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Psychological researchers should deal with the concrete stimulus-response principles of learning on which behavior is based, and study behaviors that are representative of real life behaviors. The present research strategy has come from two faulty ideas: first, a concern with underlying, inferred mental processes, rather than with actual tasks or behaviors; and second, a belief that behavior and problem solving can be functionally divided into perception and performance. These ideas lead (1) to the use of tasks that are not representative of the universe of behaviors of everyday living (e.g. the anagram problem, the water jar problem), (2) to a lumping together of behaviors that are different in nature (e.g. classical conditioning of a cat to "no!" and instrumental conditioning of a cat to his name), and (3) to the separation of behaviors that are similar in nature (e.g. learning to read letters and learning to write letters). Only by a shift of emphasis to concrete functional analysis can the artificial perception-performance dichotomy be discarded and a great deal about behavior and acquisition of skills be discovered. (MH)

Categories and Underlying Processes, or
Representative Behavior Samples and S-R Analyses:

Opposing Strategies

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There are several general points I would like to make in this paper which I may summarize at the beginning. First, I would like to suggest that much of our research in psychology has been laboring under the handicap of a poor strategy. Stated simply, the experimental tasks we employ are traditionally considered to reflect an underlying mental process. In contrast to that approach, we need to accept our experimental task as a sample of some universe of behaviors.

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Because of our implicit acceptance of underlying processes as primary in psychological explanation, we have been less concerned with the actual behaviors of humans. Dr. Olson's paper on the present symposium may be taken as an example--although it would be possible to take examples readily from the experimental literature in concept formation and identification, memory, verbal learning, problem solving, reasoning, and so on, as I have already indicated (Staats, 1966; Staats, in press). I would suggest that in Dr. Olson's study of "From Perceiving to Performing the Diagonal" the task of copying the diagonal is not of primary concern because of its own importance--as a matter of fact it is referred to as a "humble" task. The implication is that the task is used because it is felt that any such task will reflect the underlying perceptual and representational processes inferred to be involved. It is the inferred processes that are the focus of concern. It would be assumed that the processes would be the determinants of any copying. Thus, copying nature as in art is said to also demand a perceptual image and some system for representing the event.

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As another example, the same approach is followed by the investigator of problem solving who is not usually concerned with the specific experimental problem used. It is as though all problem solving tasks are the same because they are a function of the same underlying ability or process.

I would suggest, in a contrary strategy, that the experimental task is all important. It must be seen as a sample of the real life behavior in which we are interested. Furthermore, the quality of our experimental skills-- statistical design and the like--will go for naught in the study of human behavior unless we have a universe of actual behaviors defined and an experimental sample that is representative of the universe. In most cases the inferred processes supposed to be involved are only a topic for philosophical polemic. The complex behaviors of man, on the other hand, are events for study and are of the greatest importance in the individual's adjustment. I am not sure what we will have if we conclude that the child's copying ability depends upon the development of his perceptual or representational processes. I am sure, however, that if we find out the principles involved in the learning of copying skills of increasing degrees of complexity and expertness, as well as procedures for producing those skills, we will have knowledge which is basic as well as useful.

I would suggest that most of our experimental literature utilizes tasks that are completely inadequate. We do not know how representative they are of a universe of actual behaviors. What universe of problem solving behaviors does the two-string problem sample? Or the anagram problem? Or the water jar problem? What language behavior is the usual verbal learning task a sample of, or a decision making task, or a concept formation task. Although the names suggest they are samples of important human behaviors, what other

information is provided that the highly artificial, short-term experimental tasks will generalize to the problem solving, reasoning, concept learning, language learning tasks in which we are interested. Actually, we generally do not even know what the universe of behavior is which is considered under one of those terms. You can quickly get an illustration by asking someone who investigates concepts to indicate some examples of concepts in real life. Or, in an even more threatening manner, ask him to indicate how his findings generalize to a specific example of concept learning that is important to human behavior.

I would like to suggest that we drop our idealized conceptions of human behavior and the artificial experimental tasks we construct on the basis of the conceptions. The values we have against dealing with actual human behaviors--because we are afraid we might not be doing basic science--are entirely anachronistic. The study is basic if we employ basic principles and methods. Utilizing better samples of behavior only increases the basic value of a study.

In short, I wish to suggest that we must junk our traditional categorizations of behavior--including those of perceiving contrasted with performance. This must include junking the related conception that there are unitary processes underlying these categories. These two misconceptions lead us away from the task of studying significant human behaviors. I would suggest, rather, that we make specific stimulus-response analyses of real human behaviors. When we do this the traditional categories may be seen to include (1) a variety of responses, (2) which are learned via different learning principles, (3) involving different training circumstances, (4) and which come under the control of various stimuli.

With respect to the specific topic of the symposium I would like to suggest that the categorization scheme which divides behavior into perceiving and performing, implying that there is a universe in each case which has an underlying process or structure, does not aid us in the analysis of human behaviors in which we are interested. When we look to the behaviors themselves we can see that both perceiving and performing consist of complex, variegated skills with overlapping principles between the categories and different principles within the categories.

It may pay to look at examples to exemplify the suggestions. While still a graduate student I began my learning analysis of language using a very available experimental subject, a family cat. In this experimental-naturalistic study I applied classical conditioning principles and procedures to training the animal to respond appropriately to the word no. In the life of every well-bred cat a type of training is customarily conducted that is called toilet training. One time-honored strategy is to catch the animal in the undesirable act in the house and to apply a mildly aversive stimulus--like a smart rap with a rolled-up piece of newspaper. This is then followed by ejection from the premises. Since this type of spanking was necessary in producing a well-bred cat, with the opportunity for many training trials, it was available to me as the unconditioned stimulus for testing the experimental hypothesis. The only thing still necessary was to present the word which was to become the conditioned stimulus each time Max was "stimulated" with the paper.

According to the straightforward paradigm the word no should as a $\frac{C}{S}$ come to elicit the responses elicited by the aversive $\frac{UC}{S}$ --the physiological responses (like heart rate, and so on) as well as the escape responses. That is what occurred. After a sufficient number of conditioning trials Max very

reliably responded appropriately to the word. If she began to claw the sofa, for example, it was only necessary to say the word no and she would stop what she was doing and scamper a few feet away from the spot. If she jumped on the kitchen table it was only necessary to say no and she would jump off. This was very efficacious to both Max and to me--for I did not have to leave my chair to effectively control Max's behavior. (Of course, intermittent re-conditioning training was necessary from time to time.)

At any rate, on the basis of the animal's response it could be said that when I said no that Max "knew" the meaning of the word, that she understood what I meant, that she comprehended, or that she had the correct perception--or what have you.

To continue, however, Max was fortunately born into a very enriched home and she also learned other aspects of a language repertoire, one of which is relevant to the present discussion. It is a great asset to an animal owner, and adjustive to the animal, when the animal responds appropriately to its name by approaching the owner. This repertoiral skill was acquired by Max on the basis of instrumental conditioning principles. My training program was as follows: The animal's name was to serve as a discriminative stimulus which was to come to control an approach response. The reinforcing stimulus was always a small piece of food. First, I kneeled close to Max and said her name as I held the food in my hand. The food served first as a stimulus which controlled her approaching. But the other stimuli present gained strength for controlling the response. Then gradually, I removed the various other controlling stimuli, the sight of the food, the sight of me kneeling, and so on. First, I hid the food, then I moved greater distances away from Max on the training trials, then I placed myself partly behind a door, and then

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completely behind it. After that the training was a kind of "hide and seek" where Max had to find me when I called her name. By this time, of course, she behaved with considerable alacrity when I called. Soon no matter where I was she would come to me when I said Max, much to our mutual satisfaction and the amusement (and amazement) of family friends.

Again it could be said that Max "perceived" the meaning of the word correctly, that she understood, comprehended, and so on. I have described the process of Max's language enrichment to illustrate the misleading character of a classificatory system that includes both types of behavior within a single category. In the present case the two types of language were acquired on the basis of different conditioning principles--classical and instrumental conditioning. The customary usage of the terms perception, or comprehension, would imply that there was a unitary process underlying the two behaviors. Moreover, the example indicates that these two types of language are learned--not developed through the organisms's maturation, a conception which is many times a close companion of the traditional categorization schemes. It may be suggested that we are in much better position to understand the nature of such language behaviors and other behaviors if we discard the classification schema and instead analyze the specifics involved--the effective stimuli, the responses, the training circumstances and the learning principles that are involved. The behaviors referred to under the category names are inevitably complex in these various respects. It would be a mistake to attempt to study some inferred perceptual process in Max rather than the specific skills which she could acquire.

In the above example, two types of "perceptions" in language were described. I could describe additional types. The same is true in performance. Language

production can occur vocally in which complex responses and controlling stimuli are quite different from those involved in writing. It serves no purpose to lump together these two types of performance any more than the various types of language "perception," since specific study is necessary in any case.

With respect to the acquisition of the various "perception" and "performance" skills in language, there should be no enigma concerning the fact that one skill appears before the other. This can occur for various reasons. Some skills are less complex than others and require fewer training trials and a less complex training program. Secondly, some training programs are not so susceptible to direct manipulation, but require indirect training and thus more subtle training knowledge if the training is to be accelerated. Thus, for example, although speech is an instrumental behavior and is acquired according to the principles of instrumental conditioning, the first speech responses are not learned through directly being reinforced. Parents do not conduct a long-term training program in which they first reinforce infant sounds and then gradually reinforce only better and better approximations to some word they wish him to say. The original acquisition of speech is probably learned because the speech of the parents become positive conditioned reinforcers--on the basis of classical conditioning. When the speech of the parents becomes reinforcing then vocal responses of the child that are like theirs will also be reinforced--and thus be learned. (Again, it is important to note that both major learning principles are involved in the acquisition of this type of "performance.")

In other cases one skill appears prior to another skill because it is traditional to begin training on one at an earlier time than the other. Reading and writing letters occurs prior to reading and writing numbers,

ordinarily, because it is traditional to train the child to the former first.

There are also cases where one skill appears prior to another because the second skill depends upon the prior acquisition of the first. So-called comprehension in children--that is, as one example, appropriately responding to instructions (verbal stimuli)--will precede the acquisition of reading. That is because reading training depends upon the prior acquisition of such comprehension.

I would like now to present an example of the possibility of experimentally and theoretically studying representative samples of behavior. These examples come from a long-term project I have been conducting on cognitive learning of children--but I have selected these as a relevant to the perception-performance classification. In this case the learning principles are the same in both the perception and performance behaviors--cutting across the separation imposed by the classification schema. (That is, in addition to the other misleads described, the classification approach also mistakenly separates learning processes that are in principle the same.) The first example is that of a child learning to read letters (and also to count). The child is 3 years old; he is my own little boy and is just beginning to learn to read the letters. The skill is acquired according to instrumental conditioning principles and we can see the process in this film. I would like to point out that when you actually study the acquisition of a behavior you find out that it is not simple, fitting into one category. The acquisition of letter "perceptions" is actually based upon the acquisition of other complex repertoires. For example, in the film you will see the child scrutinize the stimuli as I tell him to, and you will see how he attends and is under the control of the instructions given to him. When I tell him to imitate a sound he does so. The control is far from complete, in comparison to what

it is for a child who has been more completely trained to such repertoires. Thus, other 4-year-old children who were in my project for 8 months responded with great alacrity and precision to the instructions and the stimuli that were to control their attention. The important point is that these skills are basic to the acquisition of the alphabet repertoire, in fact to most cognitive learning. With respect to perception and performance, at the point of training in the movie Peter could "perceive" the letters a, b, c, d, e, and f, and was learning h. He could copy none of them--and thus showed a "performance" lag. But this lag was arbitrary. I could have as easily trained Peter to write letters first or I could have removed a lag in either direction by training him in both skills simultaneously.

At any rate "perception" of letters--the learning to make a particular vocal response when looking at a particular letter--is a complex and difficult learning task involving many learning trials. When this cognitive learning is studied experimentally--that is, when the actual behavior is produced--a great deal of information emerges. The variables critical to gaining the skills may be seen--such as the quality of attentional responses. The process of learning may be seen as well. Thus, for example, I have data that show that cognitive training produces a distinct acceleration in cognitive learning, which is a learning how to learn effect. For example, children appear to require about 4 times as many conditioning trials to learn the first 4 letters as they do the fourth 4 letters. And a 3-year-old child while requiring a greater number of learning trials per letter at first, was learning at the same rate as two 5-year-olds after 12 hours of training.

Now I would like to show you the results of a 4-year-old child acquiring a letter writing repertoire, a so-called performance skill. The same procedures and apparatus were used as were shown in the film--again the principle

of instrumental conditioning was involved. Although we do not have time to analyze the letter-writing learning task, again I would suggest that it is a complex one made of several skills. For example, the child has to acquire the complex motor skill of tracing in which a visual stimulus controls the writing response. Then the motor skill of copying must be acquired. By doing this with letters, the sequence of motor responses involved in writing a letter must be acquired. This enables the child to make a free writing response, without a standard stimulus, under the auditory control of the trainer saying the letter. Finally, the child's own saying of the letters must control the response. To write the entire alphabet the child must also acquire the vocal sequence of saying the letters--at first under the control of what he has already written and later with no prompting.

The slides show the progress of a culturally-deprived child with an IQ of 88 in the process of learning letter writing "performance." Slide 1 shows his first writing response when asked to write his name or any letter. Slide 2 shows his first tracing of a (response 186). Slide 3 is his first copying response using a large a as the stimulus (response 206). Slide 4 is the first copying of a middle size a (response 216). Slide 5 is the first copying of a primary type size a (response 370). Slide 6 is the first free writing response of a (response 375). Slide 7 is the first copying of the small sized a and b (response 407). Slide 8 is the first free writing of the a and b (response 419). Slides 9 and 10 show the same results for a, b, c, and d and involve response 527 and response 533. Slides 11 and 12 do the same for a through f and involve responses 595 and 599. Slides 13 and 14 are for a through h and are for responses 613 and 640. Slides 15 and 16 are for a through n and involve responses 788 and 792. Slide 17 is response 892.

It is interesting to note that children with IQ's separated by as much as 42 points appeared to learn this cognitive repertoire in a very similar manner under the learning conditions employed. One of the many other findings was that the cognitive learning acceleration also occurred in this task. That is, with 10 culturally-deprived 4-year-old children it required a mean of 287.8 training trials to learn the first 4 letters learned and only a mean of 76.4 training trials to learn the last 4 letters each child learned in the lower-case alphabet. These and other findings suggest that when we know more about the learning process for actual human behaviors we will be able to provide learning conditions that will be standardly suitable for all children.

In any event, when this type of research is conducted it appears to contribute toward a verification of basic learning principles, it advances a learning theory of cognitive development--both aspects of the basic science--and it also produces principles and procedures with which to begin solving some of the problems of human behavior. I think we need to more widely exploit the strategy which has the potential for producing these types of products.

On the other hand, the perception-performance classification has little value. Thus, we classify reading the letters into perception and, copying and writing the letters into performance. The irrelevant nature of this classification can easily be seen. That is, in both cases the same principle is involved, that of instrumental discrimination learning. In one case the stimulus is a letter, the response is a vocal motor response. In the case of writing, the stimuli are visual and auditory letter stimuli and the response is a manual motor response. There is no reason to classify them differently. Moreover, the fact that one set of skills is acquired before the other is arbitrary, as has been suggested. More importantly, however, is the fact that to be concerned with the categories of perception and performance, with the

accompanying interest in the supposed unitary processes underlying the categories, only misdirects our efforts. This strategy leads us to arguments about the characteristics of the processes and to experiments to get at the nature of these characteristics. In this involvement, the nature of the behaviors themselves becomes very secondary, as do the principles by which the behaviors are acquired. This is unreasonable in view of the importance of the behaviors.

In conclusion, I would like to say again that our traditional classificatory approach (with its corollaries) gets us to separate behaviors that are actually alike in principle, to lump together behaviors that are unlike, to be less concerned with significant human behaviors, and also leads us to spend more time in dealing with trivial experimental tasks in search of nonexistent underlying psychological process.

Rather, we should take samples of actual human behaviors, analyze them in detail, and begin investigating them in long-term studies. When we do so the paradoxes of our categorization schemes disappear, but we begin to find out a lot about behavior.

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