined psychometric techniques.

Harrower-Erikson's Original Methods

Harrower-Erikson (1945) devised a test based on the Rorschach cards in order to overcome the difficulties of original Rorschach test. "In brief, her procedure is to present the subjects with a slide of each of Rorschach cards and to get them to pick out a response which to them appears most definitely suggested by the ink blot as seen on the screen. Half of the possible responses, which are printed on

a sheet, the subjects have in front of them, are typically neurotic, the other half are typically normal responses. The total number of neurotic responses chosen constitutes the subject's neuroticism score, ranging from zero (for the most normal) to ten (for the most neurotic); a score of four is considered as the critical score, above which the subject is considered in need of a psychiatric check up."

Limitations

In spite of its many good features most prominent of which is its objectivity, the adverse report of Wittson *et. al.*, points out that the test does not differentiate the neurotic group from the non-neurotic group with sufficient accuracy. This has been mainly due to two reasons :

- (1) The Harrower-Erikson test was not reliable enough to be acceptable. Split-half reliability (corrected by Spearman Brown formula was only $+ .64$, $n = 300$). Such kinds of reliability require a very high selection ratio.
- (2) The set of items from which the subject is required to choose could be improved by active experimentation.

Eysenck's Improvement

In the new form of this test as given by Eysenck (1947) it becomes a simple ranking test.

Procedure

The subject is shown at slide of one of the Rorschach cards. He is also furnished with a list of nine possible answers which might be suggested by the ink blot. He is required to write 1, after the response which seems to him most like the ink blot, and 2, after the response which seems to him second most like the ink blot, and so on down to 9 after the response which seems to him least like the ink blot. The same procedure is repeated, with different sets of responses for the other 9 ink blots. The actual responses used were taken from Harrower-Erikson's list. There were five normal and four neurotic responses selected from the list and presented in a randomized order.

Scoring

According to Eysenck : "If the theory on which the test is based is sound, then the completely normal person would rank the four neurotic responses as sixth, seventh, eighth and ninth; and the completely neurotic person would rank them as first, second, third, and fourth. The summed ranks of four neurotic answers for each of the ten cards is the person's score. In the above example, the completely normal person would have a score of $9 + 8 + 7 + 6 = 30$, while the completely neurotic person would have a score of $1 + 2 + 3 + 4 = 10$.

On a total of 10 cards, Normals would have a score of $30 \times 10 = 300$.

On a total of 10 cards, Neurotics would have a score of $10 \times 10 = 100$.

Interpretation and Discussion

Do these scores really mean anything? This question was answered by correlating the 10 scores for each S and factor analysing the resulting table for 300 neurotic Ss. "All correlations were positive and give rise to a general factor which accounted for 34% of the variance. No significant residuals were left after the extraction of the general factor. In other words the G factor identified as conformity, exhausted the entire variance of the test."

Eysenck's results prove that the test was measuring 'lack of conformity'. The split half reliability was (corrected by Spearman Brown formula) $+ .84$.

Correlation of this test with progressive Matrices (non-verbal test) was $+ .08$, and with Mill Hill vocabulary (verbal test) was $+ .27$. Therefore it was also concluded that lack of conformity is largely related to temperamental or characterological features of the personality rather than cognitive features. The test was also later administered to 300 neurotics and 150 normals and frequency distribution was plotted with equal representation of both sexes. Mean for the normal group was $= 231$. Mean for the neurotic group $= 205$. C. R. $= 3.2$, sig. beyond 1% level. Thus it is seen that the test as revised by Eysenck had differentiated the normal from the neurotic significantly. So both for diagnostic purposes and for further researches the test can be used with confidence as a safe measuring instrument, which will differentiate the neurotic from the normal.

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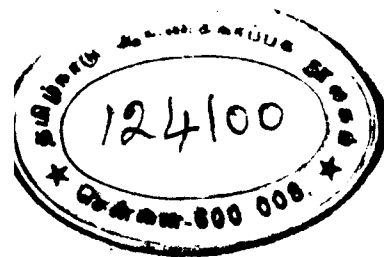
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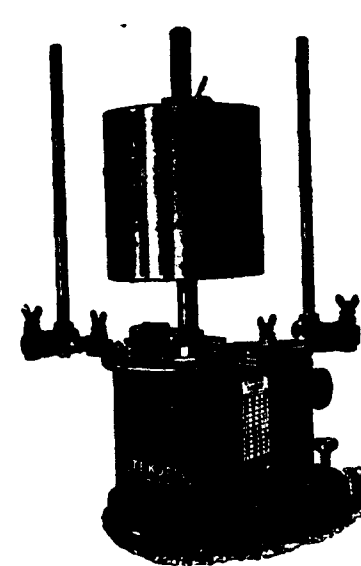
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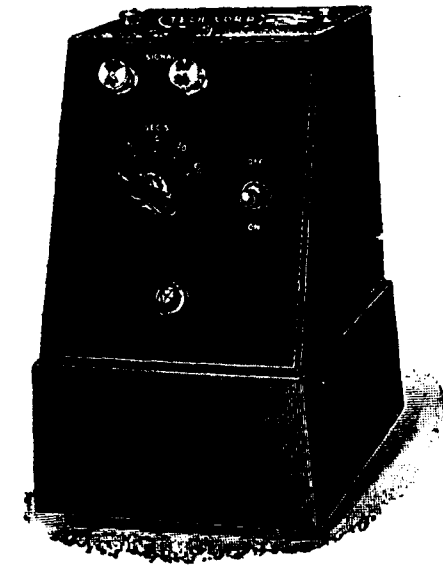


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