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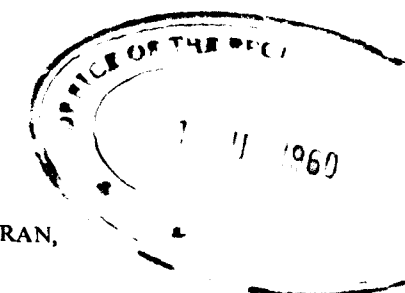
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JOURNAL OF PSYCHOLOGICAL RESEARCHES

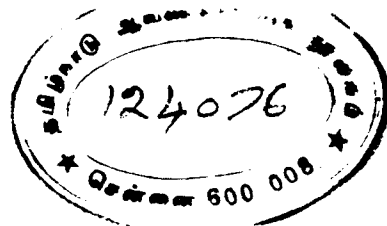
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EDITORIAL NOTES.

For sometime now, we have been planning to start a symposium through our journal on the 'concept of mind'. Ever since psychology dissociated itself from Philosophy, we have been rather evading any definition of the term 'mind'. The possibility of slipping into philosophical concepts and theories has been in a large measure keeping us from facing this problem. During the past few decades, experimental Psychologists have gathered so much data about the functioning of the human mind that it is time we consolidated our gains and embarked on some theoretical formulations also. Unless we psychologists do this, the task may be taken up by other disciplines like Philosophy, Sociology or even Anthropology, thus creating further difficulties for the experimental Psychologists to give a definition to this concept of mind. We are fortunate to have a few articles from eminent Scientists. In this issue of our journal we are starting the symposium by publishing the first article. Comments and notes from readers will be welcome and they may be published at the discretion of the Editorial Board. The first article is by Sir Cyril Burt. In the next issue, there will be an article by Prof. E. G. Boring.



A Work Study Technique for Non-Repetitive Work : Development, Reliability and Validity*

B. S. BHAGOLIWAL

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The scientific management movement, begun in the 1880's, aims at "maximum prosperity for the employer and the employee at the same time" (5). The various techniques of scientific management consist of "systematic procedures of investigation, planning, or control which can be applied to all management problems of a given type, wherever they may occur" (5). Their objective is to provide the solution to the question: How can maximum productivity with existing resources be attained? Associated with the names of the pioneers of scientific management, Taylor and the Gilbreths, work study is the chief technique employed to seek the answer to the above problem. It aims at increasing productivity through effective utilisation of human effort and reducing poorly utilized time, inefficient methods of production, and wastage due to defective designs. Work study principles have been applied in many areas and fields "as a means of raising the productive efficiency (productivity) of a factory or operating unit by the reorganisation of work" (5). By now work study is well-established in businesses and industries where repetitive work is predominant. It has also produced many improvements in some of the areas usually considered outside its domain, e.g., departmental stores, hospitals, hotels and mail-order houses (6). But the office has been slower to adopt such ideas. In recent years, a promising development has been the increasing attention to workstudy for office use (4).

Work study has been variously defined by different workers, but the definition, as given in an International Labour Office publication, "Introduction to Work Study" (5), states as follows:

"Work study is a term used to embrace the techniques of method study and work-measurement which are employed to ensure the best possible use of human and material resources in carrying out a specified activity."

Again,

"Method study is the systematic recording, analysis and critical examination of existing and proposed ways of doing work and the development and application of easier and more effective methods"; and "Work measurement is the application of techniques designed to establish the work content of a specified task by determining the time required for carrying it out at a defined standard of performance by a qualified worker" (5).

Hence it may be said that work study is a technique of analysing production and work methods with a view to determining the time required to carry out a specified task in the easiest possible way of doing it, when the necessary steps are organised in the best order and unnecessary steps completely eliminated. Thus method study and work measurement are closely linked; method study is concerned with the reduction of work content of the operation, while work measurement is concerned with the investigation and reduction of ineffective time, and the subsequent establishment of time standards on the basis of the work content established by method study.

Work study has been found useful for raising productive efficiency of an operating unit by the reorganisation of work without incurring any capital expenditure on the plant and equipment. It is considered to be one of the most accurate means of setting up standards of performance on which effective planning and control of production depend. It is also useful for better control of work scheduling and individual work assignments and enables effective budgeting, forecasting and planning. In addition, it can be used as a basis for personnel policies such as installation or revision of a job-evaluation plan, or preparation or rewriting of job-descriptions or balancing the work of members of teams or balancing workers with machines.

The process of work study consists of the following steps:

- (a) Dividing the work of a man in small elementary operations.
- (b) Recording from direct observation everything that happens, using the most appropriate recording techniques and noting the time required for each operation.
- (c) Analysing the operations critically and developing the most economical method by eliminating useless operations, taking into account all the circumstances.
- (d) Measuring the quantity of work involved in the method selected and calculating a standard time for its performance.

Work study techniques have been mainly applied to repetitive work in previous years. The techniques for analysing repetitive work have sufficed to date because repetitive work was the predominant type. However, no more work is becoming non-repetitive in nature. Automation and modern technological developments are bringing this in the form of more maintenance men, technicians, engineers, and research workers. Non-repetitive work is also associated with supervisory activities. Activities and operations such as those of foremen, purchasing agents, draftsmen, office clerks and office peons or helpers, and business executives are further examples of non-repetitive work (6).

In recent years, generally one of the three approaches was utilised for the analysis of non-repetitive work (1):

- (a) Place the observer with individual(a) doing non-repetitive work; the observer records all the activities and the time for each activity as performed by one or more of them;

- (b) Operator records what he works ; the operator is provided with a form and is asked to report the time and description of each activity as and when he performs it.
- (c) Work sampling (Occurrence study). It determines the percentage of time spent by the individual(s) on the various activities of the job by means of random observations. It is one of the most widely used techniques for analysing non-repetitive work. The foreman or the supervisor can use this technique and still perform almost all his other functions. It is also based on the theory of probability, and its reliability and validity can be statistically examined.

The present study was taken up to devise a technique for the analysis on non-repetitive work using symbols and charts, analogous to those used in motion study of repetitive work (2). It was attempted to make the technique as simple as possible so that it could be applied to any type of non-repetitive job.

As will be apparent from the description of the various approaches to the analysis of non-repetitive work, every technique requires direct observation of the worker while carrying out his tasks. This observational phase of analysis and recording activities is essentially a psychological phenomenon. Hence a psychometric assessment of the quality of observation is essential. It was therefore considered necessary to find out the reliability and validity of the proposed technique. It becomes all the more important as the current literature does not give any such estimates regarding the prevalent techniques of work study with the exception of the work sampling technique (5).

To test the applicability of the technique four different types of jobs were analysed. It was arranged so that the observations were made by the ordinary supervisors or the workers themselves, who are not familiar with the principles of work study.

For the analysis of work activities by this technique, all the activities performed by the workers should be listed in consultation with the workers themselves, their supervisors and by direct observation. These activities should be classified in suitable categories such that the categories are mutually exclusive and comprehensive. These classificatory categories are to be properly defined and each allocated a symbol. A motion and time chart should also be devised to record the time of starting any activity, the classificatory symbol, short description of the activity in one or two words and the quantity of work in cases where it can be objectively determined.

In the present investigation the following four jobs were taken up for analysis :
 (i) Research Scholar ; (ii) Stenographer ; (iii) Office Helper or Messenger boy ;
 (iv) Laboratory Assistant.

Three sets of categories were devised, one each for the jobs of research scholar and stenographer and a common set for office helpers and laboratory assistants. Each category was separately defined and examined to see whether it was comprehensive and exclusive. Instructions were also written and arranged with the

definitions, indicating how they were to be used, and how the motion and time charts were to be completed. A common chart was devised for all the jobs.

For the collection of the data, charts, instruction sheets and classificatory categories along with their symbols and definitions were distributed to the research workers and stenographer, and to supervisors in case of laboratory assistants and office helpers. The purpose of the study was explained and they were requested to keep a record of all the activities performed by the workers concerned for the full day's duties. The charts were to be maintained for a period of at least one full working week.

Results

The data obtained from these four jobs were tabulated in terms of frequency of activities and time spent on each activity for each day for each worker. Averages per day were found out by units of one or more weeks. This average time per operation was converted into a percentage of total time. Tables 1 to 3 give these percentages separately for research scholars, stenographers, and office helpers and laboratory assistants. From the tables, the performance of workers can easily be compared against one another as well as from one period of observation to another in case of the same worker.

Both intra-worker and inter-worker reliabilities were determined by computing the product moment correlation, applying the formula given in standard texts (3). For intra-worker reliability, the correlation was obtained between the percentages of time devoted by the same worker to different operations during two different periods of observation. Similarly for inter-worker reliability, the correlation was computed between the percentages of time devoted in each operation by two different persons having similar jobs studied during the same period. These reliability coefficients are given in Table 4.

To find out the validity of the proposed technique, it must be tested against some standard criterion. For this purpose, work sampling technique was chosen as it has been applied previously to non-repetitive work and its reliability and validity have been tested for work study (1). While the original data were recorded by the workers or their supervisors and were for the full working day, work sampling data were collected by the author, who took observations at times selected by random sampling. Those workers already observed by the proposed technique, were also observed by the work sampling technique. It was also noted, while collecting data by the work sampling technique, that the load of work and nature of work had changed slightly since the original observations were made, in case of office helpers, stenographer and one of the research scholars. This fact was noted to be kept in mind while judging the results of validity coefficients for different workers and different jobs. The work sampling frequencies were converted into percentages to estimate the amount of time devoted by each worker in different categories of activities. These percentages were correlated, using product-moment formula (3), with the percentages obtained from motion and time charts for the corresponding workers, to obtain the validity coefficients presented in Table 5.

Discussion

The results can be discussed in terms of the purposes of the study. As the results indicate, this technique has given high reliability coefficients for the types of jobs studied. It is highly consistent from one worker to another employed in the same job and the technique also gives consistent results in case of the same worker from one observation to another. The majority of the coefficients are significant at the 1 per cent level and all of them are significant at the 5 per cent level. (Table 4). These results suggest that this technique is reliable for analysis of non-repetitive work.

With regard to validity of the technique, the results indicate significant validity for laboratory assistants and one of the research scholars (Table 5). In the case of others, low validity was found which may have been due to many factors, for example, change in the nature and load of work during the period elapsing between original observations and work sampling, incomplete reports often made by the workers and supervisors due to pressure of work.

As the technique has shown a considerable degree of reliability and validity for several quite different jobs, it can be recommended for wider use. The classification of work activities must, of course, be carried out for each type of work. However, with little training and explanation, the regular supervisors can be entrusted with collection of the data and also, for higher level jobs, the workers themselves can be asked to maintain the records.

It can be hoped that with wider application, this technique will be found useful for all types of non-repetitive jobs, in industry as well as in the office, for example, for such jobs as those of supervisors, draftsmen, engineers and maintenance men. It can also be usefully employed for comparing the performance of different workers on the same job (Tables 1 to 3). It may therefore be used as a basis for establishing time standards for different activities in different jobs of a non-repetitive nature. Besides this, industry can adopt this technique for collecting performance records by their supervisors without imparting any special training to them. As illustrated in this study they can employ it with general explanations, and some categories of workers can be relied upon to maintain such records themselves.

The study also indicates the importance of psychometricians for such studies. As discussed earlier there is more than one technique for the analysis of non-repetitive work but none with the exception of work-sampling technique, has got a scientific basis. All however depend basically on observations by a human observer. It is the role of psychometricians to test the reliability and validity of the various techniques and other measuring tools to improve them and to demonstrate their worth before advocating their general use in business and industry.

Summary

1. A technique was developed for the analysis of non-repetitive work as a necessary preliminary for work study. Its applicability to four different types of jobs research worker, stenographer, laboratory assistant and office helper was illustrated.

2. The reliability of the technique was determined by comparing performance of one person against another in the same job and for the same person from one observation period to another. Results indicate dependable reliability in the majority of cases.

3. The validity of the technique was examined by comparing the proportion of time devoted to different activities of a job as obtained by this technique and the work-sampling technique. The results indicate considerable validity for many workers, however further investigation is required to establish this as a general feature of the technique.

4. The technique was also found useful for comparing the performance of one individual with another on the same job and could be employed for establishing time-standards for different activities in different jobs.

5. Psychometric methods were illustrated as appropriate and suitable to investigate and establish the quality of observation.

Acknowledgments

I gratefully thank Dr. (Mrs.) Rhea S. Das for her guidance and supervision and my colleague Mr. K. P. Bhattacharya for his help and suggestions. My thanks are also due to all the workers and supervisors who co-operated in this project. I wish to acknowledge the co-operation of the authorities of the Indian Statistical Institute, Calcutta, where the entire work was carried out.

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TABLE 1
Work Study Data for Non-Repetitive Work : Research Scholar Allocation of Time in Percentages
(Self-Reported)

Serial number	Nature of Work	Symbol	Successive Periods of Observation											
			Period I (4 weeks)—Persons				Period II (3 weeks)—Persons				Period III (2 weeks)—Persons			
			1	2	3	4	1	2	3	4	1	2	3	4
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
1	Job Oriented Work ...	*	81.3	82.0	79.6	87.8	92.5	88.6	80.8	89.4	84.3	84.1	84.3	86.3
2	Miscellaneous Task ...	M	18.7	18.0	20.4	12.2	7.5	11.4	19.2	10.6	15.7	15.9	15.7	13.7
3	Reading ...	L	70.3	70.3	78.3	50.1	57.4	45.5	66.7	37.	47.9	68.0	46.6	20.4
4	Discussion ...	D	1.8	.7	.3	.9	1.9	4.3	1.8	3.9	7.8	1.3	.5	7.3
5	Machine Calculation	C	1.4	.5	...	...	5.9	14.3	1.3	...	...	.8	...	...
6	Practical Exercises ...	E	4.6	1.4	...	...	18.2	24.1	11.0	...	5.6	10.6	37.2	...
7	Writing Reports ...	W	...	...	...	21.2	...	...	...	15.2	...	...	...	...
8	Field Work ...	F	...	1.1	.5	...	3.2	...	...	...	...	...	...	...
9	Testing Work ...	T	3.2	8.0	.5	15.6	5.9	.4	...	33.3	23.0	3.4	...	58.6

* Percentage of time devoted to all activities other than miscellaneous.

TABLE 2

Work Study Data for Non-Repetitive Work : Stenographer,
Allocation of Time in Percentages

(Self-Reported)

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Serial number	Nature of Work	Symbol	Successive Periods of Observation			
			I	II	III	IV
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1	Job Oriented Work ...	*	92.4	87.2	93.3	91.9
2	Miscellaneous Task ...	M	7.6	12.8	6.7	8.1
3	Dictation and Transcription ...	D	35.5	29.8	18.9	19.4
4	Attending Phone Calls	P	9.4	15.9	12.7	7.5
5	Typing for Rotaprint	T R	17.9	21.3	4.4	48.0
6	Typing for Other Papers	T P	5.7	7.2	40.0	...
7	Correspondence—Despatch ...	C D	8.7	2.4	14.4	13.1
8	Correspondence—Independent.	C I	6.6	5.8	2.4	...
9	Store Management	S & S R D	1.2	3.2	.5	3.9
10	General Supervision	G G R M	5.5	...	...	...
11	Filing	F & F D D	1.9	1.6	...	...

*Percentage of time devoted to all activities other than miscellaneous.

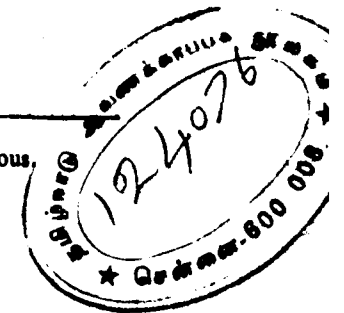


TABLE 3
Work Study Data for Non-Repetitive Work : Laboratory Assistants and Office Helpers,
Allocation of Time in Percentages
(Data Reported by the Supervisors)

Serial number.	Nature of Work	Symbol	Successive Periods of Observation											
			Period I (1 week)—Persons						Period II (1 week)—Persons					
			1	2	3	4	5	6	7	8	9	10	11	12
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
1	Job Oriented Work	*	85.2	70.0	67.3	86.7	74.9	88.8	92.9	84.5	87.1			
2	Miscellaneous Task	M	8.2	24.2	14.0	13.3	25.1	11.2	7.1	15.5	12.9			
3	Office Maintenance	O	...	1.1	...	19.9	...	.6	18.6	...	...			
4	Carrying	C	2.2	...	...	58.0	...	...	47.9	8.5	...			
5	Assisting in Clerical Work	A	18.4	...	2.9	...	57.8	54.7	...	73.2	65.7			
6	Work on Duplicating Machines	D	...	...	...	...	...	22.9	...	...	...			
7	Semi-Manual	S	...	4.0	...	4.8	17.1	1.1	26.4	...	...			
8	Technical	T	64.6	63.6	62.2	2.4	...	7.1	...	...	18.6			
9	Waiting	W	...	1.3	2.2	1.6	...	2.4	...	2.8	...			
10	Time Unaccounted for	U	6.6	5.8	18.7	...	...	...	...	...	...			

* Percentage of time devoted to all activities other than miscellaneous and unaccounted for time.

TABLE 4
Intra-Worker and Inter-Worker Reliability of the Work Study Technique for
Non-repetitive Work

Serial number	Jobs	Intra-Worker Reliability		Inter-Worker Reliability	
		Worker 1	Worker 2	Pair of Workers 1	Pair of Workers 2
(1)	(2)	(3)	(4)	(5)	(6)
1	Research Scholar	...	.99**	.89*	.99**
2	Laboratory Assistant	...	...	.91**	.88**
3	Office Helper	...	.88**	.85*	...
4	Stenographer (For two different periods of observation)	...	.98**	...	...
		...	.89**	...	...

* $p < .05$

** $p < .01$

TABLE 5
Validity Coefficients for the Work Study Technique for Non-repetitive Work :
Correlations with Work Sampling Data

Serial number.	Jobs	Workers		
		1	2	3
(1)	(2)	(3)	(4)	(5)
1	Research Scholar	...	.94**	.28†
2	Laboratory Assistant	...	.93*	.89**
3	Office Helper	...	.46†	.94
4	Stenographer	...	.61†	...

* $p < .05$

** $p < .01$

† A period of 5 weeks had elapsed between the collection of data by work sampling and by the proposed technique during which nature of work and load of work had changed considerably.

Note :—

1. The tables present the original data in percentage form. For Table 1, four research scholars were studied ; for Table 2, one stenographer was studied ; for Table 3, six laboratory assistants and office helpers were studied.

2. The reliability coefficients were product-moment correlations computed between pairs of columns for the appropriate tables. Thus, intra-worker reliability for the research scholars was computed between columns (6) and column (10) for Table 1 for worker 1 and between columns (9) and (13) of the same table for worker 2. Pairs of columns from different tables were similarly examined to obtain intra-worker reliabilities. For inter-worker reliability, the correlations were computed between columns for two persons carrying out similar types of work during the same period of observation. For example, the intra-worker reliability for research scholars was computed between columns (4) and (5) of Table 1 to obtain one coefficient and between columns (5) and (7) of Table 1 to obtain the other coefficient reported in Table 4. Similarly, pairs of columns were chosen representing different persons carrying out the same type of work for other inter-worker reliabilities.

The Concept of Mind

CYRIL BURT

Consciousness as a Datum : The word 'mind' I take to be a convenient name for 'the basis of consciousness,' leaving it an open question whether or not that basis is some material structure such as the brain, some immaterial entity such as the soul, or some ever-changing process, or perhaps after all entirely non-existent. Consciousness itself cannot be defined ; it is one of those primitive facts which we can only indicate by citing instances. At this moment I see a piece of white paper before me on a brown table ; I hear my clock strike ten ; I remember the editor's letter ; in thought I begin to meditate upon my problems ; and presently I shall pick up my pen and write. These processes of perception, memory, thought, and voluntary action are facts that I cannot doubt ; and I class them all under the single heading of consciousness.

Since what I write is to be read by the editor and by you who study the pages of this journal, I assume that other people are conscious too. Furthermore, I am not directly conscious of your consciousness, which is in some way quite separate from mine. Hence, modifying Descartes' famous aphorism, I take as my datum the proposition : "Cogitamus : ergo sunt cogitationes" : "we are conscious ; hence we must infer that our consciousnesses are real existents." If some sceptic argues that consciousness may in the end prove an illusion, I reply that it must at least be a *conscious* illusion, since no unconscious thing could question its own reality.

Consciousness as an attribute of substances : Throughout the ages it has been one of the main problems of philosophy, in the East and in the West, to examine these phenomena, and, so far as is possible, to give an intelligible account of their nature. How then shall we describe them ?

Western philosophy, from the time of Aristotle onwards, has tended to express its descriptions in terms of propositions of the simple subject-and-predicate type. It assumes the existence of certain more or less permanent substances, and seeks to predicate of these substances the appropriate attributes or qualities, e.g., "I am conscious," "The table-top is not conscious ; it is brown, hard, solid, and square." To the naive observer, therefore, the universe seems to consist of entities of two kinds : (1) those capable of exhibiting consciousness ; let us call them 'minds' and their distinctive quality 'mentality' ; (2) those incapable of consciousness ; let us call them physical bodies or things and their distinctive quality 'materiality.' However, many thoughtful writers have felt dissatisfied with this bifurcation of the universe into two quite different types of beings ; and it is natural to ask whether one or the other of these classes cannot be treated as a sub-class of the other, or whether perhaps both cannot be regarded as sub-classes of some more fundamental type of entity.

THE CONCEPT OF MIND

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Alternative Theories : Four distinct theories, or rather groups of theories, thus arise. They are recognizable even in the early discussions of the ancient Greeks and of the various Indian schools. In the West, however, they were not clearly formulated until the age of empirical science was inaugurated by Descartes and his contemporaries in the seventeenth century.

(1) *Dualism* : The first of these theories—that of Descartes himself—accepts the distinction I have described at its face value. And indeed, after examining the remaining alternatives, we may in the end feel obliged to decide that both mentality and materiality are irreducible. At the close of the nineteenth century, William James in America and most of the leading psychologists in Britain—Ward, Stout, McDougall and their disciples—still clung to this dualistic view.¹ Stout held that conscious processes ran parallel to neural processes ; the others that there was a causal interaction between the immaterial mind and the physical brain. Today with most philosophers and with the majority of contemporary psychologists dualism is out of favour.

(2) *Mentalistic Monism* : The rival doctrines have been the various types of monistic theory, and these commonly follow one of two opposite lines. We may, for instance, hold that what appear to be material substances are in reality *mental*, or at least the manifestation of something purely mental. This represents the universe as at bottom essentially spiritual ; it was the view upheld by Plato and his numerous followers from his day to this. The earliest systematic defence of this hypothesis was that of Berkeley. It was adopted by Hegel ; and, under the name of 'idealism,' became the dominant metaphysic among academic philosophers in Britain throughout the nineteenth century. Bradley's doctrine of "appearance and reality" is very like the *advaitism* of Samkara. Few western philosophers would now support this view ; but, oddly enough, it has been revived by several eminent physicists, notably Sir Arthur Eddington and Sir James Jeans, and still more recently by contemporary continental writers, particularly the leading quantum theorists.

(3) *Materialistic Monism* : The opposite form of monism maintains that mentality is merely one of many possible attributes of certain more or less complex material bodies. Except for the *lokayata* theories of the Carvakas, this view, I fancy, has never gained much support in Indian philosophy. In this country, however, during the middle of the nineteenth century it obtained increasing currency in non-academic circles. The chief exponents were members of the associationist school, especially those who were influenced by the progress of mechanical science and technology and of physiological research on the functions of the brain, like Spencer, Lewes and Huxley. "We are," said Huxley, "just conscious automata ; and our consciousness is just an accidental froth, an aura, an epiphenomenon : our sensations and feelings are but the collateral product of the mechanism of the nervous system, like the tunes ground out by the revolving wheels of a barrel-organ, having no effect on the machinery."

¹ Of recent statements of this doctrine probably the clearest is that of W. McDougall. *Outline of Psychology*, 1925, pp. 34f. The best critical discussion of earlier views is in my opinion that contained in his *Body and Mind* (1911).

In Russia, Pawlow, an ardent admirer of Lewes and Huxley, adopted their view ; and so revived, at the commencement of the present century, the old mechanistic theory under the title of 'behaviourism.' Still more recently one of our leading philosophers, Professor Ryle, in his book on *The Concept of Mind*, has accepted (with minor reservations) a thorough going behaviouristic standpoint, and has begged psychologists once and for all to discard the "theological notion" of a mind or soul, temporarily lodged in the body like "a ghost lurking in the neurological machine."

(4) *Neutral Monism* : A subtler form of monism which has attracted several speculative thinkers is one which rejects both materialism and idealism, but attempts to retain the merits of both. One of its keenest champions was the Viennese physicist, Ernst Mach. "The primary fact," he writes, "is not the conscious ego or mind, but the sensory elements which constitute the conscious ego. Material bodies do not produce sensations ; patterns of sensations make up the bodies. Rearranged in a different pattern they make up my life."¹ At first sight it might seem that this view treats consciousness itself as a kind of substance, the 'primal stuff,' as James has termed it. But, since the word consciousness would suggest an idealist conception, Mach and his followers prefer to describe the basic substance as neutral.

Arguments for and against : Let us now take each of these theories in turn and examine the evidence for and against the interpretations they propose. I shall begin with the theory which at the moment seems to enjoy the widest support from western psychologists.

A. Behaviourism : According to Professor Watson, the champion of the behaviourist school, the sole task of psychology "is the prediction and control of behaviour : introspection forms no part of its method." Consequently he thinks "the time has come when psychology should discard all reference to consciousness, and no longer delude itself into thinking that it can make mental states the object of observation."²

Briefly his arguments are as follows : When you claim to describe your mental states, and assure us that you have experienced this or that sensation, we cannot possibly verify your assertions ; for your sensations and your thoughts are private and peculiar to you, and science can deal only with what is public and general. All that we psychologists can observe is that you are making certain articulate noises with your mouth and throat, and are pointing to certain objects : that is, we can observe nothing but your reactions—the movements of your physical body and its parts ; and, according to Watson, these reactions are themselves mechanically and lawfully determined by physico-chemical processes in a material structure, namely, in your muscles and your nervous system. If they were not movements or changes in some material structure, and if they were not mechanically determined in accordance with the strict laws of cause and effect, they could not become (we are told)

¹ E. Mach, *Analysis of Sensations* (1897 : an enlarged translation of an earlier monograph in German) : a similar view is taken by a contemporary Viennese physicist, E. Schrödinger (the exponent of the theory of wave-mechanics which at the moment holds the field in quantum theory in his recent book, *Mind and Matter* (1958).

² J. B. Watson, *Behaviour : An Introduction to Comparative Psychology* (1914).

the objects of science. "The behaviourist therefore denies sensations, images, feelings, thoughts, and all the other conscious phenomena which the subjectivist claims to find by introspection"¹. And quite recently, it is alleged, the construction of so-called 'electronic brains'—ingenious machines that will react to stimuli, solve complex mathematical and logical problems, store records of past results—has fully confirmed this behaviouristic picture of the human organism.

Criticism : To this view there are four or five obvious objections.

(i) First of all, we may readily agree that it is quite possible to account for some aspects of human behaviour by regarding them as no more than the automatic reactions of a biological machine ; yet it seems wholly out of the question to offer a complete or plausible interpretation of an individual's *whole* behaviour on this very narrow basis. Take an example. In western history there can be few individuals whose life and conduct strike the modern mind as so enigmatic as those of St. Augustine. Yet once we have read his *confessions*, they become intelligible. Now imagine all reference to "sensations, images, thoughts, feelings," etc., expunged by some behaviouristic editor. How much should we comprehend?

However, Watson would perhaps reply that, as a psychologist, he is not concerned with biographical interpretations of historical personages, but solely with the "prediction and control of behaviour." But to predict and control the behaviour even of the humblest person the first essential is to understand it ; and nothing that will aid that understanding can be safely rejected. Imagine an educational psychologist confronted with a child who is dull, delinquent, or neurotic. To predict and control his behaviour will be almost impossible unless the psychologist tries to "get inside the mind" of each. Consider, as two typical cases, the backward readers described in one of my books²; how hopeless it would have been to prescribe remedial methods, had we declined to recognize that one child was almost devoid of auditory imagery and the other of visual imagery ; and note how rapidly they improved once the teaching had been changed in accordance with these findings. Surely we could never even have suspected that people *had* visual and auditory imagery, much less that they differed in their imagery, unless psychologists like Fechner and Galton had detected them in their own conscious experience by systematic introspection.

(ii) And why should we deprecate introspection as less reliable or scientific than any other mode of observation? In describing the different 'methods of psychology' Watson puts first in his list 'the method of observation': for this purpose, he adds, "vision is the sense most usually employed," though for certain purposes, e.g., verbal reactions, we "depend on the auditory sense-organs." But what in such cases *does* Watson observe? Surely, nothing but his own sensations, visual in one case, auditory in another ; and these sensations are just as private and as immaterial when used to detect the reactions of other people as when studied in and for themselves.

¹ K. S. Lashley, 'The Behaviourist Interpretation of Consciousness', *Psychol. Rev.*, XXX, 1923, pp. 237f.

² *Mental & Scholastic Tests* (1921), pp. 286-7.

To be strictly consistent Watson, Lashley, and the other behaviourists ought really to "deny" their own "sensations, images, feelings, or thoughts." Yet even if they did, the vast majority of human beings would still insist that in *their* case such experiences were undeniable. And, if such experiences actually occur, then here and there certain students of humanity will find them sufficiently interesting and intriguing to make them the subject of methodical study. The behaviourist, of course, will still forbid us to give this study its time-honoured name of 'psychology'; and in that case, I suppose, we must find some other designation.

(iii) If, however, we are to consider only the outward behaviour (*i.e.*, the actions and verbal reports) of other human beings, and not the experiences and the thoughts to which they refer, and if we are to assume that all such actions and reports are (as Watson maintains) automatically determined by physico-chemical processes in the material structures of the brain according to the laws of mechanical causation, then we must apply the same principle to the actions and verbal reports of Watson himself. I can no longer believe that he really has experienced the observations he describes; and I must regard the arguments he sets forth as automatically determined by his own nerve-structures. On his own showing therefore Watson's statements prove nothing at all about the nature of the human organism or its mode of behaviour; they are just items in Watson's own automatic behaviour with no meaning whatsoever. Plainly this interpretation of psychology is suicidal. Watson is busily engaged in sawing off a branch on which he himself sits.

(iv) Why then have these extraordinary dogmas succeeded in winning such widespread assent? The real reason is the oft-repeated demand that the concepts and methods used in any branch of study that aspires to the status of natural science must be those of physical science; and the behaviourist's notion of physical science is still that of the late nineteenth century. The physicists of those days assumed that everything could be reduced to terms of matter in motion, and that all change must be the effect of material forces operating in accordance with rigorously deterministic laws. But today no physicist accepts this mechanistic doctrine. Relativity and quantum theory have completely abolished it, except for purposes of rough and ready approximations. Matter as the basic entity has disappeared. Rigid causation has given way before the indeterminacy principle. Twentieth century physicists, such as Eddington, Jeans, Milne in this country and Einstein, Bohr, and Schrödinger abroad would be the last to subscribe to the behaviouristic pronouncement that "modern physics compels us to reject all intangible concepts such as consciousness and mind." So far as modern scientific principles are concerned, the psychologist is quite at liberty to postulate immaterial minds, free will, or a purely spiritual universe should his own theories require it.

B. Neutral Monism: Since behaviourism is no longer tenable, let us turn to the second of the current theories mentioned above. This view maintains that material things (so-called) contain no constituents which are not also constituents of minds (so-called), and that minds contain no constituents which are not also constituents of material things. What we call physical and psychical are just two complementary aspects of a homogeneous universe which is neither the one nor the other nor yet an aggregate of the two. As we have seen, this doctrine has been

supported both by physicists like Mach and by psychoiogists like James: the physicists, oddly enough, are chiefly concerned to deny that the material world is inherently material, and the psychologists to deny that the mental world is inherently mental.

The theory has taken several different shapes. To older psychologists the most familiar is that of Fechner. In his *Zend Avesta* (1851), a book which by its very title displays the influence of Eastern thought, he describes Reality as something neither physical nor psychical, but psycho-physical; viewed from within, it is alive and conscious; viewed from without it appears as the impersonal world of nature. This is plainly a description in terms of a substance and its attributes—the substance being once again a "something I know not what." The more modern version claims to dispense with the 'metaphysical conception' of an unknown underlying substance, and substitutes simply observable events. Being observable, these events are said to have the character of sense-data. The essence of this view may be traced at least as far back as Hume. "When I enter most intimately into what I call *myself*," he wrote in an oft-quoted passage, "I always stumble on some particular perception: I never catch myself without a perception, and never observe anything but a perception." Among recent writers, the most vigorous champion of the doctrine has been William James. In his essay, "Does Consciousness Exist?" (written fourteen years after his *Principles*) he concludes paradoxically that consciousness does *not* exist; "the word," he says, "is merely a loose way of indicating that certain sensory occurrences form part of my life-history".¹ The clearest exposition, however, is that of Bertrand Russell. In his *Analysis of Mind* (1921) he repudiates his earlier views, and maintains that the universe consists of "a multitude of entities which I shall call 'particulars,' arranged in certain patterns: the things commonly regarded as mental and the things commonly regarded as physical differ, not in respect of any intrinsic property possessed by the one and not by the other, but only in respect of arrangement and context." Arranged as a 'biography' *i.e.*, the order in which they occur in the life of an experiencing organism, we dub them mental; arranged according to a causal order in space, we describe them as material.

This conclusion is supported by three related lines of argument. The first turns on a quasi-aesthetic preference for a monistic rather than a dualistic or pluralistic view of the universe. The notion that things consist of "two fundamentally different kinds" (says Russell) "is far less satisfactory to our intellectual desires than that the dualism should be merely apparent and superficial." Secondly, the existence of such entities as minds and material objects are hypothetical assumptions; and Occam's razor requires us to dispense with two such assumptions if we can make do with one. Thirdly (and this is an argument emphasized more strongly by A. J. Ayer than by Bertrand Russell) to postulate the existence of a mind or cognizing self would be to postulate the existence of a specific substance; and, "when one inquires into the nature of this substance, we find it is an entirely unobservable entity." Now, according to the positivist school of philosophy to which Professor Ayer belongs, a concept which implies something entirely unobservable is not merely

¹ *J. Phil., Psychol., and Sci. Meth.*, I. 1904, pp. 16-28.

a concept that cannot be empirically established ; it is a concept that is devoid of all meaning.

On this view, therefore, the only things that exist (or perhaps we should say the only things that *occur*) are perceived or perceptible events—what Ayer calls 'sense-contents' and Russell 'sensibilia.' And thus, "the answer to the question whether sense-contents are mental or physical is," we are told, "that they are neither".¹

Criticism : The conclusion thus reached seems plausible only so long as we ignore a number of other relevant facts. Let me indicate them as briefly as I can.

(i) To begin with, although, as Professor Ayer admits, his account appears 'paradoxical,' the central argument on which it turns is based on an elementary logical truism, namely, that any assortment of elements can always be arranged and rearranged in two or more different orders, and thus grouped to form two or more distinguishable classes. For example, I can arrange the books on my shelves either according to the various subjects with which they are concerned or according to the names of the authors arranged in alphabetical sequence. And there are many other modes of classification that I could adopt : I might, for example, arrange them, as many people do, according to their size. But, simply because most libraries keep two catalogues, one of subjects and the other of authors, no one imagines that there are also two sets of books.

However, if this were all there is to the distinction between matter and mind, then it is curious that so many thinkers in the past, in the East as well as in the West, should have independently seized on just this particular two-fold classification of the 'neutral elements,' and have regarded it as fundamental. And if, as the neutral monist assures us, the distinction does not reflect any intrinsic difference in the nature of the *elements* that form each class, then, it would seem, there must at least be some intrinsic difference between the *relations* which determine the two types of classification. And in the end Russell at any rate appears to concede something of this sort. According to him, the relations are essentially causal ; and he apparently postulates two types of 'causal law,' physical and mental, which cannot be reduced the one to the other. Thus physics and psychology would still constitute two distinct branches of science. As he himself says, "A man who can see knows things which a blind man cannot know ; but a blind man can know the whole of physics : thus the knowledge which other men possess, and he does not, is *not* a part of physics." It must therefore form part of psychology. And so after all we discover that *some* kind of dualism is inescapable.

(ii) Nevertheless, I do not think that this difference between relations is the *sole* ground for the distinction. There are other relevant facts which the neutralist ignores. The psychology in terms of which his arguments are couched is an out-of-date sensationalistic psychology of a kind that prevailed in the nineteenth century, and still seems to be widely accepted by behaviourists and by non-psychological thinkers. It treats the most conspicuous form of experience—namely, perceptual experience—as the *only* form of experience. Now, so long as we confine ourselves

¹ A. J. Ayer, *Language, Truth, and Logic* (1954), pp. 123 f.

simply to perceptual experience, it is quite plausible to argue that, when I look at a brown table, the brown that I see is at once the colour of the table and the colour of my sensation, and must therefore be *both* physical *and* mental, and in that sense 'neutral.' But we cannot say this of our pains or pleasures, or of our emotions or desires : these are never elements in material objects. Nor can we apply it to belief, especially erroneous belief : the Greeks believed in centaurs, but the centaurs in which they believed are mental contents, not physical. The same is true of memory : my memory-images when I recollect what happened yesterday are purely mental, and cannot possibly be assigned a location in the world of matter and space.

(iii) Further, just as some elements form part of my mental experience but do not form part of the physical world, so, even on the neutralist's own showing, there are other elements in the universe which do not form part of anyone's experience. No one, for example, has actually seen the far side of the moon. To overcome this difficulty, Russell postulates entities or occurrences that are similar to sense-data except for the fact that no one experiences them. "We have no means (he writes) of ascertaining how things appear from places not surrounded by sense organs and a brain, because we cannot leave our own bodies ; but continuity makes it not unreasonable to suppose that they present *some* appearance at such places." Such appearances he terms 'sensibilia' ; and these he defines as "objects which have the same metaphysical and physical status as sense-data, without necessarily being sense-data to any mind." But this conception of appearances which do not actually appear, of sense-data which are unsensed, sounds very like a contradiction in terms. And in any case the hypothesis is plainly tantamount to assuming that there *are* certain existents or 'events' which are ingredients in a material object, but not ingredients in a mental object ; and that seems compatible neither with neutralism nor with monism.

(iv) The old sensationalist psychology which forms the neutral monist's starting-point is misleading in another way. It supposes that our sensations are given to us as an indiscriminate aggregate or series, and that they can then be arranged and classified *either* into 'causal perspectives' (to form things) *or* into 'biographies' (to make the individual's consciousness or mind). But this is quite misleading. What is really given to us at any particular moment are not sensations, but a complex and continuous sensory field : and what on analysis I call my sensations cohere to form a continuum quite distinct from yours ; moreover my present sensory field is itself only a phase or fragment of one continuous stream of consciousness which lasts as long as I live. Within this field certain sensory elements come to us already grouped and organized into concrete percepts, which I accept straightaway as forming or at least indicating or implying independently existent objects. Thus the existence of external objects as distinct from the personal constituents of my consciousness is something actually given by experience itself.

(v) However, the real reason for the paradoxical conclusions to which this new school of monism is ultimately driven arises from their logical assumptions rather than their psychological assumptions, namely, from the overruling emphasis placed on one particular postulate of scientific method. They insist that "any concept which would imply an 'unobservable entity' or has been constructed out

of 'unobservable entities,' must be rejected as being, not merely incapable of empirical verification, but as positively meaningless." It is for this reason that the 'metaphysical' notion of such substances as 'minds' or 'material things' is dismissed by Ayer as 'senseless.' Yet clearly the assumption (which they themselves make) that there exist in the universe other bundles of sense-data besides my own—e.g., the sense-data perceived and owned by Ayer and by Russell—itself implies 'entities' which (so far as I am concerned) are entirely 'unobservable'. Strictly speaking, therefore, I ought to declare that they and their conscious experience are for me meaningless metaphysical fictions; and similarly for Russell and for Ayer my sense-data must also be metaphysical fictions.¹ If Russell or Ayer replies that he would prefer to describe my experience as a 'logical construction' out of *his* sense-data, and that I should regard the concept of *his* experience as a 'logical construction' out of *my* sense-data, then what we end up with are two entirely different universes, each unverifiable in terms of the other.

However, the methodological postulate on which all this is based, popular though it was with physicists as well as with logicians during the earlier years of the century, has since proved quite unworkable. Modern quantum theory makes use of numerous concepts—electrons, protons, neutrinos, fields, and the like—which form their very nature are unobservable by anyone. And, once the postulate is abandoned, the way remains open for the re-introduction of either material things or minds or both, should such hypotheses help us to reach a more coherent and satisfying account of our combined experiences.

Consciousness as a Relation: Now all these different theories, as we have seen, make the tacit assumption that the phenomena in question are to be described in the subject-and-predicate form. Even the newer theories treat events as 'substances,' at least in the philosophical sense ("something that can stand as the subject of a proposition but not as a predicate"): they are 'particulars' whose defining attribute is that they are either sensed or capable of being sensed. Modern logic, however, insists on the supreme importance of a third category over and above those of subject (or substance) and predicate (or attribute), namely, the category of relation; and modern science is built up by arguments which consist chiefly of relational propositions rather than of predicative propositions.

The view I myself have always put forward is that what we ordinarily term consciousness (in the sense of being aware or conscious of) is itself a relation, or

¹ If the above interpretation is correct, then the current version of 'monism' leads in the end to a doctrine of 'phenomenalism', if not of 'solipsism'. Professor Ayer himself accepted the former inference, but not the latter. Nevertheless, it is only fair to add that he has himself since changed his views. In the preface to the second edition of the work I have cited, he says he is now "inclined to revert to a behaviouristic interpretation of propositions about other people's experiences", though he owns that this interpretation "has an air of paradox which prevents him from being confident that it is true". And in a still more recent paper on 'Perception' (*British Philosophy in the Midcentury*, ed. C. A. Mace, 1957, p. 235) he concludes that "the phenomenologists' programme cannot be carried through: statements about physical objects are not, in general, translatable into statements about sense-data". However, his earlier and better known arguments have been so widely accepted that I have thought it right to discuss them here. Let me add that I myself think that no one can expect to construct a hypothesis about the universe that is "true": the most we can do is to construct a conceptual model which shall be logically and empirically satisfying; and, when logic and empirical data give no help, I should have no hesitation in preferring the explanation which seemed most satisfactory to our more general aspirations.

THE CONCEPT OF MIND

rather a group of relations. I see a red chair to the right of my desk. My awareness of the chair, I maintain, is a particular type of a one-way relation between something which I call myself or 'I' and something that I call the chair. . Just as I can sit on it, so I can be aware of it: (whether the 'I' is the same in both instances is another matter). Both relations are unique; the first is a 'spatial' relation, and the second may be called a 'cognitive' relation. 'I' am the *subject* of the relation; the chair is the *object*. Furthermore, I am convinced that I am also *aware of this awareness*. Just as I directly perceive the spatial relation between the chair and the desk (the one is to the right of the other), so I directly perceive the cognitive relation between myself and the chair.

Closer introspection reveals that there are different species of cognitive relation: apprehending a colour or a mental image is different from apprehending or perceiving a concrete thing. Remembering a past event, thinking of an abstract idea, believing a specified proposition, are other modes. Moreover, I believe that there are different kinds of conscious relation besides the cognitive, notably the affective (e.g., being pleased with the object), and the conative (e.g., wanting the object). It is, for instance, largely in virtue of my conative experiences in dealing with objects which limit or resist my voluntary movements that I become convinced of the independent existence of material things.

One obvious advantage possessed by this relational interpretation is that we can now readily accept the view that an object may continue to exist even when it is no longer perceived, just as a woman can continue to exist after she has been divorced from her husband. In both cases the relations have been only transitory.

Those who regard conscious life as a succession of discrete experiences may nevertheless reply that, if the relation is transitory, the subject of the relation may also be transitory, and that an aggregate or succession of 'subjects' can hardly be called a mind. However, as we have seen, it is quite wrong to assume that consciousness consists of a series of separate cinematographic pictures which in some way fuse: when I perceive an orange and want the orange that I perceive, it is surely the same 'I' that is the subject of *both* relations; and in much the same way the 'I' that subsequently tastes the orange, and says that is the fruit that I wanted, is still the same.

The Concept of Mind: I can now explain more precisely my definition of mind. A mind is a particular continuant which is capable of entering into conscious relations, namely, relations of cognition, affection, and conation as above described. In entering into these relations it manifests certain dispositional properties and a certain structure which it is the business of psychology to investigate. There are other continuants which, so far as we can tell, are intrinsically incapable of entering into such relations, namely, those which we ordinarily describe as material things. If then we accept this position, we seem in the end to have come round to what is an essentially dualistic theory at least as a working hypothesis.¹

¹ I have left myself no space for any separate discussion either of dualism or idealism. For a critical defence of the former I may refer to A. O. Lovejoy, *The Revolt against Dualism* (1930). The arguments for and against idealism seem to me to belong more to the metaphysical level than to the scientific; and I find Eastern views on the subject in many ways more attractive than Western. As a metaphysic I believe it to be quite compatible with what I have said here.

However, it does not necessarily follow that a mind as thus defined is necessarily something added to, or different from, the physical organism which in some way always seems associated with a 'mind.' That is an issue to be determined by further research. If we make this identification, then we shall be forced to ascribe to certain material structures (*viz.*, the living organism, or the brain or nervous system lodged within it) mental characteristics which are quite unlike those we ordinarily ascribe to material structures, and which seem to have no connection whatever with the physico-chemical properties which are their essential characteristics. If we still feel tempted to make this identification, that, I fancy, is because we still cling to the nineteenth century picture which represents gross physico-chemical structures generating subtler substances as their products: we think of the brain as producing consciousness much as the liver produces bile. However, consciousness, as we have just seen, is not a substance that is produced, but a set of relations. And if we have to turn for an analogy to some current concept of physical science, I should prefer to think of the mind as analogous to what in electro-magnetism would be called a 'field.' In any case, the function of the brain, as it seems to me, is not to generate mind or consciousness, but rather to *limit or restrict* its activities for the biological purposes of everyday terrestrial life.

Such a concept of mind is capable of fitting in quite well with the somewhat anomalous data furnished by so-called 'psychical research,' *i.e.*, such phenomena as telepathy (which I take now to be fully demonstrated), precognition and clairvoyance (which I take to be more probable than not), and with the survival after death of individual minds (which I take to be as yet insufficiently established). To the materialist or the neutral monist, such phenomena, like those of ordinary cognition, seem quite unaccountable. He either dismisses them as impossible *a priori* or else reluctantly labels them as 'paranormal.' To the Indian philosopher, they would, I imagine, seem perfectly normal and certainly by no means incredible; and here I am tempted to suggest that the peculiar gifts for introspection and analysis displayed by Indian philosophers should render them capable of suggesting more detailed and more fruitful hypotheses than any that have so far been developed in the West.

Adjustment Problems of Married and Unmarried Women Teachers

(A Comparative Study)*

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It is generally agreed that one of the most important elements in a country's educational system is the group of individuals that constitute its teaching personnel. If we are to guide children towards emotional health we must ensure that the environment is conducive to good emotional adjustment. Since the teacher is an important part of this environment, the mental health of the teacher is of concern. Some studies have been made on these lines in the West which throw light on marriage as an important factor in one's personal adjustment.

Aim

The present study is an attempt to find out whether the married teacher differs significantly from the unmarried one in her adjustment to some of the problems of her profession, and if so how far marriage as such, contributes to the success or failure of the individual. The study is confined to women teachers only.

Areas of personal and professional adjustment studied

1. Attitude towards pupils.
2. Attitude towards colleagues and administration.
3. Attitude towards profession.
4. Attitude towards self.
5. Emotional stability.

Method

In the present investigation two questionnaires were used—one to study the emotional stability and the other to study attitudes to some aspects of the teaching profession. The personality questionnaire used in this investigation falls in line with those of Thurstone, Woodworth and other inventories. A hundred items were selected from these for the questionnaire. The attitude questionnaire was framed to study some areas of adjustment of the teacher's professional life. It constitutes her attitude to pupils, to colleagues and administration, to profession and to self. About fifty questions were framed covering these areas. A few questions on their attitude to religion and marriage were also included.

A scheme of dichotomous 'yes and No' answers were used for both the questionnaires. The scoring consisted of summing up the number of symptomatic answers for the personality inventory and summing up of the answers showing negative attitude for the attitude questionnaire. Some check questions were included at widely spread intervals in the questionnaires to check the consistency of their answers as an additional measure of reliability.

* Thesis approved for the M. Litt degree of the Madras University. The work was done under the guidance of Dr. G. D. Boaz.

Sample

Subjects of the investigation were women teachers drawn from all the Girls High Schools in the City. Printed copies of the questionnaires were distributed to the graduate teachers in each high school. The purpose of the investigation was clearly explained and they were requested to give frank answers. Those questionnaires which gave inconsistent answers were discarded.

Discussion

Table below shows the distribution of scores for neuroticism in both groups :

			Married	Unmarried
Mean	...	...	17.60	17.85
S.D.	...	...	11.28	10.975
S.E.	...	...	1.303	1.365

C.R. between the two means .132.

The variability is quite large ; the S.D. for the married, and unmarried groups being 11.28 and 10.975 respectively.

Comparing the scores of the two groups we find that there is not much difference between the means of the two groups, the difference being only .25. The C.R. between the two means is .132 which falls very short of the 1.96 required for the difference to be significant at the 5 per cent level. The scores range from 2 to 54 for the married group and 1 to 56 in the unmarried group and cases cluster towards the lower end of the scores resulting in a negative skewness.

The distribution of scores for the attitude questionnaire as a whole is shown in the table below :

			Married	Unmarried
Mean	...	...	12.26	11.85
S.D.	...	...	5.820	5.745
S.E.	...	...	.672	.712

C.R. between the 2 means .418.

The range in the unmarried group extends from 3 to 53 and in the married from 3 to 30. The S.D. was calculated to be equal to 5.820 and 5.745 for the married and unmarried groups respectively. Quite a number of cases seem to cluster round the mean. Comparing the means of the two groups we find the difference is .41. This is far from significant as indicated by the C.R. which is .412 which again shows that it falls short of being significant at the 5 per cent level.

Table below shows the mean scores and standard deviation for the different areas for the three age groups for both married and unmarried subjects

			Married			Unmarried		
			20—29	30—39	40 and above	20—29	30—39	40 and above
			N—14	N—35	N—26	N—37	N—21	N—7
Mean age	...	...	26.86	33.89	43.92	24.78	33.57	45.29
Neuroticism—								
Mean	...	...	18.65	15.94	18.12	16.00	22.10	14.57
S.D.	...	...	5.855	12.215	9.19	9.065	13.58	6.265
Attitude—								
Mean	...	...	13.64	12.37	11.65	11.29	13.38	11.14
S.D.	...	...	5.625	6.365	5.355	2.305	6.71	3.775

Table showing the C.R. between the means of the different age groups for married, unmarried and between the married and unmarried of the same age group for neuroticism and attitude

	Married			Unmarried			Married and Unmarried		
	20—29	20—29 and 30—39	30—39 and 40 and above	20—29 and 30—39	20—29 and 40 and above	30—39 and 40 and above	20—29 and 30—39	30—39 and 40 and above	40 and above
Neuroticism.	1.046	.222	.795	5.809	.511	6.295	1.226	5.403	1.193
Attitude ...	.687	1.085	1.414	1.227	.089	1.095	1.352	.556	.287

From a study of the tables above we find there is not much difference between the different age groups within the married group. Rather whatever the difference there is, it is not significant as is seen by the C.Rs. which are below 1.96 required for them to be significant at the 5 per cent level.

In the unmarried group the results show distinct difference between some age groups, with regard to some of the areas of adjustment studied. The C.R. between the means of the 20—29 and 30—39 age groups shows significant difference in the

neurotic score as is seen by the C.R. which is 5.809 and which is much above the 2.58 required for it to be significant at the 1 per cent level. Similarly between the 30-39 and 40 and above, age groups the difference is highly significant with regard to neurotic scores, the C.R. being 6.275. No such difference is shown in the attitude scores.

In the means of the married and unmarried groups at each level highly significant difference is found between 30-39 years age groups of the married and unmarried in the neurotic score. The C.R. is 5.403 which is highly significant at the 1 per cent level. Here again no difference is found between the attitude scores.

From a discussion of the results given above, we find that in the married group there is no significant difference in the scores between one age group and another in the areas of adjustment studied. It seems to show that the age of the individual has not much influence on the adjustment or maladjustment of the individual as far as the married group is concerned.

As against this, in the unmarried group it is found that the 30-39 age group differs significantly from the other two age groups in the neurotic scores thus indicating that this age group has definite problems of adjustment. When comparing the married and unmarried groups it is found that the 30-39 age group of the unmarried shows more disturbance than the same age group in the married subjects with regard to their neurotic score. Thus we find that in the unmarried group the age factor plays an important part especially in the 30-39 age group with regard to neurotic scores. Since this is found only in the unmarried group we might say it is a crucial stage in their lives when difficult decisions have to be made with respect to marrying or staying single. Probably the necessity for these decisions does not become so pressing in earlier years and in later years the decisions have already been made and the individual has reconciled to her lot. In this connection we might remember Leigh Pech's findings who in one such investigation found, from the teacher's own reports of their adjustment problems, the late twenties standing out as a difficult period.

Conclusions

There was no difference found between the married and unmarried groups with regard to neuroticism. One group tends towards neuroticism as much as the other. This shows that in the sample studied marriage does not seem to be a contributing factor in personal adjustment.

The study of age groups reveals the 30-39 years as the most perturbed period in the unmarried group. The adjustment problems are distinct in this period as should be rephrased compared to the later or earlier age groups mainly in neuroticism.

Age seems to have no influence either in their neurotic scores or attitude scores in the married group in the sample studied.

Lecture and Individual Instruction as Methods of Changing Food Habits

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With the present rate of population growth and increase in longevity, food is bound to prove insufficient. Alternative methods of nourishing life have to come. A switch-over from traditional foods to newer ones is a problem that concerns people all over the world. Every country has to face at one time or the other the problem of changing the food habits of its people.

People of different States in India have developed different food habits and at times they are placed in difficult situations because of the non-availability of the preferred type of food, although foods of different type quite rich in nutrition and calories are available. It is needless to emphasise that the present food situation in India is not a very happy one. Wheat is imported from other countries but people in several parts of the country are rice eaters. They have therefore got to take wheat in lieu of rice. But very often, they show great resistance to this. Something should, therefore, be done to bring about a change in their food habits. Some time ago in Kerala, steps were taken, although we do not know with what success, to introduce wheat and tapioca preparation in place of rice. Bengal and Bihar are mostly rice-eating areas. And so, people in these States may eventually be faced with the problems very much similar to those in Kerala and other Southern States. It, therefore, becomes necessary to find out ways and means whereby effective changes can be brought about in the food habits of the people. The problem, however, is to be tackled on a psychological level because of the need to seek the co-operation and participation of the people in bringing about the desired change.

Remington (5) has emphasized the importance of mores in the development of dietary habits. The customs and taboos regulating the feeding behaviour of savage people are influenced by religion, by geographical habitat, by climate, etc. Even in modern times, we find that certain inventions and advertisements influence the development of dietary habits. According to Lee (2) man's food intake is very much influenced by the culture of the society of which he is a member. Many dietary "choices" are made for the individual by his culture. Starvation, at times may be preferred to infringement on a food taboo. Other factors influencing the establishment of dietary habits are those relating to the personal experience of the individual, his taste, idiosyncracies, etc. Marked individual differences are in fact found in the likes and dislikes of people for foods. Altus (1) concluded that the number of one's food aversions is a partial index of his adjustment. Smith *et al* (7) found that high-anxiety individuals had a greater number of food aversions than low-anxiety individuals. In another study, Smith *et al* (8) have pointed out

that a tendency exists among individuals with disturbances in affective behaviour to report an unusual number of food aversions.

Peryam and Haynes (4) conducted a study to determine how well the relative preference ratings of foods by groups of soldiers correspond with ratings by groups of civilians under similar test situations. Correlations above 0.9 were found between the soldier and civilian ratings. It is evident that there is no significant difference between the food preferences of civilians and soldiers.

Several studies have been conducted to determine the relative effects of different methods of changing food habits. Willerman (9) found that the consumption of whole wheat bread in dormitory dining rooms could be increased more by group decision than by a letter of request from the University official. An experiment in changing food habits was conducted with six Red Cross groups of volunteers, organized for home nursing during World War II to determine the relative effects of a lecture compared with group decision in increasing the consumption of certain unpopular kinds of meat. Lewin (3) reported that only 3 per cent of the women who heard the lectures served one of the meats never served before, whereas after group decision 32 per cent served one of them. Similar results were obtained by Klisurich (reported in Lewin 1947) in an attempt to increase the consumption of milk. Group decision showed considerably greater effectiveness both after two weeks and four weeks. In another experimental study Klisurich (reported in Lewin 1947) compared the effectiveness of individual instruction and group decision in persuading mothers of first-born children to follow hospital recommendations for feeding cod liver oil and orange juice to their infants, and found that the group decision method proved far superior to the individual instruction.

Scollon's study (6) with five versions of a film designed to alter unfavourable attitude toward Army food showed that the main character should be prestigious, well characterized and identified, and possess "a high degree of relationship to the audience."

The purpose of the present investigation was to compare the effectiveness of lecture and individual instruction in changing food habits and for this two experiments were conducted.

Experiment I: Procedure—The objective of this experiment was to increase the use of wheat. Forty students (20 males and 20 females) of the Patna University served as subjects. They were divided into two groups—Group A and Group B, each consisting of 10 males and 10 females. These subjects ate rice for both their meals. They were not at all used to eat wheat preparations.

In Group A, lecture was given which linked the problem of nutrition with the problem of the health of the nation and emphasized the vitamins and other values of eating wheat preparations. The wheat preparations were discussed in detail and reference was also made to the recipes for preparing delicious dishes.

In Group B, also the problem of nutrition was linked with the problem of the health of the nation. All the points given in lecture to group A were stressed in this group also by means of individual instruction to each member of the group individually. A check-up was made after one week and two weeks,

Experiment II: Procedure—The objective of this experiment was to increase the use of par-boiled milled rice. Sixty students (30 males and 30 females) of the Patna University served as subjects. They were distributed into two groups—Group C and Group D, each consisting of fifteen males and fifteen females. These subjects were used to eat raw milled rice. They had a positive distaste for par-boiled milled rice.

In Group C lecture was given linking up the problem of nutrition with the problem of health and emphasized that par-boiled rice was rich in vitamin. It was easily digested and assimilated in the system.

In Group D the same instructions were given as to Group C by the method of individual instruction to each member of the group. As in Experiment I, the check-up was made after one week and after two weeks.

TABLE 1
Results of Experiment I

Groups	Methods	Number of subjects changing food habits	
		After one week	After two weeks
Group A ... Lecture		6	3
Group B ... Individual instruction		12	11

When the data are converted into percentages, the results stand as in Figure I.

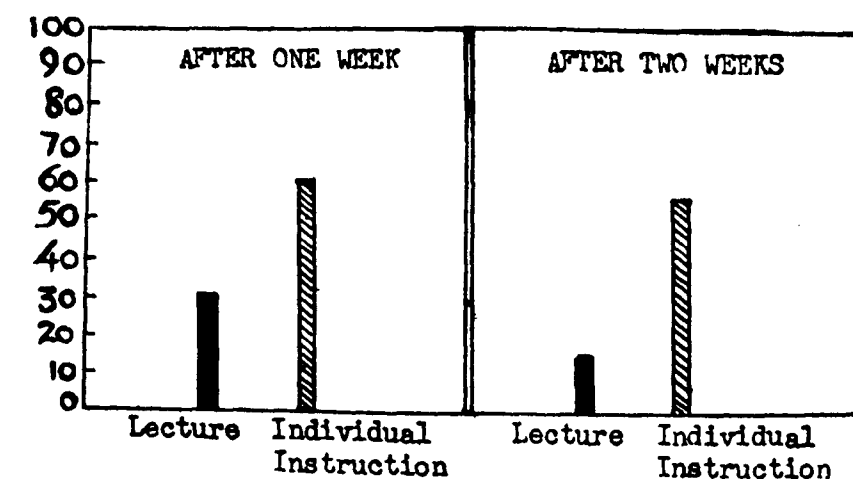


Fig. 1. Percentage of individuals taking wheat preparation in one meal after lecture and individual instruction.

A check-up was made after one week and after two weeks to ascertain the degree to which the subjects in the two groups followed the advice regarding use of wheat preparation in one of their two meals. From Figure 1, it is evident that the method of individual instruction proved superior to the lecture method both after one and after two weeks.

TABLE 2
Results of Experiment II

Groups	Methods	Number of subjects changing food habits	
		After one week	After two weeks
Group C ...	Lecture	15	12
Group D ...	Individual instruction	21	21

When the data are converted into percentages, the results are as given in Figure 2.

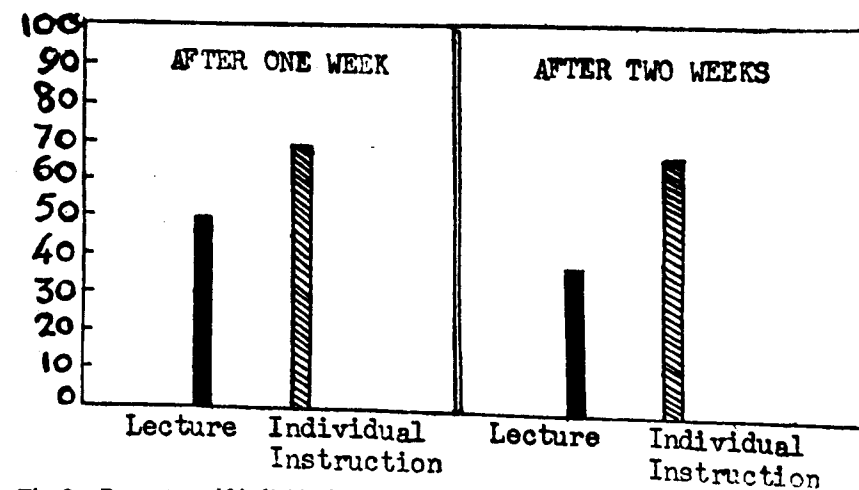


Fig. 2. Percentage of individuals taking parboiled milled rice in place of raw milled rice after lecture and individual instruction.

After one week and after two weeks, a check-up was made to ascertain the degree to which the subjects followed the advice regarding the use of par-boiled milled rice in place of raw milled rice. From Figure 2, it is clear that the method of individual instruction proved superior to the lecture method both after one and after two weeks.

Discussion

It will be evident from the results of both the Experiments that the change following individual instruction is in all cases greater than after lecture, thus showing clearly the superiority of individual instruction over lecture as a method of changing food habits. Comparing the results for first and second week in Experiment I, we notice that the levels of consumption of wheat preparations remain about the same for the group in which the method of individual instruction was used. The decrease of 5 per cent after two weeks is rather insignificant. In the case of change from raw milled rice to parboiled milled rice, the level of consumption after two weeks remains the same as after one week for the group in which individual instruction was used as the method of change. In the groups in which the lecture method was used as the method of changing food habits, the consumption falls down considerably after two weeks in both the experiments. So far as change from rice to wheat is concerned, the percentage after two weeks falls down from 30 to 15. In regard to change from raw milled rice to par-boiled milled rice also, there was a fall in the percentage from 50 after one week, to 40 after two weeks.

It is clear then that the method of individual instruction proved superior to the lecture method in both the experiments. This superiority of individual instruction over lecture can be easily explained in terms of the relatively high degree of interest that is aroused in the individuals in this situation. The attention of each individual is greatly drawn toward the problem and its significance. The restructuring of perception that takes place in this situation is probably more distinct and more meaningful than what happens in a lecture situation. Besides, as Lewin (3) writes : "Lecturing . . . seldom brings about a definite decision on the part of the listener to take a certain action at a specific time. A lecture is not often conducive to decision."

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Sociological and Psychological Factors in the Success of Engineering Students*

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In view of the high cost involved in the training of engineering students, failure and wastage are matters of vital concern. Human cost of failure is also very great. Everyone wants that only those are admitted who have a reasonably high chance of completing the course within the stipulated period. At the present juncture there is a tremendous rush for admission to engineering institutions. At least in the good institutions, it is certain that only those are admitted, who are intellectually superior, and have to their credit a more than average level of academic performance in the earlier courses. In spite of this highly selective admission, there are still "failures" and "laggers". One often wonders if success in the engineering course, and later on in the profession itself, is solely dependent on the individual's intellectual qualities and academic attainments. Apart from the, academic requirements, the success or failure depends upon certain personality factors. A few studies of the relationship of non-intellectual factors to academic achievement have been made (Lord, 1950 ; Grittiths, 1945 ; Super, 1949 ; and Morgan, 1952). Most of the selection procedures have taken into account largely the intellectual factors. Prediction of success entirely based on intelligence, previous achievement, and aptitude testing has limitation in that it fails to discriminate, properly in a smaller group of selected participants. The so-called tests of intelligence and aptitude touch only the peripheral qualities. Individuals for whom test results indicated a high probability of achievement nevertheless have failed. The answer to these difficulties lies in the realm of motivation, emotional adjustment and interpersonal relations. As Stern, Stein and Bloom (1956) have put it. "Once the question of minimal intellectual competence is resolved critical importance would then be attached to such matters as the manner in which a student could get along with his classmates, the extent to which he is accepted or rejected and the significance which he attaches to such responses from others, the character of his relationship with his teachers, and the extent to which he might be free from sources of anxiety and concern which might interfere with his capacity to absorb and integrate the academic experiences being offered him."

Thresher (1959) discusses the "Problems of College Admissions" at the M.I.T. and says : "Of the many unsolved problems in selecting students for higher education, those related to emotional factors leading to poor motivation are among the most difficult." Referring to the "unsolved problems of selection," greatly intensified due to the exacting nature of the engineering curriculum, he says : "It

* The author has, in this paper, outlined a scheme for research and investigation, he has planned to undertake. We await the results of his study.—Ed.

is significant, however, that students who drop out, either through formal disqualification or of other reasons, do not lack in intellectual ability, nor do most of them lack adequate preparation. Their trouble stems rather from emotional problems which result in poor motivation. Until we gain a deeper understanding of the development of adolescents, it will be difficult to reduce further the percentage of drop-outs. We know little of the psychological forces that turn one student into a purposeful worker and another into an aimless drifter. We cannot always distinguish the "late bloomer" from the non-bloomer Tests are a useful, in fact, and indispensable aid to intellectual selection; but tests deal only with peripheral aspects of behaviour. The energy and drive that lead to great achievement have their roots deep in the vital energies of the soul. The last half century in psychology has given us glimpses of this turbulent inner world, but we are still far from understanding it."

The attention to those non-intellectual factors of interpersonal relationships and personality dynamics in performance are becoming increasingly evident with the growing complexities of situations for which predictions are to be made. The problem is to find out the intellectually competent ones as well as to screen those who are not likely to adjust or are not readily adaptable to the life and training of an engineering student. This requires a shift in emphasis from cognitive and motor skills to personality dynamics and interpersonal behaviour. Many laboriously organised programmes of selection have failed because of lack of knowledge or insufficient attention given to the situation in which the performance is to take place. The usual tests of intelligence, aptitude, and achievement are proving inadequate because very often the individual tested is sought to be viewed as sufficient in himself, and independent from inter-individual and social factors. This neglect of the situational context in which the behaviours to be measured are imbedded has made predictions of success unreliable. The history of the testing movement in psychology clearly indicates that psychological prediction of success or failure is reasonably good for simple tasks. In complex social situations, it has achieved only a limited degree of success. This is due to not only the inherent complexity of the situation, but tests and psychological procedures of screening have been employed without adequate analysis of the *roles* of individuals in those complex situations and the transactional relationship of individuals in those situations. Human behaviour is viewed as a function of transactional relationship between individual and his environment. Individuals affect and are affected by the environment in which they live. They do not interact with their environment without changes occurring in both directions. Thus, factors associated with success (or failure) can be environmental and/or psychological. In each of these, there are conditions which aid or impede the functioning of individuals in any profession or context. For example, transactions in early childhood or in later life, may set up certain emotional-motivational barriers to success or induce predispositions that help in success. Therefore, in any investigation of the success of engineering students (or for that matter, any other profession) it is essential to understand both the characteristics of the individual actor as well as the cultural forces that surround him. It requires viewing the total personality as functioning in a particular sub-culture, i.e., factors in his past history, personality characteristics and intellectual

and special endowments that are likely to impede or help in his success in a particular sub-culture.

Following Stein (1957) it can be said that an engineering institution, like any other social organisation, is a sub-culture or sub-system within a wider culture of society. It has specific organisation of values, status relationship and rewards through which it accomplishes its goals. Some of these may be common with other educational institutions, while it may have some unique features. The constellation of these constitutes its "attraction value" for individuals seeking admission. By the same token it may have "avoidance value." It has its own "selective orientation" in terms of which it selects and recruits its students. It demands of the individuals, who get placed in it, a set of *roles* to be filled. What exactly these are can be ascertained only after careful study. It can, however, be suggested that a student has a number of roles which he is expected to fulfil and thereby he satisfies the "significant others" which is the faculty. In the role of a *student* he is expected to keep abreast with the progress made in the class, maintain a proper study habit, express himself effectively orally, in writing as well as graphically, and observe certain rules and maintain a proper code of conduct, e.g., regularity in attendance, obedience and the like. As a *scientist* he is required to keep pace with the recent developments in the basic and engineering sciences. He should possess, as the Report on Evaluation of Engineering Education (1955) puts it, "a knowledge of the fundamental scientific principles associated with any branch of engineering, including a knowledge of their limitations and of their applications to particular problems, such as development of materials, machines or structures as well as development of materials, machines or structures as well as the ability to make critical scientific and economic analyses and to organise these into clear, concise and convincing oral or written reports". Besides, he has a professional or *technical* role. He is expected to bring his scientific knowledge to bear upon the development of certain skills in a particular direction like electrical, mechanical and so on. He is expected to have a "preparation for the performance of the functions of analysis and creative, design or of the functions of construction, production or operation where a full knowledge of analysis and design of structure, machine or process is essential." The prescription of these three roles is largely codified in the form of syllabi of various departments, and the students' conduct rules. Besides these, there is a fourth role which one has to learn through personal experience. Every institution expects certain levels of relationship to be maintained with others in the class and on the campus. He has to fulfill certain *social relations* roles, some of which express themselves in the extra-curricular activities, and other informal spheres outside the classroom. These are some of the possible roles which are expected of an engineering student. The list is by no means complete or exhaustive. A careful analysis and determination of various roles is essential.

Stern, Stein and Bloom (1956) have analysed some of the institutional "presses" in terms of roles, practices and values. Within an institution, there are values which people may assume, as well as practices determined by both tradition and purpose. Just as in a business organisation there are roles and practices assigned to the typist, the accountant, the foreman, and the executive, in an education-

nal institution there are roles assigned to the student and the teacher. These may differ from school to school, and even within the same institution.

The teaching procedures used in an institution serve to define the student-teacher roles, and have much to do with determining the activities expected of both students and teachers. Such teaching procedures often follow from the *implicit* or *explicit* objectives laid down by the faculty. In a purely lecture situation, the student has a relatively passive role of a recipient of information communicated by the teacher. In a discussion session, there is co-operative attack upon a problem, and a more active role is expected. In a practical class active participation in planning and execution as well as a degree of initiative are demanded. Thus, "press" in the learning situation or classroom would consist of the expectancies with regard to his participation, passivity, or active and spontaneous participation in problems of discussion or the practical class.

Another institutional practice which helps to define the "press" is the materials which the student is expected to use. They encompass text-books, in which everything that is to be learned is made explicit to the student, as well as problem materials, primary source data, and demonstrations, representing not so much the things to be learned in themselves as materials to be used in the learning process. Materials may be required to be read and remembered, or serve as a source of problem to be understood, analysed and evaluated. The former is considered easier and congenial by students, while the latter is looked upon as more interesting and challenging to others.

The content of the subject matter represents another aspect of the "press" in learning situations. It is generally felt that humanities and social sciences involve greater ambiguity and abstraction than is ordinarily true of more concrete, tangible, and clearly structured phenomena characteristic of the physical and biological sciences. Thus, the subject matter may be viewed in terms of theoretical versus practical, verbal versus quantitative, value versus fact, or symbolic or abstract versus concrete. Students' perception of this "press" would be revealing.

Each institution has a system of rewards and penalties which serve to define the "press" and are used to secure compliance with the institutional demands. These may be codified or quite subtle. Rewards may be formalised and well-defined as by the grading system. Less easily defined ones are approval and disapproval of the student by both faculties and fellow students.

The above aspects of educational situations act as "press" upon individual participants and exert an influence upon their behaviour in such situations. A thorough analysis of the situational "press" is essential. As Murphy (1947) says, "A study of situations that act upon persons should be at least as full and as systematic as is a study of the internal structures which respond to these situations."

Based on the prescription of these *roles*, the faculty builds up certain *expectancies*. Formulation of the student roles normally serves as the basis for the judgment of the faculty, just as engineers of a particular denomination are judged by the significant others in their environment of work according to their scientific, professional, business, and social relations roles. If the student is able to fulfil

these roles (as judged by the faculty), he is considered as successful, or if he falls short of the expectancies, he is declared a failure. Successful fulfillment of these roles requires certain characteristics and attitudes in the individual. Some of these qualities are intellectual while others have to do with inter-personal relationships and the emotional and dynamic aspects of the individual. Thus, a scientific study of factors associated with success would entail an analysis of the environmental "presses" and the roles prescribed, seen in their transactional relationship with the psychological characteristics of the individual who is expected to fulfill these roles. A study like this would enable us to have a more accurate knowledge into the causes of success or failure in a given institution, help in the development of a programme of testing to screen failures and serve as the basis for counselling. Underlying all this is the common desire to increase the probability that individuals being selected for participation in various kinds of institutional programmes would do so with maximum efficiency and economy both for themselves and the institution in question. Further, what factors make for successful performances as an engineering student, and what factors make for successful performance as an engineer of a particular denomination though not identical should be closely related. A study of this nature is likely to give us some insight into the factors underlying the success of an engineer.

It may be added that merely sociological analysis of roles and environmental press will not be sufficient. The individual is not to be viewed as a passive participant who becomes adapted to and moulded by externally imposed sets of circumstances. The emphasis has to be a little more psychological, in that, personality and motivational factors associated with social role functions are stressed. Thus, data on environmental press would have to be translated into psychologically meaningful statements of social roles and role fulfilment in terms of needs or personality, characteristics required for most effective functioning. Some illustrative examples are provided by Anne Roe's (1956) studies of personality configurations characterising various scientists and artists. Henry's (1949) study of the business executive, Stein's (1955, 1957) analysis of creativity in industrial research chemists, Stern's (1954) analysis of personality structure of theological students, and Kubie's (1953, 1954) study of the scientific career.

In short, the project requires an intensive analysis of the roles of an engineering student, the expectancies attached to him by the significant others, and sociological and the psychological characteristics that are associated with the successful fulfilment of these roles by the student. Ultimately it should lead to the classification and elaboration of a personality model for the hypothetical individual capable of optimal role-fulfilment, rather than mere discovery of empirical correlates to criterion performance. Apart from a search for material which would discriminate between established "highs" and "lows" in performance, *i.e.*, the *high* and *low* achieving students, an intensive study of their personality would be made to develop a hypothetical model of a successful student, and of those who have met with difficulties. This will help to answer many of the puzzling questions regarding superior or poor performance of students in engineering courses, and reduce the risk of error in the selection of students for technological education.

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Four-Fold Cutaneous Sense-Response of Idiot Subjects

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Since aments are occupying the lowest apartment of the normal distribution curve of human experiences and cutaneous sensibility being the earliest developed sense modality, a relation of direct variation between the two is supposed to exist. The four-fold division of cutaneous senses, however, being under attack (7) and whatever suggestions (Walsh, Katz, Geldard) might be put after head's proposition the essential characteristics of the object depend upon the cutaneous experiences (12). Considering as such the object-concept development of Idiots recently with Piaget's theory of Sensori-motor intelligence in course of interpretation of Idiots' behaviours, Woodward (11) had observed initially the primary circular reactions as integrals of the so-called meaningless behaviour of Idiots. It was further observed that primary cutaneous sense-perception had great part to play in the formation of ideation.

As reported elsewhere, sensory-discrimination between warm-cold and pain-pressure if considered as something else than reflex activity has been observed to be irrelevant and puzzling in the case of aments and especially of Idiots (10). After Von Frey's postulation of pain and pressure and Dallenbach's of warm and cold spots, much work has been done in this line with normal subjects. In this article attempts have been made to ascertain the basic responses to the stimuli warm, cold, pain and pressure of 56 Idiot subjects.

It was suggested by different workers (1, 2, 6, 9) to consider social factors as one of the criteria while labelling the 'mentally deficient' on the basis of traditional test-score system. This may be applicable in the classification of high-grade aments but was not indispensable in the case of the present Ss as almost all of those were destitutes, most of them were orphans and picked up from among street urchins. The chances of faulty labelling in the case of present Ss were far remote due to their severe idiocy. Sarason's (6) Contention that the factor of motivation during experimental-situation was another factor of great importance that could not be studied in this work with Idiot Ss due to the reason stated by Woodward (11).

Subjects

The 56 Ss included 31 males and 25 females both being residents of an Institution and taken from different clinical varieties, viz., mongoloid, epiloid, phenyl-pyruvic, micro-cephalic, hydro-cephalic and epileptic. The age ranged from 7 to 19 years for males and 11 to 21 years for females. Clinical examination during admission described 53 cases as having suffered from total absence of verbal comprehension, 2 could use monosyllables and 1 boy could use two to three syllables

The author is indebted to the authorities of BODHIPEET, an Institution for mentally deficient for permitting him to carry out this investigation in the said Institution.

combined but all used to show a tendency of expressing things in some peculiar idiotic manner. Binet scale and the Progressive Colour Matrices (Ravens) were used and 64 per cent were found unable to succeed in more than three items of age group II and could not solve the A-1 of the second test. From the rest 19 Ss could successfully respond to the minimum five items of Binet scale and one upto one item of age group II-6, but all were unsuccessful to solve A-1 of the Colour Matrices.

Procedure

Tow sets of stimuli were used (i) the room temperature being at 27°C two vessels one containing hot water of 34°—37°C and the other containing cold water of 17°—21°C were taken to an adjustable vono-table which was occupied by the S on one end and E on the other, having a screen between them through which the Ss right hand was extended comfortably to the E for the application of stimuli. The index finger of the S was made to dip into the vessels in the sequence W-C-C-W-W-C-C-W-W-C-W-C-W-C-C-W-C-W-W-C where W stands for warm and C for cold. (ii) To exert pressure on the ball of the forefinger of the S, a thin metallic rod the circumference of its head being 8 mm was used and the pressure exerted being 23 gm. to 25 gm. The ordinary pin that is used as office stationery served to apply pain stimulation. E practised to maintain uniform pressure of the pin that could arouse normal pain. The nature of presentation of the stimuli was as follows where P = Pain and Ps = Pressure ; P-Ps-Ps-P-Ps-Ps-P-Ps-P-Ps-P-Ps-Ps-Ps-P-Ps-P-Ps-P-Ps.

Results and Discussion

As the verbal comprehensions of the Ss were inadequate to respond with proper vocabulary, different aids were made available in their visibility which were varieties of objects that they come across in their day-to-day life. With certain presumptions and guided by ingenuity, the following layout of the room was made—water being boiled over burner, lump of ice in a jar, water falling from tap, smoke coming out, a set of injection syringe, percussion hammer, certain action pictures and different other articles. Tables I and II would show how many of the above-mentioned aids were used by the Ss. Ss, however, did not use similar aids for all occasions of responses and different Ss used different aids for the same stimulus. Nature of expression varied from one extremity to another and lack of consistency was marked.

TABLE I
Type of aids used by Ss in responding to Stimulus 1

Warm	Per cent	Cold	Per cent
Indicating boiling water over flame.	2	Indicating plain water ...	...
Rubbing feet ...	4	By non-withdrawal of finger ...	3
Taking away finger with unpleasant facial expression.	11	Indicating pleasant facial expression.	6
Using peculiar vocal sound ...	2		...
Vacant look and no reaction ...	26	Vacant look and no reaction ...	21
Haphazard responses ...	55	Haphazard responses ...	70

TABLE II
Types of aids used by Ss in responding to Stimulus 2

Pain	Per cent	Pressure	Per cent
Injection syringe ...	3	Percussion hammer ...	2
Rubbing feet ...	6	By non-withdrawal of finger ...	3
Taking away finger with unpleasant facial expression.	20	Pleasant facial expression ...	5
Vacant look and no reaction ...	11	Vacant look and no reaction ...	33
Haphazard responses ...	60	Haphazard responses ...	57

From the medical reports, it became evident that the visual and auditory sense organs of the Ss were unimpaired. Even then, on every occasion peculiar mannerisms and the emotive peculiarities of the Ss with which the E was familiar for the last five years had to be taken into consideration including the confirmatory remarks of the attendants who were in constant look-after of the Ss for a good many years. There were unwillingness, crying, vague expression, fear, etc., which had to be remedied with recess, refreshment and such other methods.

It was seen that the Ss were poor in understanding the interrogations put as 'What do you feel—hot? cold? pain? pressure?' Certain improvised methods with physical manners and some sort of sounds (vocal) had been used to elicit responses. Also, the indication and identification of the aids were not as clear and perfect but rather responses were intermingled in their expression through mannerisms.

Each part of the stimulus was exposed to the S for 10 times at an average interval of 2 to 3 minutes and thus the occurrence of paradoxical phenomena was avoided. Unlike normal Ss, the expectation error and practice effect seemed to be absent in the present Ss.

It appeared that 26 percent of the total cases were having no reaction to warm stimulus, 21 percent to cold, 11 percent to pain and 33 percent to pressure. It further appeared that 19 percent had correctly responded to warm sensation out of 10 repetitions, 9 percent to cold, 29 percent to pain, and 10 percent to pressure while the rest responded irrelevantly.

Some allied studies in this line mention about the arousal of affection with the change of temperature (5) and with pain and pressure, (3, 4). This is corroborated by one results from the Table I and Table II where rubbing of feet, facial expressions pleasant and unpleasant, were expressed as some aids of responses by the Ss.

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Table of Percentages and Proportions

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Workers in the fields of social sciences like education, psychology, sociology, anthropology, etc., often have to calculate percentages (or proportions) in course of analysing their data. Holzinger provides a table of quotients* which can be consulted for finding these values instead of calculating them every time. But this table which runs to twenty pages is long out of print. In order to remove the want for a handy table of proportions (or percentages) the present table has been prepared. When the divisor (*i.e.*, the total number of cases) does not exceed 100, and the dividend is always less than the divisor, this table can be used to obtain percentages in integers (and proportions by putting the decimal point before each value). Although Holzinger's table gives values to four places of decimals, for all practical purposes two places of decimals can be considered satisfactory.

How to consult the table

In the table divisors (in bold face type) are given at the top and the bottom of each page in rows marked N, and dividends (also in bold face type) in the marginal columns marked K. The values in the body of the table are percentages. To find a required percentage, look up the value at the intersection of the particular N, column and K row. For proportion put a decimal point before the value.

Example 1 : What percentage of 79 is 23?

The value at the intersection of column headed 79 (N) and the row 23 (K) reads 29, which is the required percentage.

Example 2 : What proportion of 38 is 7?

The value at the intersection of column headed 38 (N) and the row 23 (K) reads 18. This is the percentage. The proportion is .18.

*Holzinger, K. J. (1931) "Statistical tables for students in education and psychology." Chicago, University of Chicago Press.

Table of Percentages and Proportions

N→	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	50←N
K↘	04	04	04	03	03	03	03	03	03	03	03	03	03	03	02	02	02	02	02	02	02	02	02	02	02	02
1	08	07	07	07	06	06	06	06	06	06	06	05	05	05	05	05	05	05	05	04	04	04	04	04	04	04
2	12	11	11	10	10	09	09	09	09	09	08	08	08	08	08	07	07	07	07	07	07	06	06	06	06	06
3	15	15	14	14	13	13	12	12	12	11	11	11	11	10	10	10	10	09	09	09	09	09	08	08	08	08
4	19	19	18	17	17	16	16	15	15	14	14	14	13	13	12	12	12	12	11	11	11	11	10	10	10	10
5																										
6	23	22	21	21	20	19	19	18	18	17	17	16	16	15	15	15	14	14	14	13	13	13	12	12	12	12
7	27	26	25	24	23	23	22	21	21	20	19	19	18	18	18	17	17	16	16	16	15	15	15	14	14	14
8	31	20	29	28	27	26	25	24	24	23	22	22	21	21	20	20	19	19	18	18	17	17	17	16	16	16
9	35	33	32	31	30	29	28	27	26	26	25	24	24	23	22	22	21	21	20	20	20	19	19	18	18	18
10	38	37	36	34	33	32	31	30	29	29	28	27	26	26	25	24	24	23	23	22	22	21	21	20	20	20
11																										
12	42	41	39	38	37	35	34	33	32	31	31	30	29	28	28	27	26	26	25	24	24	23	23	22	22	22
13	46	44	43	41	40	39	38	36	35	34	33	32	31	30	30	29	28	27	27	27	26	26	25	24	24	24
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16	58	56	54	52	50	48	47	45	44	43	42	41	39	38	38	37	36	35	34	33	33	32	31	31	30	30
17																										
18	62	59	57	55	53	52	50	48	47	46	44	43	42	41	40	39	38	37	36	36	35	34	33	33	32	32
19	65	63	61	59	57	55	53	52	50	49	47	46	45	44	42	41	40	40	39	38	37	36	35	35	34	34
20	69	67	64	62	60	58	56	55	53	51	50	49	47	46	45	44	43	42	41	40	39	38	37	36	36	36
21	73	70	68	66	63	61	59	58	56	54	53	51	50	49	48	46	45	44	43	42	41	40	39	38	38	38
22	77	74	71	69	67	65	62	61	59	57	56	54	53	51	50	49	48	47	45	44	43	42	41	40	40	40
23																										
24	81	78	75	72	70	68	66	64	62	60	58	57	55	54	52	51	50	49	48	47	46	45	44	43	42	42
25	85	81	79	76	73	71	69	67	65	63	61	59	58	56	55	54	52	51	50	49	48	47	46	45	44	44
26	88	85	82	79	77	74	72	70	68	66	64	62	60	58	56	55	53	52	51	50	49	48	47	46	45	45
27	92	89	86	83	80	77	75	73	71	69	67	65	63	62	60	59	57	56	55	53	52	51	50	49	48	48
28	96	93	89	86	83	81	78	76	74	71	69	68	66	64	62	61	60	58	57	56	54	53	52	51	50	50
29																										
30																										

N→	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	←N
K↘	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	←N
1	57	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32	32
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5	65	64	63	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41	40	40
6																										
7	67	66	65	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42	42
8	70	68	67	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44	44
9	72	70	69	67	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46	46
10	74	72	71	69	68	67	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48	48
11	76	74	73	71	70	69	68	67	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50	50
12																										
13	78	76	75	73	72	71	70	69	68	67	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52	52
14	80	78	77	75	74	73	72	71	70	69	68	67	66	65	64	63	62	61	60	59	58	57	56	55	54	54
15	82	80	79	77	76	75	74	73	72	71	70	69	68	67	66	65	64	63	62	61	60	59	58	57	56	56
16	84	82	81	79	78	77	76	75	74	73	72	71	70	69	68	67	66	65	64	63	62	61	60	59	58	58
17																										
18	86	84	83	81	80	79	78	77	76	75	74	73	72	71	70	69	68	67	66	65	64	63	62	61	60	60
19	88	86	85	83	82	81	80	79	78	77	76	75	74	73	72	71	70	69	68	67	66	65	64	63	62	62
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21	92	90	89	87	86	85	84	83	82	81	80	79	78	77	76	75	74	73	72	71	70	69	68	67	66	66
22																										
23	94	92	91	89	88	87	86	85	84	83	82	81	80	79	78	77	76	75	74	73	72	71	70	69	68	68
24	96	94	93	91	90	89	88	87	86	85	84	83	82	81	80	79	78	77	76	75	74	73	72	71	70	70
25																										
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27	100	98	97	95	94	93	92	91	90	89	88	87	86	85	84	83	82	81	80	79	78	77	76	75	74	74
28																										
29	102	100	99	97	96	95	94	93	92	91	90	89	88	87	86	85	84	83	82	81	80	79	78	77	76	76
30	104	102	101	99	98	97	96	95	94	93	92	91	90	89	88	87	86	85	84	83	82	81	80	79	78	78
31																										
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33	108	106	105	103	102	101	100	99	98	97	96	95	94	93	92	91	90	89	88	87	86	85	84	83	82	82
34	110	108	107	105	104	103	102	101	100	99	98	97	96	95	94	93	92	91	90	89	88	87	86	85	84	84
35	112	110	109	107	106	105	104	103	102	101	100	99	98	97	96	95	94	93	92	91	90	89	88	87	86	86

Table of Percentages and Proportions

$N \rightarrow$	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75 $\rightarrow$ N
1	02	02	02	02	02	02	02	02	02	02	02	02	02	02	02	02	01	01	01	01	01	01	01	01	01
2	04	04	04	04	04	04	04	03	03	03	03	03	03	03	03	03	03	03	03	03	03	03	03	03	03
3	06	06	06	06	05	05	05	05	05	05	05	05	05	05	05	05	04	04	04	04	04	04	04	04	04
4	08	08	08	07	07	07	07	07	07	07	07	08	08	08	08	08	06	06	06	06	06	06	05	05	05
5	10	10	09	09	09	09	09	09	08	08	08	08	08	08	08	08	07	07	07	07	07	07	07	07	07
6	12	12	11	11	11	11	11	10	10	10	10	10	10	09	09	09	09	09	09	09	08	08	08	08	08
7	14	13	13	13	13	12	12	12	12	12	11	11	11	11	11	11	10	10	10	10	10	10	10	09	09
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9	18	17	17	17	16	16	16	16	15	15	15	15	14	14	14	14	14	13	13	13	13	13	12	12	12
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20	39	38	38	37	36	36	35	34	34	33	33	32	32	31	31	30	30	29	29	29	28	28	27	27	27
N																									
21	41	40	40	39	38	38	37	36	36	35	34	34	33	33	32	32	31	31	30	30	30	29	29	28	28
22	43	42	42	41	40	39	39	38	37	37	36	35	35	34	34	33	33	32	32	31	31	31	30	30	29
23	45	44	43	43	42	41	40	40	39	38	38	37	37	36	35	35	34	34	33	33	33	32	32	31	31
24	47	46	45	44	44	43	42	41	41	40	39	39	38	38	37	36	36	35	35	34	34	33	33	32	32
25	49	48	47	46	45	45	44	43	42	42	41	40	40	39	38	38	37	37	36	36	35	35	34	34	33
N +																									

TABLE OF PERCENTAGES AND PROPORTIONS

$N \rightarrow$	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75 $\leftarrow N$
26	51	50	49	48	47	46	46	45	44	43	43	42	41	41	40	39	39	38	38	37	37	36	36	35	35
27	53	52	51	50	49	48	47	47	46	45	44	44	43	42	42	41	40	40	39	39	38	38	37	37	36
28	55	54	53	52	51	50	49	48	47	47	46	45	44	44	43	42	42	41	41	40	39	39	38	37	36
29	57	56	55	54	53	52	51	50	49	48	48	47	46	45	45	44	43	43	42	41	40	40	39	39	38
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31	61	60	58	57	56	55	54	53	53	52	51	50	49	48	48	47	46	46	45	44	44	43	42	42	41
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35	69	67	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51	51	50	49	49	48	47	47
36	71	69	68	67	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51	51	50	49	49	48	48
37	73	71	70	69	67	66	65	64	63	62	61	60	59	58	57	56	55	54	54	53	52	51	51	50	49
38	75	73	72	70	69	68	67	66	64	63	62	61	60	59	58	57	56	55	54	54	53	52	51	51	50
39	76	75	74	72	71	70	68	67	66	65	64	63	62	61	60	59	58	57	57	56	55	54	53	53	52
40	78	77	75	74	73	72	71	70	69	68	67	66	65	63	62	61	60	59	58	57	56	56	55	54	53
41	80	79	77	76	75	73	72	71	69	68	67	66	65	64	63	62	61	60	59	59	58	57	56	55	55
42	82	81	79	78	76	75	74	72	71	70	69	68	67	66	65	64	63	62	61	60	59	58	57	56	56
43	84	83	81	80	78	77	75	74	73	72	71	69	68	67	66	65	64	63	62	61	60	59	58	57	57
44	86	85	83	81	80	79	77	76	75	73	72	71	70	69	68	67	66	65	64	63	62	61	60	59	59
45	88	87	85	83	82	80	79	78	76	75	74	73	71	70	69	68	67	66	65	64	63	62	62	61	60
46	90	88	87	85	84	82	81	79	78	77	75	74	73	72	71	70	69	68	67	66	65	64	63	62	61
47	92	90	89	87	85	84	82	81	80	78	77	76	75	73	72	71	70	69	68	67	66	65	64	63	63
48	94	92	91	89	87	86	84	83	81	80	79	77	76	75	74	73	72	71	70	69	68	67	66	65	64
49	96	94	92	91	89	88	86	84	83	82	80	79	79	77	75	74	73	72	71	70	69	68	67	66	65
50	98	96	94	93	91	89	88	86	85	83	82	81	79	78	77	76	75	74	72	71	70	69	68	68	67
$\uparrow K$																									
$N \rightarrow$	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75 $\leftarrow N$

Table of Percentages and Proportions

N→76		77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	90←N	K ↓
		01	01	01	01	01	01	01	01	01	01	01	01	01	01	01	01	01	01	01	01	01	01	01	01	
1	03	03	03	03	02	02	02	02	02	02	02	02	02	02	02	02	02	02	02	02	02	02	02	02	02	1
2	04	04	04	04	04	04	04	04	04	04	03	03	03	03	03	03	03	03	03	03	03	03	03	03	03	2
3	05	05	05	05	05	05	05	05	05	05	05	05	05	05	05	05	05	05	05	05	05	05	05	05	05	3
4	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	06	4
5	07	07	07	07	07	07	07	07	07	07	07	07	07	07	07	07	07	07	07	07	07	07	07	07	07	5
6	08	08	08	08	08	07	07	07	07	07	07	07	07	07	07	07	07	06	06	06	06	06	06	06	06	6
7	09	09	09	09	09	09	09	08	08	08	08	08	08	08	08	08	08	08	07	07	07	07	07	07	07	7
8	10	10	10	10	10	10	10	10	10	10	09	09	09	09	09	09	09	09	09	08	08	08	08	08	08	8
9	11	11	11	11	11	11	11	11	11	11	10	10	10	10	10	10	10	10	10	09	09	09	09	09	09	9
10	12	12	12	12	12	12	12	12	12	12	12	11	11	11	11	11	11	11	11	11	10	10	10	10	10	10
11	13	13	13	13	13	14	13	13	13	13	13	13	12	12	12	12	12	12	12	12	11	11	11	11	11	11
12	14	14	14	14	14	15	14	14	14	14	14	14	14	13	13	13	13	13	13	13	12	12	12	12	12	12
13	15	15	15	15	15	16	15	15	15	15	15	15	15	15	14	14	14	14	14	14	14	13	13	13	13	13
14	16	16	16	16	16	17	16	16	16	16	16	16	16	16	16	16	16	16	16	16	15	15	15	15	15	15
15	17	17	17	17	17	18	17	17	17	17	17	17	17	17	17	17	17	17	17	17	16	16	16	16	16	16
16	18	18	18	18	18	19	18	18	18	18	19	18	18	18	18	18	18	18	18	18	18	17	17	17	17	17
17	19	19	19	19	19	20	19	19	19	19	20	19	19	19	19	19	19	19	19	19	19	18	18	18	18	18
18	20	20	20	20	20	21	20	20	20	20	21	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
19	21	21	21	21	21	22	21	21	21	21	22	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21
20	22	22	22	22	22	23	22	22	22	22	23	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22
21	23	23	23	23	23	24	23	23	23	23	24	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23
22	24	24	24	24	24	25	24	24	24	24	25	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
23	25	25	25	25	25	26	25	25	25	25	26	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
24	26	26	26	26	26	27	26	26	26	26	27	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26
25	27	27	27	27	27	28	27	27	27	27	28	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27

TABLE OF PERCENTAGES AND PROPORTIONS

N→76		77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	→N
26	34	34	34	33	33	32	32	31	31	31	30	30	30	29	29	29	28	28	28	27	27	27	27	26	26
27	36	35	35	34	34	33	33	33	32	32	31	31	31	30	30	30	29	29	29	28	28	28	28	27	27
28	37	36	36	35	35	34	34	34	33	33	32	32	31	31	31	31	30	30	30	29	29	29	29	28	28
29	38	38	37	37	36	36	35	35	35	34	34	33	33	33	32	32	32	31	31	31	31	30	30	29	29
30	39	39	38	38	38	37	37	36	36	35	35	34	34	34	33	33	33	32	32	32	32	31	31	31	30
31	41	40	40	39	39	38	38	37	37	36	36	35	35	34	34	34	34	33	33	33	33	32	32	31	31
32	42	42	41	41	40	40	39	39	38	38	37	37	36	36	36	36	35	35	34	34	34	34	33	32	32
33	43	43	42	42	41	41	40	40	39	39	38	38	37	37	37	37	36	36	35	35	35	35	34	33	33
34	45	44	44	43	42	42	41	41	40	40	40	39	39	38	38	38	37	37	36	36	36	36	35	34	34
35	46	45	45	44	44	43	43	42	42	41	41	40	40	39	39	39	38	38	37	37	37	37	36	35	35
36	47	47	46	46	45	44	44	43	43	42	42	41	41	40	40	40	39	39	38	38	38	37	36	36	36
37	49	48	47	47	46	46	45	45	44	44	43	43	42	42	41	41	40	40	39	39	39	38	37	37	37
38	50	49	49	48	48	47	46	46	45	45	44	44	43	43	42	42	41	41	40	40	40	39	38	38	38
39	51	51	50	49	49	48	48	47	46	46	45	45	44	44	43	43	42	42	41	41	41	40	39	39	39
40	53	52	51	51	50	49	49	48	48	47	47	46	45	45	44	44	43	43	43	42	42	41	41	40	40
41	54	53	53	52	51	51	50	49	49	48	48	47	47	46	46	45	45	44	44	43	43	42	42	41	41
42	55	55	54	53	52	52	51	51	50	49	49	48	48	47	47	46	46	45	45	44	44	43	43	42	42
43	57	56	55	54	54	53	52	52	51	51	50	49	49	48	48	47	47	46	46	45	45	44	44	43	43
44	58	57	56	56	55	54	54	53	52	52	51	51	50	49	49	48	48	47	47	46	46	45	45	44	44
45	59	58	58	57	56	56	55	54	54	53	52	52	51	51	50	49	49	48	48	47	47	46	46	45	45
46	61	60	59	58	58	57	56	55	55	54	53	53	52	52	51	50	49	49	49	48	48	47	47	46	46
47	62	61	60	59	59	58	57	57	56	55	55	54	53	53	52	51	51	50	50	49	49	48	48	47	47
48	63	62	62	61	60	60	59	58	57	56	56	55	54	53	53	52	51	51	51	50	50	49	49	48	48
49	64	64	63	62	61	61	60	59	58	58	57	56	56	55	54	54	53	53	52	52	52	51	51	50	49
50	66	65	64	63	62	62	61	60	60	59	58	57	57	56	55	55	54	54	53	53	52	52	51	51	50
↑K																									
↓N																									

Table of Percentages and Proportions

N	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	N
51	67	66	65	65	64	63	62	61	61	60	59	59	58	57	57	56	55	55	54	54	53	53	52	52	51
52	68	68	67	66	65	64	63	63	62	61	60	60	59	58	58	57	57	56	55	55	54	54	53	53	52
53	70	69	68	67	66	65	65	64	63	62	62	61	60	60	59	58	58	57	56	56	55	54	54	53	52
54	71	70	69	68	68	67	66	65	64	64	63	62	61	61	60	59	59	58	57	57	56	55	55	54	53
55	72	71	71	70	69	68	67	66	65	65	64	63	62	62	61	60	60	59	58	58	57	57	56	55	54
56	74	73	72	71	70	69	68	67	67	66	65	64	63	62	62	61	60	60	59	59	58	57	57	56	55
57	75	74	73	72	71	70	69	68	67	67	66	65	64	63	63	62	61	61	60	60	59	58	57	56	55
58	76	75	74	73	72	71	70	69	68	68	67	66	65	64	64	63	62	61	61	60	59	58	57	56	55
59	77	76	75	74	73	72	71	70	69	69	68	67	66	65	65	64	63	62	61	61	60	59	58	57	56
60	78	77	76	75	74	73	72	71	70	70	69	68	67	66	66	65	64	63	62	61	60	59	58	57	56
61	80	79	78	77	76	75	74	73	72	72	71	70	69	68	68	67	66	65	64	63	62	61	60	59	58
62	82	81	79	78	78	77	76	75	74	73	72	71	70	69	69	68	67	66	65	64	63	62	61	60	59
63	83	82	81	80	79	78	77	76	75	74	73	72	71	70	70	69	68	67	66	65	64	63	62	61	60
64	84	83	82	81	80	79	78	77	76	75	74	73	72	71	71	70	69	68	67	66	65	64	63	62	61
65	86	84	83	82	81	80	79	78	77	76	75	74	73	72	72	71	70	69	68	67	66	65	64	63	62
66	87	86	85	84	82	81	80	79	78	78	77	76	75	74	73	72	71	70	69	68	67	66	65	64	63
67	88	87	86	85	84	83	82	81	80	79	78	77	76	75	74	73	72	71	70	69	68	67	66	65	64
68	89	88	87	86	85	84	83	82	81	80	79	78	77	76	75	74	73	72	71	70	69	68	67	66	65
69	91	90	88	87	86	85	84	83	82	81	80	79	78	77	76	75	74	73	72	71	70	69	68	67	66
70	92	91	90	89	88	86	85	84	83	82	81	80	79	78	77	76	75	74	73	72	71	70	69	68	67
71	93	92	91	90	89	88	87	86	85	84	83	82	81	80	79	78	77	76	75	74	73	72	71	70	69
72	95	94	92	91	90	89	88	87	86	85	84	83	82	81	80	79	78	77	76	75	74	73	72	71	70
73	96	95	94	92	91	90	89	88	87	86	85	84	83	82	81	80	79	78	77	76	75	74	73	72	71
74	97	96	95	94	93	92	91	90	89	88	87	86	85	84	83	82	81	80	79	78	77	76	75	74	73
75	99	97	96	95	94	93	92	91	90	89	88	87	86	85	84	83	82	81	80	79	78	77	76	75	74

SUSHIL KUMAR

TABLE OF PERCENTAGES AND PROPORTIONS

K	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	K
74	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	76	
73	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	77	77	
72	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	78	78	78	
71	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	80	81	81	81	
70	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	81	82	82	82	82	
69	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	82	83	83	83	83	83	
68	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	83	84	84	84	84	84	84	
67	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	84	85	85	85	85	85	85	85	
66	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	85	86	86	86	86	86	86	86	86	
65	86	87	88	89	90	91	92	93	94	95	96	97	98	99	86	87	87	87	87	87	87	87	87	87	
64	87	88	89	90	91	92	93	94	95	96	97	98	99	87	88	88	88	88	88	88	88	88	88	88	
63	88	89	90	91	92	93	94	95	96	97	98	99	88	89	89	89	89	89	89	89	89	89	89	89	
62	89	90	91	92	93	94	95	96	97	98	99	89	90	90	90	90	90	90	90	90	90	90	90	90	
61	90	91	92	93	94	95	96	97	98	99	90	91	92	93	94	95	96	97	98	99	91	92	92	92	
60	91	92	93	94	95	96	97	98	99	90	91	92	93	94	95	96	97	98	99	92	93	93	93	93	
59	92	93	94	95	96	97	98	99	90	91	92	93	94	95	96	97	98	99	93	94	94	94	94	94	
58	93	94	95	96	97	98	99	90	91	92	93	94	95	96	97	98	99	94	95	95	95	95	95	95	
57	94	95	96	97	98	99	90	91	92	93	94	95	96	97	98	99	95	96	96	96	96	96	96	96	
56	95	96	97	98	99	90	91	92	93	94	95	96	97	98	99	96	97	97	97	97	97	97	97	97	
55	96	97	98	99	90	91	92	93	94	95	96	97	98	99	97	98	98	98	98	98	98	98	98	98	
54	97	98	99	90	91	92	93	94	95	96	97	98	99	98	99	99	99	99	99	99	99	99	99	99	
53	98	99	90	91	92	93	94	95	96	97	98	99	90	91	92	93	94	95	96	97	98	99	90	90	
52	99	90	91	92	93	94	95	96	97	98	99	90	91	92	93	94	95	96	97	98	99	91	91	91	
51	90	91	92	93	94	95	96	97	98	99	90	91	92	93	94	95	96	97	98	99	92	92	92	92	
50	91	92	93	94	95	96	97	98	99	90	91	92	93	94	95	96	97	98	99	93	93	93	93	93	
49	92	93	94	95	96	97	98	99	90	91	92	93	94	95	96	97	98	99	94	94	94	94	94	94	
48	93	94	95	96	97	98	99	90	91	92	93	94	95	96	97	98	99	95	95	95	95	95	95	95	
47	94	95	96	97	98	99	90	91	92	93	94	95	96	97	98	99	96	96	96	96	96	96	96	96	
46	95	96	97	98	99	90	91	92	93	94	95	96	97	98	99	97	97	97	97	97	97	97	97	97	
45	96	97	98	99	90	91	92	93	94	95	96	97	98	99	98	98	98	98	98	98	98	98	98	98	
44	97	98	99	90	91	92	93	94	95	96	97	98	99	99	99	99	99	99	99	99	99	99	99	99	
43	98	99	90	91	92	93	94	95	96	97	98	99	90	91	92	93	94	95	96	97	98	99	90	90	
42	99	90	91	92	93	94	95	96	97	98	99	90	91	92	93	94	95	96	97	98	99	91	91	91	
41	90	91	92	93	94	95	96	97	98	99	90	91	92	93	94	95	96	97	98	99	92	92	92	92	
40	91	92	93	94	95	96	97	98	99	90	91	92	93	94	95	96	97	98	99	93	93	93	93	93	
39	92	93	94	95	96	97	98	99	90	91	92	93	94	95	96	97	98	99	94	94	94	94	94	94	
38	93	94	95	96	97	98	99	90	91	92	93	94	95	96	97	98	99	95	95	95	95	95	95	95	
37	94	95	96	97	98	99	90	91	92	93	94	95	96	97	98	99	96	96	96	96	96	96	96	96	
36	95	96	97	98	99	90	91	92	93	94	95	96	97	98	99	97	97	97	97	97	97	97	97	97	
35	96	97	98	99	90	91	92	93	94	95	96	97	98	99	98	98	98	98	98	98	98	98	98	98	
34	97	98	99	90	91	92	93	94	95	96	97	98	99	99	99	99	99	99	99	99	99	99	99	99	
33	98	99	90	91	92	93	94	95	96	97	98	99	90	91	92	93	94	95	96	97	98	99	90	90	
32	99	90	91	92	93	94	95	96	97	98	99	90	91	92	93	94	95	96	97	98	99	91	91	91	
31	90	91	92	93	94	95	96	97	98	99	90	91	92	93	94	95	96	97	98	99	92	92	92	92	
30	91	92	93	94	95	96	97	98	99	90	91	92	93	94	95	96	97	98	99	93	93	93	93	93	
29	92	93	94	95	96	97	98	99	90	91	92	93	94	95	96	97	98	99	94	94	94	94	94	94	
28	93	94	95	96	97	98	99	90	91	92	93	94	95	96	97	98	99	95	95	95	95	95	95	95	
27	94	95	96	97	98	99	90	91	92	93	94	95	96	97	98	99	96	96	96	96	96	96	96	96	
26	95	96	97	98	99	90	91	92	93	94	95	96	97	98	99	97	97	97	97	97	97	97	97	97	
25	96	97	98	99	90	91	92	93	94	95	96	97	98	99	98	98	98	98	98	98	98	98	98	98	
24	97	98	99	90	91	92	93	94	95	96	97	98	99	99	99	99	99	99	99	99	99	99	99	99	
23	98	99	90	91	92	93	94	95	96	97	98	99	90	91	92	93	94	95	96	97	98	99	90	90	
22	99	90	91	92	93	94	95	96	97	98	99	90	91	92	93	94	95	96	97	98	99	91	91	91	
21	90	91	92	93	94	95	96	97	98	99	90	91	92	93	94	95	96	97	98	99	92	92	92	92	
20	91	92	93	94	95	96	97	98	99	90	91	92	93	94	95	96	97	98	99	93	93	93	93	93	
19	92	93	94	95	96	97	98	99	90	91	92	93	94	95	96	97	98	99	94	94	94	94	94	94	
18	93	94	95	96	97	98	99	90	91	92	93	94	95	96	97	98	99	95	95	95	95	95	95	95	
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16	95	96	97	98	99	90	91	92	93	94	95	96	97	98	99	97	97	97	97	97	97	97	97	97	
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13	98	99	90	91	92	93	94	95	96	97	98	99	90	91	92	93	94	95	96	97	98	99	90	90	
12	99	90	91	92	93	94	95	96	97	98	99	90	91	92	93	94	95	96	97	98	99	91	91	91	
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9	92	93	94	95	96	97	98	99	90	91	92	93	94	95	96	97	98	99	94	94	94	94	94	94	
8	93	94	95	96	97	98	99	90	91	92	93	94	95	96	97	98	99	95	95	95	95	95	95	95	
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6	95	96	97																						

Reviews :

A Laboratory Guide in Psychology

BY

BISHWANATH MUKHERJEE, PUSTAK-BHANDER, PATNA

Pages 104. Price Rs. 10

This is a welcome addition to the manuals currently being used in laboratory courses in Psychology in colleges such as those by Metfissel, Valentine, Kuppuswamy, and Yoganarasimhaiah and Khadir. It is different from the other Indian guides in two respects. It covers experiments which fall usually in the syllabus of the senior classes. And it gives more than mere out-line of procedure to conduct the experiments. The procedure is prefaced by an introduction that is brief, to the point and serves the purpose very satisfactorily. Points for discussion of data are provided—this will be welcome to students. The references, mainly to chapters in Boring *et. al* and Woodworth are made in a convenient manner. An appendix on apparatus and a list of manufacturers is given.

Some instructors might find it necessary to alter the sequence of experiments to suit the local syllabus. It would have been a very good idea to out-line alternate procedures wherever possible, so that the teacher could choose from them. Some related problems, which could be attacked with the same materials could have been suggested at the end of each experiment.

The printing and get-up are not very satisfactory. A book that has to be handled continually by the student needs to be a little stronger in the inside too. The price is rather high for the average student.

We have received Vol. XXV of *The Gardian*, published by the S. B. Garda College and B. P. Baria Science Institute, Navsari. It contains among other things an attitude survey on factors associated with student indiscipline. The line of approach to the problem of indiscipline holds great promise although the present report leaves much to be desired in methodology, etc.

M. A. FAROQI

Review :

The Fifth Mental Measurements Year Book

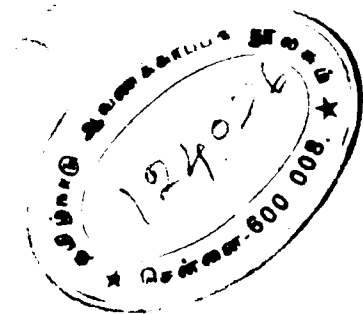
EDITED BY

O. K. BUROS

The Gryphon Press, U.S.A.

Students of psychology will be already familiar with the earlier volumes in this series. These year books have always been referred to for useful information regarding various kinds of mental tests. This Fifth year book is completely a new work supplementing and replacing the earlier volumes. This covers a period of 7 years, 1952 to 1958. This volume contains 957 tests and 698 original test reviews by 350 reviewers. The tests include intelligence tests, aptitude tests for various subjects, achievement test batteries and personality tests. One can imagine the range covered by this book when we see the total number of tests reviewed. This fifth year book thus gives an invaluable help to all students of psychology who have anything to do with the use of tests or test construction. The reviews are given very scientifically, clearly indicating the advantages and the limitations of each one of them. When there are thousands of tests available in these days reviews like this help us to get exactly what we want. No library can afford to be without a copy of this book. Manasayan, 32, Faiz Bazar, Delhi-7, from whom copies of this book are available under payment through the Indian currency have certainly done a service to the libraries in this country, by undertaking the distribution. Each copy costs Rs. 112.50 net.

G. D. BOAZ

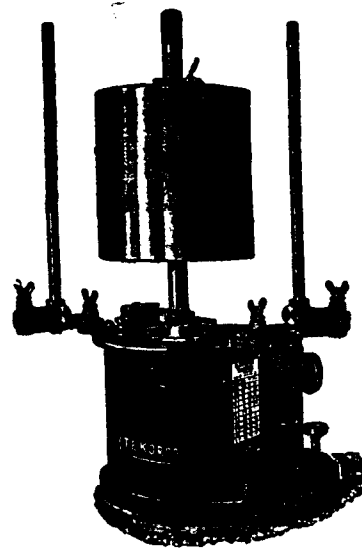


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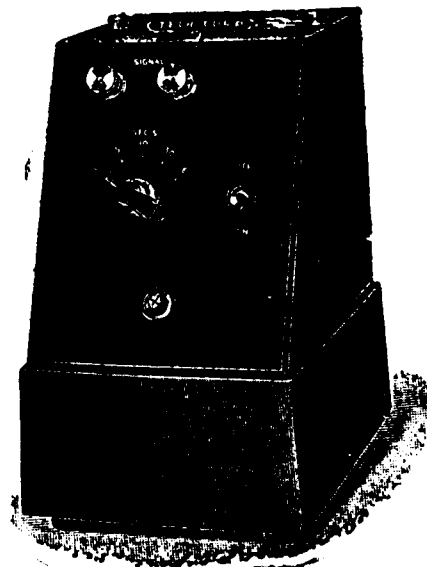
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