Skinner's Behaviorism and the Nature-Nurture Dichotomy

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Nature and nurture are commonly regarded as fundamental determinants of behavior, with nature referring to heredity or evolution, and nurture to the environment or learning. Although nature and nurture are cast in terms of a dichotomy, we typically acknowledge both and recognize "that neither operates to the exclusion of the other" (Catania, 1998, p. 371). That is, we properly conceptualize the nature-nurture dichotomy as a continuum (e.g., Catania, 1998, p. 371; Fantino & Logan, 1979, pp. 475-476).

Critics of behavior analysis, however, have characterized it as falling exclusively to the nurture or environmental side of the dichotomy (e.g., Gould & Marler, 1987a, 1987b). Such characterizations are fundamentally flawed (Skinner, 1974, pp. 4, 243-244; Todd, 1987; Todd & Morris, 1992), for behavior analysis actually falls "on the middle ground" (Skinner, 1977, p. 1007), acknowledging both nature and nurture as determinants of behavior. We seek to clarify Skinner's position on nature and nurture.

In exploring Skinner on the nature-nurture dichotomy, we first discuss his ultimate explanations for innate and acquired behavior: phylogenic and ontogenic contingencies. Second, we explore the ways in which he distinguished between these two sets of contingencies, that is, in terms of temporal relations, consequences, and what is selected. Third, we consider the concepts he invoked when explaining the control of innate and acquired behavior by phylogenic and ontogenic contingencies: temporal gaps, changed organisms, and causal chains. Throughout, we use the term "innate" broadly, referring to everything that, from Skinner's perspective, is considered inborn, for instance, respondent and operant conditionability, unconditioned eliciting stimuli and elicited responses, releasers and released behavior, and primary positive and negative reinforcers (see, e.g., Michael, 1985, pp. 101-102; Skinner, 1969, pp. 201-202).

Explaining Innate and Acquired Behavior

As already pointed out, Skinner acknowledged both innate and acquired behavior (e.g., Skinner, 1966, 1975a, 1981, 1984; see Michael, 1985). What he rejected were their explanations cast in terms of a hypothetical "inner causal agent" (Skinner, 1953, p. 116; see Skinner, 1953, pp. 27-31), in particular, instincts and habits. About these, Skinner (1966) commented:

> Until we have identified the variables of which an event is a function, we tend to invent causes. Learned behavior was once commonly attributed to "habit,".... "Instinct," as a hypothetical cause of phylogenic [i.e., innate] behavior, has had a longer life. We no longer say that our rat possesses a marble-dropping habit, but we are still likely to say that our spider has a web-spinning instinct. (p. 1208)

Instead of instincts and habits, Skinner accounted for innate and acquired behavior by appealing to contingencies of selection (see Skinner, 1981). In his words:

> I do not believe in a strict dichotomy between "ontogenic behavior" and "phylogenic behavior," if by behavior one means a stored habit or an instinct, but I think it is quite easy to distinguish between ontogenic phylogenic contingencies of selection, and that was one of the points of "Phylogeny" [i.e., "The Phylogeny and Ontogeny of Behavior," 1966]. (Skinner, in Catania & Harnad, 1988, p. 420)

Phylogenic contingencies or "contingencies of survival" refer to natural selection and explain how organismic characteristics such as innate behavior are selected, which are then transmitted to subsequent members of a species (Skinner, 1966, 1974). Similarly, ontogenic contingencies or "contingencies of reinforcement" refer to selection in the behavioral domain and explain how acquired behavior becomes part of a repertoire during an organism's individual behavioral history (Skinner, 1966, 1974). Phylogenic and ontogenic contingencies, then, not instincts and habits, are the variables of which innate and acquired behavior are respectively and ultimately a function.

Phylogenic and Ontogenic Contingencies

With innate and acquired behavior accounted for in terms of phylogenic and ontogenic contingencies, we turn to the defining characteristics of these contingencies to clarify further Skinner's version of the nature-nurture dichotomy. Skinner distinguished between these contingencies in at least three ways: (a) their temporal relation to behavior, (b) their consequences, and (c) what they select.

Temporal Relations

First, according to Skinner (1966), "the contingencies responsible for unlearned behavior acted a very long time ago" in the evolutionary history of a species (p. 1208), whereas ontogenic contingencies operate during the lifespan of individual organisms and are responsible for acquired behavior. Thus, whereas phylogenic contingencies are relatively remote from future instantiations of the selected innate behavior, ontogenic contingencies are relatively near and determine the selected acquired behavior.

Consequences

The second way in which phylogenic and ontogenic contingencies are distinguished lies in their consequences. As Skinner (1966) said of phylogenic contingencies:

> A given response is in a sense strengthened by consequences which have to do with the survival of the individual and species. A given form of behavior leads not to reinforcement [as in operant ontogenic contingencies] but to procreation. (p. 1206)

In other words, survival and the production of offspring are the functional consequences of innate behavior, which is therefore more likely to occur in future members of a species. In contrast, reinforcement is the functional consequence of acquired (i.e., operant) behavior, which is therefore more likely to occur during the remaining lifespan of an individual (Glenn & Madden, 1995; Skinner, in Catania & Harnad, 1988, p. 76; Smith, 1986).

Selection

The third way in which phylogenic and ontogenic contingencies are distinguished lies in what they select. As Skinner argued:

> [Phylogenic] contingencies selec variations in genes which contribute to the "innate" behavior of a species,[ontogenic]... contingencies con ribute to the selec ion of variations which compose "learned" behavior. (Skinner, in Catania & Harnad, 1988, p. 405)

Here, Skinner seems to have distinguished between two domains-- behavioral and biological. In the behavioral domain, phylogenic and ontogenic contingencies differ in what they select--innate and acquired behavior, respectively. In the biological domain, phylogenic contingencies also select genes, whereas what ontogenic contingencies select or how they operate on the organism was left unspecified by Skinner, at least in the passage above. Nonetheless, we tentatively conclude (and later, try to argue) that, for Skinner, ontogenic contingencies operate on the organism biologically, for example, neurologically (e.g., Skinner, in Catania & Harnad, 1988, p. 422). Discussing the role of the biological organism in the analysis of behavior may further clarify Skinner's version of the nature-nurture dichotomy, to which we now turn.

Temporal Gaps, Changed Organisms, and Causal Chains

To understand the processes involved in the selection of innate and acquired behavior, we turn to three other concepts in Skinner's system: temporal gaps, changed organisms, and causal chains.

Temporal Gaps

Both innate and acquired behavior occur after the contingencies that selected them are no longer present. Skinner referred to the intervals between past contingencies (phylogenic and ontogenic) and present or future behavior (innate and acquired) as "temporal gaps" (e.g.,

Skinner, 1953, p. 54; 1974, p. 236; 1975b, p. 43; see Skinner, 1978, p. 49; 1989, p. 18). For Skinner, these gaps presented a problem: How can we account for the control of current or future behavior by past contingencies? Skinner's solution: Something bridges the temporal gap, in particular, a changed organism (e.g., Skinner, 1971, pp. 195-196; 1974, p. 237; Skinner, in Catania & Harnad, 1988, pp. 409, 422).

Changed Organisms

In general, the changed organism that Skinner emphasized refers to a behaviorally changed organism, that is, to change in an organism's response repertoire and the variables of which it is a function. In the context of phylogenic and ontogenic contingencies, though, change also involves biological change (see Delprato & Midgley, 1992; Hayes, 1992; Lee, 1988, pp. 162-163; Parrott, 1983; cf. Branch, 1977; Glenn & Madden, 1995). For instance, in replying to a critic, Skinner noted that:

> Eibl-Eibesfeldt raises a question about the product [of phylogenic and ontogenic contingencies]. Both kinds of contingencies change the organism--"the wiring of the neuronal networks." Phylogenic contingencies do so in a way involving the genome, ontogenic contingencies in a different way, individual organism. (Skinner, in Catania & Harnad, 1988, p. 422)

In other words, Skinner identified the changed organism as the link bridging the temporal gap between historic contingencies-- either phylogenic or ontogenic--and current or future behavior. In general, the sequence from (a) contingencies to (b) biological organism to (c) behavior constitutes a three-link "causal chain" (cf. Skinner, 1953, pp. 34-35).

Causal Chains

The preceding discussion suggests that Skinner saw the concept of the "causal chain" (e.g., Skinner, 1953, pp. 34-35, 160, 279; 1956, p. 92; 1974, p. 231) as useful in explaining both innate and acquired behavior (see Skinner, 1974, pp. 236-237; 1975b, pp. 42-43; 1978, p. 49). We describe these chains in what follows, beginning with their initial links--phylogenic and ontogenic contingencies, respectively.

Phylogenic contingencies

Remote phylogenic contingencies are linked to current or future innate behavior by causal chains. The chains consist of a sequence of events occurring over a species' evolutionary history: Organisms are exposed to phylogenic contingencies; phylogenic contingencies select innate behavior and genes; genes are replicated, leading to the development of biological organisms that, as current members of a species, are biologically different from other, past members; and the current biological organisms are more likely than their predecessors to engage in certain innate behaviors under particular conditions. The replicated genes and the biological organisms are the middle links in a causal chain. That is, replicated genes and the biological organisms to which they give rise (i.e., the organisms' biological structures and functions) bridge the temporal gap between (a) phylogenic contingencies, which operate in the evolutionary history of the species, and (b) the current and future innate behavioral repertoire of the members of the species.

Ontogenic contingencies

Likewise, ontogenic contingencies are linked to current or future acquired behavior by causal chains. These chains, however, consist of a sequence of events occurring within an individual's behavioral history: An organism is exposed to ontogenic contingencies, ontogenic contingencies select acquired behavior and change the organism biologically (e.g., neurologically), and the biologically changed organism is therefore more likely than its earlier self to engage in certain acquired behaviors under particular conditions. The changed organism is the middle link in a causal chain. That is, the biological organism bridges the temporal gap between (a) ontogenic contingencies, which operate in the behavioral history of the individual, and (b) the current or future acquired behavioral repertoire of the individual.

Conclusion

Behavior analysis has long been characterized as falling exclusively on the nurture side of the nature-nurture dichotomy. To be sure, Skinner was critical of "genetic explanations" for what are more likely instances of acquired behavior (e.g., Skinner, 1974, p. 49) and, while he acknowledged biological factors in the analysis of behavior, he conducted almost no empirical research on them (but see, e.g., Skinner & Heron, 1937). Skinner, however, recognized both nature and nurture as determinants of behavior. Phylogenic and ontogenic contingencies are his version of the nature-nurture dichotomy (cf. Catania, 1998, p. 371).

In presenting Skinner's position, we are not unaware of the criticism and debate that the nature-nurture dichotomy has evoked. Our purpose, however, has been other than evaluative. Nonetheless, if behavior analysis decides to reconsider the nature-nurture dichotomy, it might turn to alternative conceptualizations that are in keeping with a natural science perspective. One alternative is the developmental systems perspective, wherein "nature and nurture are not alternative causes but product and process," respectively (Oyama, 1985, p. 131; see Midgley & Morris, 1992).

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