Can Operant Research With Animals Rescue the Science of Human Behavior?

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We find it amusing that some behavior analysts have argued against basic operant research with humans. Essentially, research has shown that humans are different from rats and pigeons and this difference apparently extends to their behavior. One real problem is that humans live most of their lives outside of the laboratory and "we don't know what they have been up to." Additionally, people may not be sensitive to experimental contingencies because many of them talk and read. In this case, an extensive "verbal history" is said to interfere with the operating contingencies. All of these difficulties have convinced a few behavior analysts that investigating human behavior in the operant chamber is a waste of time.

Of course, these skeptical researchers recognize that it is important to have a science of human behavior. This science depends on the discovery of fundamental principles based on the behavior of relatively simple organisms. Basic principles are then extended to human behavior through applications and interpretations. In this view, applied research with bothersome people shows that behavioral laws operate at the human level. For instance, many studies have found that the law of effect works with lots of different folks who have lots of different problems. Behavioral interpretations also extend the science of behavior to humans. For example, gamblers continue to bet on variable-ratio (VR) schedules of reinforcement, buses arrive on variable-interval (VI) schedules, piece work is really a fixed-ratio (FR) schedule, and the US Congress passes bills on a fixed-interval (FI) schedule. Based on interpretations and applications, many behavior analysts conclude that reinforcement works in everyday life. Unfortunately, it

turns out that some behaviorists and many non-behaviorists remain skeptical.

In their paper, Baron, Perone, and Galizio argue that the experimental analysis of human behavior is an integral part of the science of behavior. Further, they suggest that interpretations of human conduct and evidence from applied studies are not enough. Although direct analysis of human behavior is difficult it is a necessary component of our discipline. The authors state that:

The unavoidable question is this: If research fails to demonstrate the role of operant principles in human behavior under the relatively simple, highly controlled circumstances of the laboratory, then what is the basis for believing that the principles operate in the complex and uncontrolled settings of everyday life?

In order to conduct this analysis, a steady-state research strategy is recommended where people are exposed to experimental contingencies until they "beg for mercy" and are let out. In other words, the operating contingencies remain in effect until stable performance is obtained. This is the typical procedure used in operant experiments with animals but it is atypical in controlled laboratory investigations of human behavior. Generally, we agree with the authors' position and the remainder of this comment will explore some of the issues raised by their paper.

THE SIMPLE-TO-COMPLEX RESEARCH STRATEGY

Historically, behaviorists have advocated a simple-to-complex scientific strategy. The idea is to analyze the behavior of simple organisms in simple environments. Presumably, as the stack of cumulative records grows larger and larger, the underlying order will emerge from the data. Once this order is discovered

more complex organisms and environmental contingencies should be tackled. Today, cumulative records can be measured in megatons but a viable science of human behavior still eludes us.

The authors of the target article note that some behavior analysts still believe that more research with animals will eventually lead to a scientific understanding of human behavior. We wonder how much more is necessary—is there a light at the end of the tunnel? After nearly 30 years of research on choice and preference with birds (and a handful of rats), it is clear that pigeons match, frequently undermatch, occasionally overmatch, and perhaps maximize. Apparently, order has not yet emerged for the pigeon and it is too soon to extrapolate to humans. With the simple-to-complex strategy as the only basis of knowledge we may have to wait until the next ice-age for a science of human behavior.

LABORATORY PROCEDURES AND STEADY-STATE TACTICS: THE DIFFERENCES REMAIN

There are those who are already tired of waiting for the answers and we are among them. We have decided that a two-pronged approach is a better tactic. This strategy involves simultaneous research at the animal and human levels. For example, a recent study by one of the commenters (Belke, Pierce, & Powell, 1989) examined the performance of both humans and pigeons on concurrent-chains schedules of reinforcement. The same steady-state criteria were applied to the performances of birds and humans under nominally identical schedules of reinforcement. Performance was considered stable when three criteria were met. First, a minimum of 10 sessions had to be completed. Second, relative behavior had to vary 0.10 or less for five consecutive sessions with no evidence of trend. Third, response rates during the initial components had to stabilize within the subject's range of variability for five consecutive sessions. With these criteria, the birds stabilized between 17 and 33 sessions and humans between 11 and 25 exposures to the contingencies. This finding supports

the target article as human performance in this situation took many hours to stabilize. In most cases, performance on the first few days had little resemblance to stable values (for birds and humans).

Unfortunately, steady-state procedures did not produce similar results in pigeons and people. At steady state, the birds' performance reflected the effects of conditioned reinforcement and delay reduction. In contrast, the steady-state performance of humans was regulated by overall rate of reinforcement (i.e., maximization). Both humans and birds developed steady-state responding but the controlling variables were different. One implication is that it is not possible to predict human performance on concurrent-chains schedules based on studies with pigeons. Apparently, each organism responds to different aspects of the contingencies.

In order to assure ourselves, and the reviewers, that procedural differences did not account for these results, a number of techniques were devised and implemented. A human operant chamber was constructed that was similar to the one used with pigeons. This apparatus is shown in Figure 1. Two pigeon keys were separated by several meters and a token dispenser was in the center of the apparatus. The dispenser was constructed from a vending-machine token dispenser and a modified pigeon hopper. When reinforcement occurred, a token fell onto a plate attached to the hopper. The token remained available for 4 s after which the hopper retracted and the token dropped out of reach into a collection box. This procedure was designed to equalize availability of reinforcement for pigeons and humans.

Pigeons and humans were hopper-trained until birds reliably ate from the feeder and people grabbed the token. Humans were told "there are no instructions. Do whatever you want. . . . We will begin in a moment" (Belke et al., 1989, p. 101). At this point humans and birds were shaped to hit the keys. In order to prevent embarrassment, humans were not required to peck the keys and all of them preferred to press with their fingers. In both species, the sound of the magazine

Figure 1. A photograph of an operant chamber for the experimental analysis of human behavior. The two response-keys were located at opposite ends of a free-standing structure and a token dispenser was situated in the middle. Tokens dropped onto a plate that was mounted to a modified pigeon-hopper. At the moment of reinforcement, a token dropped onto the plate and remained available for 4 seconds. If a subject did not retrieve the token, the hopper retracted and the token fell into a receptical. Concurrent-chains schedules of reinforcement were programmed on the keys (see Belke et al., 1989, for more details).

was used to shape the target response. Successive approximation was not required for a few pigeons and people—they autoshaped when the key lights were paired with reinforcement.

These procedures (and several others) were used to expose humans to conditions similar to those found in operant experiments with pigeons. However, as we have stated, the performance of birds and humans on concurrent-chains schedules was different at steady state. In a recent study (Kwan, Pierce, & Epling, in progress), we found that even when people are food deprived and are working for “bits” of their lunch they still don’t act like birds. This experiment was conducted because several reviewers suggested that the initial finding (i.e., maximization by humans and delay reduction by birds) may have occurred because birds ate their reinforcers and people

didn’t. The experiment involving humans and food reinforcement suggests that “consumability of reinforcement” is not why humans maximize.

In these experiments, both humans and pigeons appear to behave in accord with the contingencies of reinforcement. The difficulty is that each species appears to respond to different aspects of the contingencies. Pigeons are regulated by events that are correlated with relative reduction in time to primary reinforcement. Humans tend to respond to overall rate of primary reinforcement and are less controlled by conditioned reinforcement in the situation.

AN ALTERNATIVE VIEW OF HUMAN OPERANT RESEARCH

The performance difference of humans and pigeons may be due to remaining

procedural discrepancies, environmental history, species history, or some interaction of these conditions. These same conditions, however, pertain to both animal and human studies (see the target article on pre-experimental and experimental histories). Nonetheless, there is often a presupposition that the animal data are more representative of the actual effects of reinforcement while the human results are suspect. Steady-state methods and attention to procedural details may produce as much order at the human level as these methods do in animals—yet human performance may still depart from the behavior of rats and pigeons.

When this occurs, there is no reason to favor the results based on animals. There is, however, a reason to favor human data if our intention is to develop a science of human behavior. In the experiments we have previously outlined, humans seem to behave optimally while pigeons fail to maximize reinforcement. It may be that the birds are in some sense “tricked” by local features of the situation while humans respond appropriately, in terms of survival. Given this perspective, attention should be directed at those aspects of the pigeon experiments that produce sub-optimal behavior. In this case, the assumption is that the human results are accurate and the animal findings are misleading.

Our point is that the simple-to-complex strategy for building a science of human behavior may not always be the best approach. Simultaneous research with humans and other animals should proceed at the same time. Controlled experiments with humans and operant research with animals should be viewed as complimentary areas of investigation—each informing and being informed by the other. In this cooperative process, investigators of human behavior should strive for greater control and replicability of their findings. Animal researchers, on the other hand, should not be predisposed to reject methodologically-sound results with humans that are discrepant with the performance of rats and pigeons. At the very least, we should consider the possibility that nominally identical reinforcement contingencies may result in different operating contingencies for humans, rats, and pigeons.

REFERENCES

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