Common Versus Distinctive Species: On the Logic of Behavioral Comparison

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Harrison's thoughtful essay and critical comments (this issue) center on investigators who study animal behavior as nothing more than an expedient substitute for human behavior. He asks, why—other than for sheer convenience, for additional experimental control, or for ethical reasons—would one ever opt to study another “representative” species when human beings are so available and eager to participate in helping scientists to understand their nature?

Harrison's question is really rhetorical. I believe that the basic issues in which he is genuinely interested might better be illuminated if we were instead to contrast the notion of a “common” species with that of a “distinctive” species.

Common Versus Distinctive Species

A “common” species gains prominent empirical attention because of its general similarity to a wide range of other species; its selection is based on its apparent unremarkableness in respect to a set of investigative issues. To take a most familiar example, the pigeon is often studied in behavioral experiments because it appears to respond to contingencies of reinforcement in much the same way as do other kinds of animals that have been studied in analogous situations. The selection of this species for behavioral study does not in any way mean that the pigeon is not a highly specialized beast—it is. Its pumplike drinking is rare among avians. Its homing is remarkable among vertebrates. And aspects of its vision may be exceptional among all other animals because of the bifoveal organization of its retina.

A “distinctive” species, on the other hand, is one that can be effectively used

as an experimental substitute for another because of the existence of some crucial or peculiar shared similarity. If, for example, a biochemist were interested in an enzyme present in the intestine of human beings and if that enzyme were to be found in the intestines of only a very few other kinds of animals, then the focused study of those other creatures can be justified by their distinctiveness in respect to their digestive systems. It is primarily for this exceptional reason that the experimenter will pick one of these particular species for study, recognizing that there will still be some element of uncertainty in generalizing the obtained results to humans. For many other reasons, however, it might be unwise for investigators to focus much experimental attention on this particular species of animal because of its many other notable dissimilarities to human beings.

Of course, the more we learn about the behavior of any being the better informed we will be as to whether, for a given scientific issue, it could peculiarly substitute for another species or whether it is generally similar to a wide range of other animals about which we have systematic evidence. Yet, this is precisely where we might quarrel over the merits of particular animals as proper selections for experimental study. Do those of us who study pigeons, rats, or monkeys do so because we believe that they are exceptionally good substitutes for human beings? Or do we instead believe that their behavior might be sufficiently similar to ours and to that of a great many other species as well to be used for helping us to elucidate fundamental laws of behavior?

My guess is that most researchers of pigeons, rats, or monkeys would probably choose the second option. Indeed, Harrison himself might also do so in regard to his innovative studies of auditory dis-

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crimination in rats and monkeys. Did he choose to study these particular animals because he believed that they were uniquely similar to human beings? Probably not. The more likely reason is that, by investigating how discriminative stimulus location, operant location, and reinforcement contingency combine to yield discriminative responding, the behavior of these two different species might shed light on some important general laws of discrimination learning.

Harrison is eminently capable of choosing between the above options, as I am sure he will in his reply to my remarks. I will make my own choice here. For the past 25 years, I have studied the behavior of pigeons in dozens of autoshaping, short-term memory, and concept learning experiments. My implementation of these experiments has doubtlessly exploited the pigeon's natural sensory and motor predispositions. Such exploitation notwithstanding, I would like to believe that my research has helped to contribute to our general understanding of behavior. Organisms—not just pigeons—learn to approach and to contact localized signals of positive reinforcement, perhaps helping us to comprehend Harrison's own studies of auditory discrimination learning (Wasserman, 1981). Organisms—not just pigeons—remember prior stimuli, responses, and reinforcers, often with amazing accuracy and for sequences of multiple events, not just solitary stimuli (Wasserman, 1986). And, organisms—not just pigeons—learn to categorize discriminatively different stimuli into classes of functionally equivalent entities (Wasserman & Astley, 1994). In all of these cases and many others, adaptive patterns of behavior have been disclosed and elucidated in laboratory experiments that, despite the seeming “unnaturalness” of the situations, help to inform us about the natural contingencies of reinforcement that may have shaped these remarkable patterns of behavior (Wasserman, 1993).

From the General to the Specific

When we consider the structure and behavior of different species of animals, we can either be impressed by the similarities or by the differences among them.

Pigeons fly through the air, rats run along the ground, and monkeys swing in the trees. The skeletal, muscular, and neural systems that permit these marvelously adapted movements must surely differ in important ways among these different species. Yet, decidedly different action systems may nevertheless accomplish similar ends. For example, the attraction of all of these different species of animals to localized signals of positive reinforcement—whether the animals fly, run, or swing to those signals—is probably so basic a behavioral predisposition that nature has organized these different action patterns along a single common plan. Mobile animals are probably all well served by this autoshaping or sign-tracking tendency, despite the distinguishably different behaviors that the various species exhibit by dint of the different habitats and niches that they have occupied in nature for countless generations.

My point here is that as we move from closely related to more distantly related species, we are likely to encounter increasing numbers of behavioral and anatomical differences. So, when quite distantly related species exhibit very similar behavior or structure, we are probably witnessing the economy of nature in operation. The proverbial “wheel” is unlikely to be reinvented in order to serve each of the survival demands of each species; it is more likely that some ubiquitous environmental contingency is working to preserve an extant structural or behavioral adaptation throughout a broad wealth of species.

As we move from distantly related to closely related species, we are likely to encounter increasing numbers of behavioral and anatomical similarities. So, when quite closely related species exhibit very different behavior or structure, we are probably seeing relatively recently evolved adaptations to highly particularized properties of the animals' respective habitats and niches. Those peculiar adaptations are no less important than the general ones; each structural or behavioral adaptation demands explication in terms of both phylogenetic and ontogenetic influences.

These evolutionary considerations

suggest that there is really no one correct way to conduct comparative behavioral research. Choosing to study distantly related species has been called capricious comparison by detractors of this approach; yet, such study may tell us a great deal about important behavioral universals. Choosing to study closely related species may, on the other hand, tell us much about relatively recently evolved behavior; yet, such study may very well fail to disclose notable differences if one happens to be studying aspects of behavior that are quite general across many different habitats and niches.

We will surely learn important truths about the causes and functions of behavior no matter what species of animals we choose to study. We do need to exercise due caution and wisdom, however, in interpreting the results of those studies. Here is where some of the claims that were quoted by Harrison about animals as fitting "representatives" of human beings take on special meaning.

REFERENCES

- Harrison, J. M. (1994). The representative animal. *The Behavior Analyst*, 17, 207-219.
- Wasserman, E. A. (1981). Response evocation in autoshaping: Contributions of cognitive and comparative-evolutionary analyses to an understanding of directed action. In C. M. Locurto, H. S. Terrace, & J. Gibbon (Eds.), *Autoshaping and conditioning theory* (pp. 21-54). New York: Academic Press.
- Wasserman, E. A. (1986). Prospection and retrospection as processes of animal short-term memory. In D. F. Kendrick, M. Rilling, & M. R. Denny (Eds.), *Animal memory* (pp. 53-75). Hillsdale, NJ: Erlbaum.
- Wasserman, E. A. (1993). Comparative cognition: Beginning the second century of the study of animal intelligence. *Psychological Bulletin*, 113, 211-228.
- Wasserman, E. A., & Astley, S. L. (1994). A behavioral analysis of concepts: Its application to pigeons and children. In D. L. Medin (Ed.), *The psychology of learning and motivation* (pp. 73-132). San Diego: Academic Press.