

THE ORGANISMAL POINT OF VIEW IN THE STUDY OF MOTOR AND MENTAL LEARNING

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The question as to whether human learning differs from animal learning in kind or only in degree has been difficult to answer clearly. Accordingly psychologists have differed in their views, with a tendency it seems for that view to gain adherents which holds that the difference is one of degree only. The writer hopes to set forth soon a view of the technic of 'thinking' based upon an analysis of language-use that shall attempt to show the unique factors in human learning.

In making this analysis of language habits we shall use the 'organismal' method as we have already applied it to the motor learning of animals.¹ The object of the present paper is to state in some detail the general theory and basis of the 'organismal' point of view in order that when we come to enter the difficult field of human psychology our problem will not be further confused by lack of clearness in the method employed. We shall therefore (1) discuss the 'organismal' view with reference to general psychological theory, (2) exemplify the 'organismal' method in the study of simple forms of motor learning, and (3) attempt to state the central problem of human psychology in the shaping which this 'organismal' method requires. It is hoped that the discussion will have some interest from the viewpoint of general philosophy of psychology as well as furnish us a helpful approach to a specific problem to be taken up at a later time.

It will not be amiss, I think, to have a word on the general philosophy of psychology since we are pleading the cause of a view quite fundamentally different at some points from the methods of both 'introspection' and 'behaviorism.' It

¹ PSYCHOL. REV., May, 1921.

is in any case wise procedure to examine frequently the general theory of a science, for while the general technic of the scientific method is everywhere the same, its proper application is contingent upon the nature of the facts to be examined and the character of the practical problems which the particular science raises. It is surely not saying too much to urge that one of the most fruitful sources of confusion in the organic sciences has been the uncritical carrying-over *in toto* of attitudes, aims, and modes of attack from sciences lower in the serial order without any serious attempt to adjust these to the requirements of known facts and problems of the science in question.

This uncritical attitude on major matters seems to me to have hindered psychology. It appears difficult for example for psychologists to get away from a certain pathos of profundity to ask just what psychology as a distinct concrete science is seeking. This seems to be due to an attitude carried over from the aims and practice of the inorganic sciences.

Just what is the problem of psychology anyway? When we come to apply to the study of psychology the discursive technic of science—its analysis and synthesis—what are we trying to do? Has the nature of the science any guidance for us? How far may we abstract within this science if we are to be strictly scientific and how far may we generalize? Now there are certain very obvious differences in our datum and our problem from those of the inorganic sciences. Do these differences lay down for us the conditions of successful method? There seems to be a quite general feeling in psychology that we are especially seeking something very *fundamental* in the biologic deeps—that we are after something very *primary* in the ‘psychic’ or physiological sense—just as the inorganic sciences are seeking something very fundamental in the organization of matter. But are we?

“Science is for prevision.” Prevision depends upon the nature of the datum and the shaping of the problem. In saying this I am not of course urging merely the so-called

'practical' claims of science unmindful of what we owe to pure science. But no science neglects pragmatic matters. Whether our problem is in 'pure' or 'practical' science¹ it is equally important that we make our attack with the *real nature of our datum and problem in mind* in order that our abstracting shall not be *arbitrary but observational*, and our generalizations shall not be *superimposed upon the facts but discovered in them*.

Now the sciences of physics and chemistry are seeking something which is very fundamental. They are after that which is primary in the organization of matter itself, for their task is to break matter up and refabricate it. This being the case the more primary the discovery the more far-reaching the conclusions. Moreover the structure of inorganic matter seems to lend itself to be broken up in a more and more primary way. Hence fundamental discoveries like that of radio-activity are very far-reaching and have the greatest achieving value in the theory and practice of the science.

Similarly psychology appears to conclude that the most important discoveries it could make would be those most fundamental in the *biologic* sense. So we have been trying to find the nature of mind, the technic of primary neural organization, or the secrets of muscular and glandular behavior—*always some profound fact in the depths of the organism itself*. Granting always the undoubted importance of any careful research in so fertile a field, may we not ask if this is not a turned-about, mistaken emphasis—the projection of false profundity which really hurts progress in the long run? Is there any good reason in the nature of our datum and problem for believing that the discovery of the most primary life-facts connected with learning would help most in solving the really pragmatic problems of psychology? Is there any reason to believe that the discovery of facts very far from primary in the 'psychic' and physiological sense may not prove to be the most dynamic discoveries for the science?

¹The terms 'pure' and 'practical' are merely a convenience. All science is pure. So-called practical science is simply closer to concrete application.

In short does the general method of breaking up into elemental parts and reshaping—the method of the inorganic sciences—hold in psychology? Does the well-known nature of the facts and problems of psychology favor it? Is not almost the contrary rather the case?

So unconscious oftentimes are our preconceptions and so important our general orientation to a problem or set of problems, that I may perhaps be pardoned some repetition in pressing a point of view somewhat different from that which I understand to be customary. We said that the problem of the physicist for example is to manipulate matter as far as possible and isolate it part from part, and the further he can push his analysis the more far-reaching his results when he refabricates it. But does anyone suppose that the situation is similar in the organic sciences and especially in psychology? Surely we do not assume that even if we could analyze out some profound biologic secret connected with learning we could take a living organism part from part and put it together again or otherwise fabricate its structure. Now if we may not hope to manipulate parts and processes directly within the organism, the field of manipulation is a limited one. We would have to manipulate indirectly by means of outside factors and this would alter the shaping of the whole problem.

If we cannot break organisms down and build them up again thereby changing learning processes, our field of control is limited to manipulating such factors as media, food, chemicals, temperature, location and quality of stimuli, etc.—factors outside of the organism. This appears to me to be the case. The problem of the ‘individualism of the organism’ extends over the whole field of biology and is, despite much study, in a state of complete flux. It would seem wise for psychology to frankly assume this individualism and go straight to the problem of how the organism *as a unit* makes its adaptations rather than either attack the general problem of the nature of the integrity of the organism or what is worse *attempt an elemental analysis which ignores it*.

Now if we are to accept the organism and the obvious

fact that it makes its adaptations as an integrated whole¹ such a view shifts the main emphasis outside of the organism to the different *types of learning* or adaptation which animals achieve, and the relative importance of these types with reference to particular problems. If we cannot hope to change the processes of learning themselves, it is our task to apply selective intelligence to knowing the different *types or patterns of adaptation, their relative merit for particular problems, and the conditions favorable to the controllable factors upon which the respective types are built up.*²

This view simplifies the problem and radically changes the method. It does not exclude any other problems but merely brings a different problem to the fore *which a more pragmatic emphasis in theory makes primary*. In attacking our problem as we have stated it—a problem simple and objective,—we may assume for the present a great deal under the unity of the organism and any problems in our assumptions come later in serial order and can wait. Besides whatever problems are neglected for the time and whatever their relevancy for psychology they are not primary to this science and they appear to be such for the most part as will be more open to solution after we have dealt successfully with the more objective problem concerning the *types* of

¹ When a reaction is being learned there is a marked 'set' of the organism, even very slight movements are accompanied by this noticeable 'set' of the whole. Well-learned reactions show a minimum of general 'set' or 'attention.' The same is true of 'thinking' as of motor reaction.

² Does anyone doubt the tremendous dynamic value for educational theory there would be in a well-organized body of facts on the *types* of learning of which organisms are capable, the relative merit of different *types* for different kinds of problems, the factors that shape the respective *types* and that control their accuracy and rapidity in function, and the factors that facilitate substitution and integration of *types*? Are we so sure about other matters? Suppose we could come into possession of a like body of facts concerning the primary physiological structure and activity associated with the adaptation of organisms. Is it clear that this information would be of large pragmatic value for psychology? Might we not still be limited to the same controllable factors as before? To be sure such discoveries, assuming them within reach at the present time, might throw new light upon controllable factors or even open up new and unseen possibilities. We have no right to assume that they would not. What we are urging is this. The first body of facts appears to be within reach of research now and is of undoubted pragmatic value; the second raises questions both as to its possibility and value.

learning by which organisms actually adapt to their environment, and have noted the controllable factors from which the types have been built up. Be that as it may *the order we are proposing in the attack seems to be based upon a serial order in the problem itself.*

The behaviorist appears to have seen this need of getting at the more pragmatic facts of learning. But in emphasizing actual observation of overt behavior he was unfortunate in *defining his datum*. He was too precipitous and crystalized his theory too soon. He does not appear to have seen sharply the *distinctive* problem of psychology, although his mind was moving in the right direction. The abstracting tendency led him astray. Instead of taking the behavior of the *organism as a whole* as his datum and passing from this integrated whole to a study of the behavior of parts also, he studied the reactions of 'muscles and glands' and attempted to arrive at conclusions for the whole organism by piecing together results.¹

This it appears is sure to be an unsound method.² It might seem at first thought to be a possible method in the study of very simple organisms, but when you come up to higher levels its weakness is apparent. With respect to 'thinking,' the very highest learning, even the data themselves which are to be observed by the behavioristic theory, become an *ignis fatuus* which almost every one admits to exist and which no one can reach and evaluate. When we are on the lower levels the emphasis of actual observation is often 'organismal' and the behaviorist seems therefore to be starting us out upon a scientific trail broad and clear, but as we come up to higher levels, where abstracting out the reactions of 'muscles and glands' becomes prominent, the trail disappears into a squirrel-hole leaving nothing for the

¹ It is interesting to note that the behaviorist position under fire accepts the wholeness of the reaction. Watson says in a rejoinder in the *British Journal of Psychology*, October, 1920: "A man thinks with his whole body in each and every part."

² Much of the behaviorist's work is fruitful because it is better than his theory. A good deal of his *observation* is free from the false abstracting of his *doctrine*.

behaviorist to do but impotently tell us *what we would find if only someone could pursue the way and find it*.¹

The writer believes all this trouble comes from an uncritical abstracting tendency. It is born of a failure to see sharply the distinctive problem of psychology as contrasted with the problems of the inorganic sciences. The inorganic sciences are after elemental parts. Psychology does not neglect these, but it does well to remember perhaps that the integrity of the organism is its most primary fact. Psychology should study therefore first of all the behavior of the organism treated as a unit and when the parts are studied they should be studied as parts. This distinction is always important but is especially necessary in practice on the higher levels. The organism is accepted as a whole simply because for the present at least *we cannot get behind it*. So long as we cannot take the various elements of the body of a living organism apart and put them together again *we cannot legitimately abstract them out and think finally to get results for the whole organism by a summation of separate results*.

An organism is a whole. This is our first fact. What we first want to know therefore as students of psychology are the *patterns* of the adaptations which the *organism as a whole* makes to its environment and the *controllable factors* which so affect the environment and the organism as to modify learning. If as we have said an attack upon this problem invites a study of the behavior of the elemental parts of an organism, as well it may in many cases, the part must be approached with reference to the whole—the *main datum*—and not the whole with reference to the part.

This position which urges us to accept the wholeness of the organism in our assumptions appears to be sound. This wholeness is the most distinctive fact which separates the organic from the inorganic sciences. Paton reminds us² that

¹ Watson says that if we could bring out 'thinking' for observation as you can rowing and tennis playing, the need for explaining it would disappear.

² 'Human Behavior,' '21, p. 28. Paton emphasizes in general the same approach we are stressing and I am indebted to him for the name 'organismal' as applied to it although I had applied the method in detail in my former papers before reading his book. It is not clear to me how he would apply the method to concrete problems.

the distinction between living and inorganic matter is not so much in the specificity of any particular reaction as in the totality and integrity of the reactions which are peculiar to living organisms. Surely then the most unarbitrary and consistent move which psychology can make is to accept for the present the organism as a whole and,—rejecting all pathos of profundity, psychic or physiological—attempt first the commonplace task of isolating the patterns of the different types of learning which enter into the actual adaptations of organisms from the lower to the higher levels, and evaluating the controllable factors which enter into the building of the various types. This appears to be for the present not only the most important function of psychology as a concrete science, but it also looks like the serial step *most likely to open the road to deeper facts of physiological structure which condition the learning process.*

We of course are not urging that the study of elemental parts of an organism is unprofitable for psychology. Far from it. We however urge that since psychology has to do with the laws of learning and since organisms as integrated wholes make adaptations to definite problems and thereby make progress in learning,—that therefore the first interest of psychology should be to isolate the laws (patterns, types) of these adaptations and the factors which shape them, and evaluate these types and factors *in order to control and advance learning.* This would seem to be more important for psychology as a primary step than to inquire into the nature of the organism. Besides it is by no means certain that we shall not always be able to judge better concerning the fundamental bodily structure and activity which is concomitant to higher adaptive adjustments by a study of the *patterns of the overt behavior* than we ever shall be from a direct examination of *living tissue.* This may always be the only open road. At least there seems to be little doubt as to *where the emphasis should rest at the present stage of progress.*

Accordingly we attempted to set forth in the PSYCHOLOGICAL REVIEW, May, 1921, the types of learning which

enter into the learning of sub-human animals.¹ Also the March, 1922, number of the *PSYCHOLOGICAL REVIEW* has a paper which attempts from the same 'organismal' point of view to interpret the dilemma between the 'introspective' and 'behavioristic' attack upon the problem of 'thinking.'² We found in the latter paper that when we come to the problem of human learning, 'introspection' lacks a fully *objective method* and 'behaviorism' lacks an *objective datum*, and we offered some reasons to show that an analysis of language habits from the organismal point of view should furnish both an *observational datum* and an *objective method*.

It is our purpose now to exemplify the 'organismal' method upon simple examples of motor learning, having as our especial aim to set forth the theory upon which this method is based in its detailed application to the problem of learning. This may be done by isolating the two lowest types of learning which organisms employ after the manner used in the former paper on animal learning,³ and calling attention to the technic of the method by which the types are isolated, and the inferences which we are able to draw concerning concomitant physiological structure and activity from the structure of the pattern which learned behavior takes. When we have done this we shall be ready to set up the *distinctive problem of human psychology—the problem of 'thinking', in terms of the 'organismal' theory and method*.

Let us suppose we were observing the earliest movements of a just-hatched fish embryo. We note that it makes now and then a struggling wabbling movement in which it turns up somewhat from the dorsal toward the ventral side and moves along a short distance in the general direction of its main axis. As the effort ceases the embryo turns back each time to the dorsal position and lies quiet for a short period. Now we observe two things as we watch the re-

¹ 'The Structure of Animal Learning.'

² 'The Crux of the Psychological Problem.'

³ The two types chosen, 'organic fixation,' and 'organic spacial adaptation' are typical. The observations which we shall make apply equally to the other types which animals use—'organic choice,' 'organic association,' 'organic conception' and 'organic judgment.'

peated 'trials.' First, we note that the organism is gaining both in reaching more nearly the ventral position and in moving faster and farther. Again, we notice that the direction of the movement, at first that of a spiral, is slowly straightening out toward a right line. This process keeps up until the individual has achieved the normal swimming habits of the adult fish, in which it lies on its ventral side and swims mainly in a straight course.

Now it is apparent that if we observed many individuals pass through this process we would conclude—unless we were to say dogmatically that the whole process is one of maturation only—that here is a general type of learning. We would therefore ask what is the fundamental nature or pattern of this type,—that which is peculiar to it and always present in it?

So primitive and simple is the behavior here that the question is easily answered. A wabbling incoördinate movement has become fixed and controlled. It is apparent also that since the medium in which the embryo swims remains the same, the change which takes place in the reaction is guided from the structure of the organism itself. We conclude therefore that the effects of the repeated movements help to tighten up the inherited bilateral structure of the organism. We shall call this *type (r)*. The fundamental thing about this type is that it is the *fixing of a reaction with reference to structure in the organism itself*.

Before we draw any further conclusions with reference to this type of learning let us turn to another type that sometimes looks from a superficial point of view very similar. We shall give it first in a form where the overt behavior looks quite different and then exemplify it so that the superficial spacial behavior is similar to the type we have just noted.

Suppose any one of the vermes to be placed in a narrow alley and every time it approaches the left side of the alley it is pricked sharply with a needle-point. If the same individual is put many times in the alley always facing the same way and subjected to the treatment noted above, it will be ob-

served that he finally *ceases to turn to the left* but holds closely to the right side of the alley. But suppose rather that we both prick the animal on the left side when he approaches that side and on the right side when that side nears the side of the alley, what then? In this case the organism becomes cautious as it were in his movements and by repeated experiments learns to avoid turning far in either direction but *follows a fairly straight course* down the middle of the alley. We shall call the learning of this kind *type (2)*.

Now in the first part of this experiment the animal learns to avoid turns to the left but still turns freely to the right. The spacial pattern in this case does not resemble that of fixation noted in *type (1)*. But in the second instance the two patterns of *types (1) and (2)* are similar spacially. They both represent a zigzag course straightening out toward a right line. But in *type (2)* the learning is not due primarily to the nature of the animal's structure as is the former type. The stimulations which produced the learning came from the outer environment, and the type of the reaction clearly shows that it is built up on the basis of the location of these points of stimulation and the movement of the animal. This represents *organic space adaptation* in simple pattern.

We have now two distinct types of learning—an organism adjusting movement to its own inherited structure by practice and an organism adjusting its movement to the structure of its environment by practice. We have called them 'organic fixation' and 'organic space adaptation.' They represent adjustment to two distinct problems of the organism. These two types of learning do not appear to be correlated with differences in physiological processes but to differences in the *structure of the adaptive problem*. The end of the adaptive reaction is in each case the equilibrium of the organism in movement *with reference to this structure of the problem*.

It is clear from our observations above that we can see the true *pattern* of a type of learning only after we have found the *constant* elements in the behavior. To find these

constant elements; which are the structure of a pattern of learning, we would observe many examples of the behavior of each general type whose structure we are seeking. Having observed any general type of behavior repeatedly so as to eliminate the effects of chance and ephemeral factors, we next observe the relation of the constant elements in the *learning reactions* to the constant elements in the *structure of the environmental problem*.

For example in type (1) we would take care that many observations were made and that the medium was kept the same throughout the learning. Several specimens would be tried to eliminate the effects of variable elements in the individuals. Since the learning in the several cases *follows a constant pattern* we conclude that *control factors* are at work. We seek them in the situation. Since in type (1) there are none in the outward situation which can account for the learning we judge that the pattern is correlated with control elements in the *structure of the organism itself*. The nature of the pattern of the learning leads us to believe that it is the product of the *bilateral structure of the organism* and some *physiological process within the organism which assimilates the effects of the various movements*.

Also with respect to type (2) we follow the same method of observation, analysis and conclusion. It is a well-known fact that worms do not always turn to the right nor do they follow normally a straight course. The specimens observed do not at first. We conclude that the constants in this learning are therefore not due to the normal structure of the organisms tested. We note on the contrary that the structure of the learning pattern bears an obvious relation to the *structure of the environment* in which the learning was repeatedly run off. The learned behavior is clearly and definitely correlated with the location spacially of the points of stimulation. We judge then that this type of learning is accounted for by the *loci of the stimuli* with reference to the moving organism, together with the same *physiological process which assimilates the effects of the various movements*.

Let us now look at the two types together. While they represent two distinct types of reaction to two distinct types of problems they both appear to root back in the *same physiological process* which is at the base of learning. In each case there are the *effects of movement, the assimilation or synthesis of effects, and the projection of the final result* in the learned reaction. The differences in the two types do not appear to be accounted for at all by differences in *physiological processes* but solely by differences in the *structure of the adaptive problem*.

These two types are typical. It will be found that the generalizations which we have arrived at are equally applicable to the other types of learning of which animals below man are capable.¹ Let us state these generalizations in brief form:

1. Patterns of learning appear to be correlated not with differences in physiological processes but with *differences in the structure of the problem of adaptation*.

2. We isolate the final pattern of a type of learning in reference to the relation existing between *constants* (structure) *in the learning behavior* to *constants* (structure) *in the adaptive problem*.

3. Patterns are explained from the effects of constants (structure) in the *environmental situation* or constants in the *bodily organization of the animal*. When learning patterns are not accounted for by the structure of the environment they cannot be deemed due to chance but must be due to *control structure in the organism itself*.

It follows, if the above are sound, that learning roots in a fundamental life-fact,—a secret in the depths of the organism. But we must note that this mysterious fact is *present in all learning*—in the very lowest as well as in higher types. It cannot therefore be appealed to to explain progress from type to type. But this *progress* is what is of supreme interest. The fact of learning would be of slight interest if it remained at the lowest levels. The important emphasis rests therefore on those factors which, given the physiological

¹ 'The Structure of Animal Learning,' *PSYCHOL. REV.*, May, 1921.

process at the base of learning, *account for the shaping of the respective types of learning from the lower to the very highest levels.*

We have just pointed out that these types represent constant relations between (1) the shaping of learned behavior and (2) the structure of the organism and the environment—that is, they are shaped in relation to the *life-needs* of the organism and the structure of *life-situations*. The effects upon learning which come from the structure of the organism itself are of course important for certain problems, but those from the structure of the environment appear to be even more important in actually shaping learning patterns. Given the general structure of the organism, the *structure of the environmental problem* determines the pattern of the learning which adapts to it. It is on this account that *the pattern of the behavior of a man in a maze is like that of the rat in the maze*, just as Watson says. It could not be otherwise, for the *environmental problem shapes the end-result*. It does not therefore prove anything with reference to ‘thinking’ as Watson appears to conclude. Proof with reference to the value of ‘thinking’ must come by a quite different route.

Let us see. Since adaptive patterns have reference to the structure that shapes them, if we would know the value of human learning we should seek the *pattern of distinctively human behavior*. If any motor problem whatever must in the nature of the case require from any individual solving it, whether animal or man, the *same pattern*, simply because the *structure of the problem shapes the pattern*, the way to test man for distinctive learning is to observe him in adaptations of which he alone is capable and look for the pattern of the behavior. Or again, if the pattern of learning—the end-result—is fixed from the effects of either (1) the constants in the environment in which the learning is built up (2) or constants in the inherited technic of the organism, the way to get at the human learning is to look for the *pattern of the most characteristically human behavior* and try

to evaluate the pattern. Such behavior is obviously the *use of language as the overt expression of 'thinking.'*

The problem then becomes one of observing language-use, in order to discover if possible in this mode of behavior the relations which may exist between (1) *language habits* and (2) the constants in the situation out of which language-use is built up or constants in the inherited structure of man himself as a separate species. But the 'organismal' method with its eye on the adaptive problem leaves aside, as off the main trail, the 'muscular and glandular' reactions associated with language-use, and keeps in mind the use of language as related to *the function of adaptation*. From this point of view language is referred to the *ear*. *It is a sign-system heard.*¹ As such we observe it as the overt expression of 'thinking' and look for its fundamental *pattern*.

Let us now turn back to the three generalizations which we drew from our observation of the two types of primitive learning, and which we asserted were equally applicable to all learning of sub-human animals, and view our problem of human learning in the setting that this exemplification of the 'organismal' method in animal learning gives us. We shall merely set our problem within the rules as a way of stating the problem. That is, the generalizations are discursive and we shall fit the terms of our problem into them and offer them in this form as a definite statement of the *problem of 'thinking' by the 'organismal' method*.

1. The significance of 'thinking' is not to be sought in some different biologic process peculiar to it but in any *distinctive structure which may be found in language habits*.

2. The pattern (if any) of thinking is to be sought in its overt behavior in language-use, by seeking the relation between constants (a) in *language habits* and constants (b) in the *environmental situations* in which these habits are built up or in *inherited bodily structure* employed in language use.

3. Any patterns in language habits must be due to either (a) constants in the *environmental situations* in which language

¹ 'The Crux of the Psychological Problem,' PSYCHOL. REV., March, 1922.

grew up or (b) constants in the *inherited mechanism* of 'thinking' of which language is the overt expression. Any constant pattern in language-use which is not accounted for by constants in the environmental situations in which language habits have been built up cannot be deemed due to chance but must be due to the effect of *control elements in man's inherited structure*.

Finally our whole problem may be generalized as follows. If upon examination there should be found no pattern in the use of language—the overt expression of 'thinking'—which is not accounted for by (1) the structure of the environmental problems of language and (2) lower forms of learning, then it would appear that there is nothing distinctive in man's inherited learning technic. If however *a definite constant pattern is found in the behavior of language-use which remains unaccounted for by (1) lower types of learning or (2) the constants in the environmental situations in which language habits are formed, then this pattern must be deemed due to man's inherited structure. Moreover this constant pattern would be definitely correlated with this inherited structure and would represent the structural difference between 'thinking' and animal learning (motor learning).*