

Wasserman, E. A. (1999). Behaviorism. In R. A. Wilson and F. C. Keil (Eds.), *MIT encyclopedia of the cognitive sciences*. Cambridge, MA: MIT Press.

"Psychology is the Science of Mental Life, both of its phenomena and their conditions. The phenomena are such things as we call feelings, desires, cognitions, reasonings, decisions, and the like" (p. 1). So said William JAMES in his 1890 *Principles of Psychology*, perhaps the most important and widely cited textbook in the history of psychology. James believed that psychology would have finished its job when it "ascertained the empirical correlation of the various sorts of thought or feeling with definite conditions of the brain" (1890: vi).

His own primary interest in conscious mental experience notwithstanding, James did predict that "the data assumed by psychology, like those assumed by physics and the other natural sciences, must some time be overhauled" (1890: vi). James did not, however, predict that only a few short years after publication of his *Principles*, just such a major overhaul would be in full swing. Nor did James foresee that the impact of this overhaul would be so revolutionary and controversial nearly a century later. 'Behaviorism' is the name given to this dramatic shift away from psychology as the science of mental life and toward the science of overt action.

John B. Watson is usually credited with beginning behaviorism. Surely, his 1913 paper, 'Psychology as the Behaviorist Views It,' made the case for behaviorism in a most dramatic and forceful manner. But, other scholars paved the way for behaviorism. Among them, Watson's biologist colleague at Johns Hopkins University, H. S. Jennings, more methodically and less polemically advocated a behavioristic approach for psychology in his 1906 book, *Behavior of the Lower Organisms*. Jennings' views on the science of psychology still serve as a fitting introduction to the premises and methods of behaviorism.

As did Watson, Jennings studied the behavior of nonhuman animals. Interest in nonhuman animals or even human infants poses very real limits on our readiest means for understanding the psychological phenomena of thinking and feeling: namely, INTROSPECTION, what Edward B. Titchener (1896) called the one distinctively psychological method. Without verbal report, how can we ever claim to have gained access to another organism's mental life? Indeed, just because we ask other people to report to us their private thoughts and feelings, why should we be sanguine that they are either willing or able to do so?

Jennings took a decidedly cautious stance concerning the private world of conscious thoughts and feelings. "The conscious aspect of behavior is undoubtedly most interesting. But we are unable to deal directly with this by the methods of observation and experiment.... Assertions regarding consciousness in animals, whether affirmative or negative, are not susceptible of verification" (1906: v). Contrary to the claims of their critics, most behaviorists, like Jennings, deny neither the existence nor the importance of CONSCIOUSNESS; rather, they hold that private data cannot be the subject of public science.

Having judged that the introspective investigation of consciousness is an unworkable methodology for objective science, Jennings offered a new alternative to a science of mental life -- a science of overt action. "Apart from their relation to the problem of consciousness and its development, the objective processes in behavior are of the highest interest in themselves" (1906: v).

Jennings noted that behavior has historically been treated as the neglected stepsister of consciousness. The treatment of behavior as subsidiary to the problem of consciousness has tended to obscure the fact that in behavior we have the most marked and perhaps the most easily studied of the organic processes. Jennings observed that "in behavior we are dealing with actual objective processes (whether accompanied by consciousness or not), and we need a knowledge of the laws controlling them, of the same sort as our knowledge of the laws of metabolism" (1906: v). Discovering general laws of behavior -- in both human and nonhuman animals -- with the methods of natural science is the aim of a behavioristic psychology.

Jennings' consideration of nonhuman animal behavior (what we now call COMPARATIVE PSYCHOLOGY) was a key extension of psychological science, an extension that was effectively precluded through introspective investigation, but was made possible by behavioristic study. This extension was controversial because it had important implications for our understanding of human behavior. How so? "From a discussion of the behavior of the lower organisms in objective terms, compared with a discussion of the behavior of man in subjective terms, we get the impression of a complete discontinuity between the two" (1906: 329). Jennings believed that this dualistic view of human and nonhuman psychology offered centuries earlier by DESCARTES was stale and incorrect; a fresh and proper answer to the question of whether humans differed fundamentally from all other animals required examining their behavior from a common and objective vantage point. "Only by comparing the objective factors can we determine whether there is a continuity or a gulf between the behavior of lower and higher organisms (including man), for it is only these factors that we know" (1906: 329).

Based on that objective evidence, Jennings agreed with Charles DARWIN and his theory of EVOLUTION through natural selection that "there is no difference in kind, but a complete continuity between the behavior of lower and of higher organisms [including human beings]" (1906: 335). Indeed, many years of assiduous study convinced Jennings that, "if Amoeba were a large animal, so as to come within the everyday experience of human beings, its behavior would at once call forth the attribution to it of states of pleasure and pain, of hunger, desire, and the like, on precisely the same basis as we attribute these things to the dog" (1906: 336), however problematical for an objective psychology these anthropomorphic attributions of MOTIVATION and EMOTION might be.

Jennings' exhortation for us to limit our consideration of both human and nonhuman behavior to objective factors underscores the key imperative of behaviorism. "The ideal of most scientific men is to explain behavior in terms of matter and energy, so that the introduction of psychic implications is considered superfluous" (1906: 329). Mentalism was to play no part in this new psychological science of the 20th century, although it is at the core of the current, but arguably (see Blumberg and Wasserman 1995) reactionary school of nonhuman animal behavior, COGNITIVE ETHOLOGY, founded by the biologist Donald R. Griffin (1976).

Critics of behaviorism nevertheless argue that excluding the realm of private experience from psychological science is misguided. Doesn't a behavioristic account omit most if not all of the truly interesting and important aspects of psychological functioning? "No," said Jennings. What is advocated is simply an objective analysis of psychological processes. With remarkable sophistication and some 30 years before Edward C. Tolman (1936) did so more prominently, Jennings urged the operationalization of psychological terms and phenomena so as to make their study completely objective and permit their exact experimental investigation -- even in nonhuman animals and human infants. (Clark L. Hull 1952, B. F. Skinner 1945, and Kenneth

W. Spence 1956 later developed behaviorism in very different ways to deal with ideation and thinking.)

Take, for example, one of James' favorite psychological notions -- ATTENTION. For Jennings, attention is not a conscious mental state. Rather, "at the basis of *attention* lies objectively the phenomenon that the organism may react to only one stimulus even though other stimuli are present which would, if acting alone, likewise produce a response" (1906: 330). The organism can then be said to attend to the particular stimulus to which it responds. Or, take what to many is the hallmark of mental life -- choice or DECISION-MAKING. For Jennings, choice is not a conscious mental process. Instead, "*choice* is a term based objectively on the fact that the organism accepts or reacts positively to some things, while it rejects or reacts negatively or not at all to others" (1906: 330). In these and many other cases, Jennings explained that "we shall not attempt to take into consideration the scholastic definitions of the terms used, but shall judge them merely from the objective phenomena on which they are based" (1906: 329).

What then are the limits of a behavioristic approach to psychological phenomena? This key question has not yet been answered, but it has been vigorously debated. Watson himself believed that the matter would eventually be decided by experimental study. "As our methods become better developed it will be possible to undertake investigations of more and more complex forms of behavior. Problems which are now laid aside will again become imperative, but they can be viewed as they arise from a new angle and in more concrete settings" (1913: 175).

A case study for looking at psychological issues from a new angle and in a concrete setting is recent research into CATEGORIZATION and conceptualization by nonhuman animals. Building on powerful experimental methods pioneered by Skinner (1938) and his student Richard J. Herrnstein (1990), my colleagues and I have trained pigeons to categorize complex visual stimuli such as colored photographs and detailed line drawings into different classes, ranging from basic-level CONCEPTS (like cats, flowers, cars, and chairs), to superordinate concepts (like mammals, vegetables, vehicles, and furniture), to abstract concepts (like same versus different). In all three cases, the pigeons not only acquired the visual discriminations through reinforcement learning, but they also generalized those discriminations to completely novel stimuli (Wasserman 1995); such generalization is the hallmark of conceptualization. Additional extensions of behavioristic methods and analyses have been made to visual IMAGERY (Rilling and Neiworth 1987) and to the reporting of interoceptive stimuli induced by the administration of drugs (Lubinski and Thompson 1993). Here too, pigeons were taught with purely behavioral methods to engage in behaviors which, when performed by people, are conventionally considered to be the product of conscious mental states and processes. Behaviorists, like Skinner, take a different tack and ask, Isn't it more productive and parsimonious to attribute these behaviors to the contingencies of reinforcement (which can be specified and experimentally manipulated) than to mental entities and psychic machinations (which cannot)?

Some firmly resist this maneuver and emphatically say "No." Empirical demonstrations such as these have done little to convert behaviorism's most trenchant critics, like Noam Chomsky (1959). These individuals argue that behaviorism is formally unable to explain complex human behavior, especially LANGUAGE AND COMMUNICATION.

These critics note, for instance, that human verbal behavior exhibits remarkable variability and temporal organization. They contend that CREATIVITY and grammar are properties of linguistic performance that are in principle beyond behavioristic explanation and they instead argue that these properties of language uniquely implicate the operation of creative mental structures and processes. In response, behaviorists note that all behaviors -- from the simplest acts like button pressing to the most complex like reciting poetry -- involve intricate and changing topographies of performance. In fact, variability itself is a property of behavior that research (Eisenberger and Cameron 1996) has shown is modifiable through the systematic delivery of reinforcement and punishment, in much the same way as other properties of behavior like frequency, amplitude, and duration are conditioned by reinforcement contingencies. As to the temporal organization of behavior, even nonhuman animals like pigeons and monkeys have been taught to recognize and to produce structured sequences of stimuli and responses (Terrace 1993; Weisman et al. 1980). Such complex performances were again the result of elementary LEARNING processes brought about by familiar CONDITIONING techniques.

More famously and directly, Skinner offered a behavioristic account of human language in his 1957 book, *Verbal Behavior*.

Many theorists therefore conclude that behaviorism is the strongest alternative to a mentalistic account of human and nonhuman behavior. Far from being run out of business by the premature proclamations of their mentalistic critics, behaviorists have steadfastly proceeded with the task of experimentally analyzing many of the most complex and vexing problems of behavior using the most effective and current tools of natural science.

As behaviorists say when they tackle a challenging behavioral or theoretical puzzle, "It's an empirical question."

See also

CONDITIONING AND THE BRAIN
ETHOLOGY
FUNCTIONALISM
LEARNING
NATIVISM, HISTORY OF

Edward Wasserman

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