The Creative Porpoise Revisited

Per Holth
Oslo and Akershus University College

The sources of novel behavior and behavioral variability is an important issue in behavior analysis for theoretical as well as for practical reasons. "The Creative Porpoise" study by Pryor, Haag, and O`Reilly from 1969 has been repeatedly referred to in the behavior-analytic literature as a demonstration of how "novelty" can be directly reinforced by making reinforcement contingent upon it. However, the purpose of the present paper is to show that a direct scrutiny of the original 1969 report leaves such a conclusion questionable.

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Identification of the sources of behavioral variability is important for theoretical as well as for practical reasons. Theoretically, the question of sources of novel behavior is important because the role of selection by consequences as an explanatory principle depends on continued variability for differential selection. In the absence of continued genetic variability, differential survival could not explain evolution beyond the original variation. Similarly, in the absence of continued behavioral variability, differential behavioral consequences could not explain behavior change beyond the initial behavioral variation.

For practical purposes, the question of the sources of novel performances is of basic importance simply because no number of different training situations will suffice in order to train directly the infinite number of topographically different responses that a trainee must eventually emit with respect to continuously changing environmental stimulation. Generally, teaching aims to establish more than what is directly taught. Thus, a training program with developmentally disabled persons is successful only if, at some point, the acquired skills "emerge" in novel situations. In fact, the lack of such generality of directly taught skills is among the more serious concerns in the work with developmentally disabled persons (cf. Stokes & Baer, 1977; Stokes & Osnes, 1989), and behavior modification texts typically include sections on "making generalization effective" (e.g., Grant & Evans, 1994), or "programming generalization" (e.g., Martin & Pear, 2007). However, much of what is considered under these headings goes significantly beyond what is covered by the technical concepts of stimulus and response generalization (c.f., Johnston, 1979).

Beyond just response and stimulus generalization, several concepts have been introduced to cover classes that encompass novel behavior. Such concepts include resurgence (e.g., Epstein, 1983), adduction (e.g., Andronis, Layng, & Goldiamond, 1997), continuous repertoires (e.g., Wildemann & Holland, 1972), higher-order classes (e.g., Catania, 1995), and overarching operants (e.g., Hayes, Barnes-Holmes, et al., 2001). Of particular interest here is that some authors have even proposed that novelty or variability can be directly reinforced and become operant classes of their own. I have two main concerns with these concepts of "operant novelty or variability": The first is that, after a scrutiny of the basic empirical studies in this area, I do not think that they demonstrate what they have been claimed to demonstrate, and the second is a problem with their implications of open-ended response classes.

Training for Novel Behavior

The "Creative Porpoise study" by Pryor et al. (1969) has been repeatedly cited as a demonstration of how "novelty" can be directly reinforced by making reinforcement contingent upon responses that have not been observed to occur previously (e.g., Bateson, 1972; Bernstein, 2003; Catania, 1998; Hayes et al., 2001; Marr, 2003). However, as the original report elaborates, that study included a lot more than just the "reinforcement of novel performances":

A. Occasionally, previously reinforced responses were again reinforced – "in order to strengthen the response, to increase the general level of responding, or to film a given behavior." (p. 654)

B. A number of specific new responses were shaped "in order to interrupt Hou's unvarying repetition of a limited repertoire." (p. 656)

C. Some responses (e.g., the "corkscrew") were reinforced "by means of an increased variable ratio."(p. 656)

D. "The experimenters rotated their positions, and reinforced any descent by the animal toward the bottom of the tank, in a further effort not only to expand Hou's repertoire but also to interrupt the persistent circling behavior." (p. 656)

E. When the trainer "began reinforcing" a novel response like the "flip," this response ". . . occurred 44 times, intermingled with some of the previously reinforced responses and with three other responses that had not been seen before" (p. 657)

F. Sometimes, ". . . no reinforcement occurred in a period of several minutes."

G. A response that occurred for the first time in one of the last sessions (31) "was reinforced and immediately repeated 14 times without intervening responses of other types."

H. In the next to final session another novel response was reinforced and repeated 10 times without interruptions.

I." The final session (33) started with 19 min during which no new responses were observed and reinforced -- although a high number of previously reinforced responses occurred throughout most of the period." Finally, "Hou stood on its tail and clapped its jaws, spitting water towards the trainer; this time the action was reinforced, and was repeated five times." (p. 659)

Thus, it is clear from the report that (1) not only novel behavior was reinforced, (2) novel behavior was far from the only, or even most typical, outcome, and (3) when novel behavior occurred, it typically emerged during extinction. Even during the final session, the trainers did not observe any novel responses during the first 19 min, and when a novel response finally occurred and was reinforced, it was repeated five times. All in all, (1) a high number of different performances were directly shaped, possibly providing a substantial pool of behavioral "atoms," (2) periods of intermittent reinforcement produced a certain level of resistance to extinction, (3) extinction provided conditions under which previously extinguished behavior (or behavioral atoms) typically reoccurs (resurgence), and (4) stimulating conditions were changed by having experimenters rotating – possibly providing a prerequisite for adduction.

Open-ended Behavioral Classes

Conceptually, the idea of an operant class that consists of, or includes, all sorts of novel instances is problematic because such a class would have no defining criteria to permit the counting of instances, or even to specify where an instance of novel behavior starts or ends. As Skinner (1969) pointed out, "the topography of an operant need not be completely fixed, but some defining property must be available to identify instances. An emphasis upon the occurrence of a repeatable unit distinguishes an experimental analysis of behavior from historical or anecdotal accounts."[1] (p. 175)

In the operant-class terminology suggested by Catania (1973), a descriptive class

1. Incidentally, he same problem of non-identifiable instances seems to characterize *Relational Frame Theory* when suggesting that "the concept of a response class with an infinite range of topographies is a defining property of operant behavior, and has been from the very beginning" (Hayes, Barnes-Holmes, & Roche, 2001, p. 147).

specifies the criteria upon which reinforcement is contingent, a functional class specifies the class of responses generated by that contingency, and the concept of the operant is appropriate to the extent that there is a correspondence between the descriptive and the functional classes. Although novelty does not specify any topographical properties or physical dimensions upon which reinforcement can be made contingent, a descriptive class is specified as "behavior not seen before." It is not clear, however, how one is supposed to identify instances that are generated by the reinforcement procedure, including where an instance starts or ends.

In Sum

A direct scrutiny of the original Creative Porpoise study by Pryor, Haag, and O'Reilly shows that the study did not demonstrate the direct reinforcement of creativity or novel behavior. The study involved too many independent variables. Moreover, the idea of an operant class of novel behavior is conceptually problematic because criteria for determining class membership seem insufficient.

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