

AN EXPERIMENTAL PROGRAM

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There are various factors which decide the problem that a particular person, whether faculty member, graduate student, or advanced senior, will accept for experimental investigation. One such factor is the presence or absence of a fairly definite program of work set up by the department whether it be a department of physics, government, sociology, biology, or any other. Sometimes, of course, each man in a department will have his own research program or each man will direct research independently of other men in the department whether either he or the department has a program or not.

ADVANTAGES OF A RESEARCH PROGRAM

In the absence of a research program the study is likely to bear no relation to other studies which precede, go on at the same time as, or follow it. There is no coherence between studies undertaken. Either the director of research or the person who is to do the research "thinks" of something which might be interesting and it becomes the research problem. Psychological literature is filled with reports of such studies. Sometimes they fit into someone's program and he uses the results. Too often such studies remain as dead timber in the literature.

Every science as well as every other field of knowledge grows through the confirmation or negation of general principles and hypotheses. To be sure a principle or an hypothesis does not spring into being from nowhere and out of nothing. Sometimes an experimental problem conceived on the spur of the moment and without relation to anything in particular affords results which serve as the basis for a new hypothesis or a new insight into the nature of some phenomenon.

This hit-and-miss type of research which, as conceived, has no relation to a broader systematic background is not to be condemned forthwith and completely. It does sometimes have great value but a large percentage of it represents a waste of time, energy, and paper.

This raises an interesting point especially in our own field of psychology. It became fashionable a few years ago, especially in our elementary texts, to shun and even to abhor any systematic presentation. In the preface to several texts the authors disclaimed in the most positive terms any intention of indoctrination. It became a heinous crime to organize materials in terms of systematic principles. The facts, according to these writers, who never quite lived up to their own preachments, should be presented and allowed to speak for themselves. They must not be interpreted or given a setting in a larger systematic whole.

This in itself would not have been so bad if they had not carried the same principle through all their teaching. As a consequence of such training, the graduates left the place without having their knowledge organized in any way. The knowledge they had was largely a hodgepodge of unrelated, unsystematized facts. A person so trained must work by a hit-and-miss plan; he cannot have a program of work because neither has he been given a program nor has there been built in him a foundation on which to erect one. There can be no coherence to his research. What he does today will have no relation to what he did yesterday or to what he will do tomorrow. His growth and development is haphazard; it lacks orderliness and symmetry. It is like a scraggly misshapen tree which is useless for shade, for fruit, for beauty, or for lumber. It takes up space which might be put to much better use. The opprobrium

attaching to systematic presentation and experimentation has done us a great disservice in my estimation.

The man who picks up his research problems from here, there, and yonder, it may be argued, covers a wider range of topics than does the person who adheres to a well-formulated program. Often this is true. It depends upon the scope of the program, as will appear presently. Even in those cases for which it is true, the experimenter has not necessarily added much to his stature. He has the satisfaction which comes from the completion of a research study, but his own results have little or no value to him beyond themselves.

Scientific experimentation, it is often said, has no end or object beyond the discovery of the facts of nature. To this statement I give complete endorsement. *Science* on the other hand is often defined as the systematic organization of all the facts pertinent to a given section of natural phenomena. The two are in no way contradictory. There is no reason why the search for facts should not be carried out systematically.

RESEARCH PROGRAM AT THE UNIVERSITY

The advantages to be derived from a systematic approach can be deduced from what has been said about the shortcomings of a haphazard type of work.

At the University of Oklahoma the Department of Psychology has generally followed a fairly well-considered and formulated program. This does not mean that the program has not changed from time to time. At present, and for some time past, the program has centered about the topic of determination in human functioning. Stated a little more precisely perhaps, our interest has centered in the role played by muscular adjustment and the resulting kinesthetic experiences in human functioning.

Nervous system as agent of control. It was customary before the advent of Lashley to ascribe all determination of human functioning to the nervous system. It is popular in many quarters to teach that all human functioning is determined and directed by neural mechanisms. The human being is made to be the absolute slave of a nonintelligent wholly mechanistic nervous system. Almost all of us accepted this role of being mechanical robots without too much protestation. It at least took control away from a whimsical capricious ego agent and placed it within the organism. Lashley's work rendered this doctrine wholly untenable for many who, for the most part, did not swallow it with entire ease anyway.

Lashley's work opened anew the problem of determination in human behavior. The displaced neural doctrine never had an experimental foundation; it was all theory. A great many experimental results can be and apparently still are satisfactorily interpreted in terms of the neurological theory and many workers apparently still hope to find the secret of determination and guidance of human conduct tucked away somewhere in neurograms.

In recent years, as many of you know, many studies have been made of "brain waves" and of differences in potential within the brain mass. It can now be stated very positively that the brain waves, that is, electrical discharges, are a regular and constant feature of brain activity. Stimulation modifies this activity and does not originate it.

Some writers have drawn what appear now to be hasty conclusions relative to the relation between brain activity and human behavior on the basis of studies on electrical fields associated with particular nerve tracts, and on differences in potential. The newer approaches to the problem have not, as yet, shed much light on the question of control and direction of human functioning. There still remains to be tried out a psychological approach. This is, and for some time has been, our problem. We have undertaken a systematic study of determination in connection with various phases of mental life as well

as in connection with overt behavior. Only a part of this comprehensive program has been worked at, up to now. No part of it is complete, we are sure.

Role of sensory experience. Because of what we had found in our own research, and because of an increasing number of like findings reported in the literature, we became convinced that every mental phenomenon was accompanied by muscular adjustment. The most intimate functional relationship between the sensory and the muscular phases of human functioning exists at all times. We, with many others, are sure that all meaning and ultimately all knowledge depends upon sensory experience. If you were robbed of all sensory experience you could not function at all. You literally would not know whether you were coming or going or whether you were even moving. If you had no sensory experience you would be as senseless as the proverbial clod. You would be insensitive to the starry skies, to the verdure of the fields, and to a kick in the ribs.

Role of muscular adjustment. The sensory, however, does not yield all these meanings independently of muscular activity. The muscles are continuously in a state of shifting tensions. These muscular tensions, together with the accompanying kinesthesia, are what we choose to call determinations. This name seems to be appropriate because patterns of muscular tensions are ever present and more especially because they are the immediate antecedents of every overt activity whether it be verbal or manual performance. Not only do they appear as the immediate antecedent of all activity but every activity seems to be wholly determined by its antecedent muscular adjustment. Moreover all learning appears to consist of nothing more, or other, than the development of the appropriate and correct adjustment, or determination, whether it be skill or verbal learning. A purpose which may dominate a person's life over a span of years is nothing other, or more, than a pattern of muscular adjustments and accompanying experiences, or a determination. I could go on for pages with examples all of which point to muscular adjustment as the supreme immediate determining factor in all phases and aspects of man's mental and behavioral life.

Specific phases of the program. Our program consists first in determining the presence or absence of such muscular adjustments in all, or as many as possible, of the various phases of man's functional life. Secondly, the program calls for knowledge, as exact as we can make it, of the role played by these determinations, or muscular adjustments. Thirdly, it calls for a description or delineation, as precise as possible, of these tensional patterns. Lastly it calls for an understanding of the origin and source of these determinations or, if you please, the determination of the determinations. In connection with this last part of the program some unknowns are soon encountered but the work has proven highly fruitful even here.

Rather than summarize the results from various studies we have chosen to present the results from a few experiments. These will show something of the wide scope of the program as well as the bearing of the results obtained in specific studies on the general problem of determination. The presentation of these concrete studies will show in part how far we have been able to go with each of the four parts of the program as outlined above.

STUDY OF VISUAL PERCEPTION

For the next few minutes I shall summarize some of the results from a study of visual perception. We, along with others, believe that perception is basic for all mental life. Unless we can find out something about determinations at this elementary level our doctrine of muscular cooperation in mental life would be without a foundation; it would be a failure in connection with the most basic of all mental processes.

Visual perception, under ordinary conditions, takes place so rapidly that observation of the total perceptual process is all but impossible. We perceive

objects almost as soon as we look at them. To overcome this handicap we presented colored pictures on a screen with the projector badly out of focus. At this stage there was nothing more than a smear of color on the screen. This in itself was a perception, of course. But the subject was instructed to perceive some familiar object as the projector was very slowly brought into focus. The objective of this study was the description of everything, in as far as it could be described, related to the emergence of a definitely perceived colored object. By slowing down the perceptual process, the subjects were able to report a great deal more than they could have reported otherwise. All that anyone can report are sensory experiences or inferences based on sensory experiences. He may report a tightening of the muscles of the throat but this can be done only if there were pressures localized in the region of the throat. Again no sensory experience, no meaning, and no knowledge. The subject simply reported pressures as movement. Without the pressures there would have been no meaning of movement and you can lay to that.

The first thing to be noted is a fact which has long been recognized and which has been demonstrated over and over. Without adjustments which establish in the observer the determination, or purpose, to perceive a familiar object in the mass of color, no such perceptual process would have occurred. That is, at all times specific functioning takes place under the domination of a more general phase of adjustment or a more general type of determination and specific functioning never starts from a zero state, a state of no functioning at all. I shall not develop this point further but it will be expanded further in the two subsequent papers by members of our department.

The second thing to be noted was the necessity for the color masses to become sufficiently definite in form for the subject to adjust to them as discrete shapes before the perception of a definite object could arise. The shape of visual experience thus appears as a very important factor in visual perception.

Thirdly, under the conditions of this experiment, adjustment was usually first related to some relatively small part of the total pattern and gave a meaning of the class to which the object belonged. This resulted in a shift of the general adjustment from looking for just any object to looking for a man, flowers, a lake or what not. With this shift, specific adjustment was made to other parts of the colored mass, which was by this time becoming fairly clearly differentiated, not to see what they were but to see whether they would fit into the pattern of the suggested object.

During this process of fitting the parts of the visual experience into a predetermined object, a part might be noticeably modified in quality or form or both. Thus, the adjustments are restricted, and to that degree determined, when the suggestion of an object of a certain class arises. The sensory pattern is also modified within limits to fit the suggested object.

It should be stated perhaps that sometimes this whole process was disrupted. As the colored parts emerged, an entirely new object might be suggested in which case an entire readjustment took place, and, at the same time, the visual field underwent complete reorganization. It may be necessary to state that the object perceived with a given slide differed from subject to subject and it often differed from what would have been perceived had the projector been correctly focused. Since we were interested in the perceptual process, the object perceived made no difference.

When the parts of the colored field fitted together into a recognizable object, there was a pronounced release of tension. For some untrained subjects this release of tension at the completion of the perception was the first reportable evidence that the muscular system had participated in the perceptual

process. From this they were able to work backward, as it were, to a more complete description of experience associated with perceptions as they arose.

You will appreciate the fact that my presentation of this study, which was carried out by Victor Hamilton, is very condensed. It does not go into details, but the general picture, I hope, is clear. Determination, defined as muscular adjustments and the accompanying kinesthetic experience, plays an important part at every stage in the perceptual process under the conditions of this experiment.

The one question which all of you are itching to ask, if you have followed the discussion, is, Does all this hold true under normal conditions? Such evidence as we have, and it is considerable, points to an affirmative answer. To be sure it will differ in amount with different perceptions but the absolute necessity for muscular adjustments if perception is to take place is, we believe, well-established. If it is, then determination, as defined, forms an integral part of human functioning in its basic elementary phases and is not something which mysteriously intrudes itself when action is demanded. It has been there all the time and is itself determined to a large degree by sensory experience.

CONCLUSIONS

If these results are substantiated by further experimentations, the following very important conclusions follow:

1. All perception involves the intimate cooperation of the sensory and muscular systems.
2. Every perception involves specific adjustments.
3. These specific adjustments are in part determined by a broader functional organization and in large part by the externally aroused sensory experience.
4. Externally aroused sensory experience thus assumes a role of almost immeasurable importance through its influence on determinations and through the determinations on knowledge, ideation, and all overt behavior.
5. The concrete externally aroused sensory experience itself depends upon muscular adjustment and its characteristics are in part determined by such adjustments.
6. All verbalization whether descriptive or otherwise issues from the muscular adjustment. Since this adjustment arises in conjunction with sensory experience, verbalization has to be related and appropriate to the sensory.
7. Once an adjustment pattern has developed in conjunction with the perceptual process it may arise later as ideation and issue in the same or similar overt behavior whether verbal or manual.
8. The process of learning consists solely in the adequate development of the appropriate adjustments related to perceptions and to each other.

When a person has gained full comprehension of these conclusions with all their implications he has gained considerable insight into human functioning.