

Explanation Is Not Description

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The point of this article is indicated by the title: Explanation and description are different activities. For example, although both are essential features of natural science, their roles are different, they have different purposes, and they are evaluated on different grounds. Consequently the ways in which they can be problematic are different. The arguments leading to these conclusions and examples of problematic explanations are given in this article.

Distinctions Between Description and Explanation

Novak (1996) said, "Description means 'to delineate' or 'give an account of'" (p. 21) and explanation means "to make clear a cause or reason" (p. 22). The reference to reasons as well as causes in the definition of explanation is consistent with ancient and modern usages. Aristotle used the Greek word *aitia* when he discussed causes; this word refers to cause in the legalistic sense of "guilty of" or "responsible for" (translator's note in Aristotle, 1929, pp. 126-127) rather than the modern scientific sense of "unmediated producer of." For example, if a person is shot and dies, the unmediated cause of death might be systemic shock, and one reason for this cause might be loss of blood, and one reason for the loss of blood might be a bullet wound, and one reason for the bullet wound might be someone's shooting a gun toward the victim, and one reason for this shooting might be "malice aforethought." In other words, an Aristotelian type of explanation can include reasons as well as unmediated causes.

Adults and children as young as 5 years old, but not 3 years old, invoke causes and reasons in explanations, but they tend to invoke them in different domains--respectively, physical and social domains (Kalish, 1998). Day (1976/1992, p. 122), however, seems to have implicitly acknowledged reasons as well as causes in explanations within the physical domain; he argued that reinforcement history is a causal variable and that "Relations of behavior to the present antecedent environment are of a controlling, not a causal kind." If I understand his distinction, it means that controlling variables are *reasons* for rather than *causes* of occurrences of the behavior.

Aristotle pointed out that explanation requires theory because experience teaches only *that* or *how* and theory reveals *why* (*Metaphysics*, Bk. 1, chap. 1 [981a 13 - 981b 9]). For example, he said: "It is the physician's business to know that circular wounds heal more slowly, the geometer's to know the reason why" (*Posterior Analytics*, Bk. 1, chap. 13 [79a 14-16]; quoted from Aristotle, 1952, p. 108). He was illustrating the difference between what he called (a) "natural philosophers" or "empirical observers," who deal with "facts," and (b) "scientists," who deal with "reasoned facts" or explanations (op. cit. [respectively 79a 12, 3; 78b 32]; 1952, p. 108). Toulmin (1953, pp. 44-56) made the same distinction, which he called "descriptive science" versus "explanatory science."

Natural *history* is a descriptive science and natural *science* is an explanatory science. Behavior analysis is a natural science, differing from others in subject-matter, not in aims. The aims of both natural history and natural science include identifying and describing regularities, but like all descriptive sciences, natural history stops at description and therefore it is "mere bug-hunting," as Toulmin said (1953, p. 54). The aims of natural science go beyond description to explanation of the regularities (e.g., Bergmann, 1957, p. 79; James, 1907/1981, pp. 30-32; Marx, 1951, pp. 5, 6; Pepper, 1966, pp. 265-266; Skinner, 1931, 1953, pp. 13, 15-16; Spiker, 1986; Toulmin, 1953, pp. 44-56). To paraphrase Kant's famous aphorism, explanations without facts (descriptions) are empty, and facts without explanations are blind (Kant's aphorism can be found near the beginning of the *Transcendental Logic*, Kant, 1787/1965, p. 93).

According to this distinction, explanation is different from description: "Description tells us what is there, explanation why it is there" and "Science explains by laws what the scientist first describes by individual fact" (Bergmann, 1957, p. 79). This is the received opinion, advocated by, for example, mechanists such as Bergmann (1957, pp. 75-83) and Toulmin (1953, pp. 44-56) and contextualists such as James (1907/1981, p. 82) and Pepper (1966, pp. 264-265). The distinction seems to be inconsistent with an alternative opinion, that explanation is the same as description, which is advocated by radical empiricists such as Ernst Mach (1914, pp. 337-338), Kantor (1953, p. 34), and Skinner (1931). For example, Kantor (*ibid.*) said that explanations generally "constitute elaborate descriptions" and Skinner (1931, p. 446) said that description and explanation are "essentially identical activities" and that "the full description of an

event is taken to include a description of its functional relationship with antecedent events." However, these elaborate or full descriptions are what others call explanations and therefore the distinction is preserved. To be really elaborate or full, a description must refer to more than the outcome of a specific experimental analysis, and therefore it becomes explanatory. It becomes explanatory because it goes beyond the question answered by description--"What happens?"--to the question answered by explanation--"Why does it happen?" (Bergmann, 1957, p. 79).

A final point in this section is that explanations are theory-based and therefore are "constructions," but descriptions are also constructions (Kantor, 1953, p. 34). Theory influences description (Skinner, 1953, chap. 1, e.g., pp. 9-10) because, as Popper (1966, p. 260) said, "all scientific descriptions of facts are highly selective, [and] they always depend on theory." Examples of this selectivity in behavior analysis are emphasis on frequency of occurrence rather than force, magnitude, and other characteristics of operant behavior and definition of operants as response classes, which usually requires ignoring topographical variations.

Types of Explanation

Kaplan (1964, p. 298) identified two types of explanation. One is deductive, or syllogistic: A phenomenon is explained when it is shown to be deducible from premises. One of the premises--the one identified in formal logic as the major premise--is functionally a theory (Reese, 1989). The other type of explanation involves identification of a pattern or network of facts (Kaplan, *ibid.*; Overton, 1991, 1998): A phenomenon is explained by a persuasive demonstration or argument that it fits into the network. The network constitutes what Kaplan (*ibid.*) called a "concatenated" theory. The theory in either type of explanation must be at least the inductive kind, which is a theory in which the constructs are induced or abstracted directly from data (Marx, 1976). This is the kind of theory behavior analysts find acceptable because it refers to a level not much different from the level of observation. Examples of theoretical concepts in this kind of theory include "private event," "response class," "operant," and "relational frame." Higher-level theories include concepts further removed from the level of observation; examples are "drive," "cognitive process," "intelligence," and "heritability."

Deductive explanations are ideal for hypothetico-deductive theories, which are usually associated with the mechanistic world view. Pattern explanations and concatenated theories are usually associated either with the organic world view, as in Piaget's brand of cognitivism (e.g., Piaget, 1983; Piaget & Inhelder, 1966/1969), or with the contextualistic world view, as in Kantor's interbehaviorism (e.g., Kantor & Smith, 1975) and in behavior analysis (e.g., Hayes, Hayes, & Reese, 1988; Morris, 1988). The type of explanation admired by most behavior analysts refers to empirically demonstrated "functional relations" rather than intervening variables or inferred causes (Bijou, 1979; Day, 1976/1992; Delprato, 1986; Marx, 1951; Moore, 1990; Skinner, 1931), but these explanations are still based on theory. The theory is usually concatenated and the explanations are usually the pattern type, consistently with Moore's (1990) argument that in behavior analysis, an explanation is a verbal behavior, not an exercise in logic.

In practice, pattern explanations very often include elements of deductive explanation in the form of sets of statements that look like syllogisms, often beginning with an "If-then" statement. Syllogisms have a legitimate ancillary role in a pattern explanation when they are used to exclude something from the pattern. For example: "If behavior X is mediated by behavior Y, then X will not occur if Y is prevented. X occurred even though Y was prevented; therefore, X is not mediated by Y." This is the valid argument of denying the consequent, or *modus tollens*. However, a more common use seems to be to show that something fits the pattern. For example: "If behavior X is mediated by behavior Y, then X will not occur if Y is prevented. X did not occur when Y was prevented; therefore, X is mediated by Y." This is an invalid argument, involving the logical fallacy of affirming the consequent, but it is valid if it is interpreted as inductive reasoning rather than as deductive reasoning.

Problematic Explanations

Reductionism. The word "reductionism" usually connotes reduction of one domain to another domain--in psychology, reduction of behavior to physiological processes, of these to chemical processes, and of these to molecular structures (e.g., Teyler, 1975, pp. 5-6). These kinds of reduction have never been accomplished except in small parts of a few domains (e.g., Bergmann, 1957, p.

168; Reese, 1996); but in any case this kind of reductionism is typically rejected in behavior analysis (Bijou, 1979; Reese, 1982; Skinner, 1950). Explanation in behavior analysis is nevertheless reductive (Skinner, 1953, chap. 3) in the sense of reduction of a whole—a behavioral phenomenon—to its parts and their interrelations. If this reduction is accomplished by an experimental analysis, it is interpretable as an explanation of the behavioral phenomenon. If it is accomplished by a conceptual analysis, it is a tentative explanation, that is, an hypothesis.

Behavior analysts typically distrust explanations that refer to a level other than the observational level, and although many of them seem to believe that this distrust has a philosophical basis, none is provided by radical behaviorism or any other version of contextualism. However, the distrust does have an empirical basis: Past experience has shown that when the distrusted type of explanation is used, it may not advance the prediction and control of behavior. However, I think the failures have been attempts to reduce behavior to physiology, chemistry, or physics rather than to inferred behavioral entities such as private events, response classes, or relational frames, which are not at the observational level but are still in the behavioral domain.

Reductions to higher-level concepts will not necessarily fail. As William James (1907/1981) pointed out, theories are ideas and therefore they are not the answers, they are the instruments; they "*become true just in so far as they help us to get into satisfactory relation with other parts of our experience, to summarize them and get about them by conceptual short-cuts instead of following the interminable succession of particular phenomena. . . . Any idea that will carry us prosperously from any one part of our experience to any other part, linking things satisfactorily, working securely, simplifying, saving labor is true for just so much*" (p. 30; his italics; punctuation modified).

For example, Barnes and Roche (1997) pointed out that every individual has a unique behavioral history and therefore the explanation of each individual's behavior is unique. However, each of these explanations fits the pattern type, and the unique networks of facts overlap because all of them contain certain universal principles about stimulus functions, response functions, stimulus-response relations, and so on. Also, some universals will be found even in the networks of individuals of different species, such as pigeons and rats in research on the effects of

changeover delays on matching (as can be seen in a brief review by Shahan & Lattal, 1998). If these overlaps did not occur, every explanation would be a truly unique *description* and behavior analysis would be a bug-hunting natural history rather than a natural science.

Limited scope. Many explanations in psychology are like one-pony circuses—small and with only one focus of attention. Theorizing starts with a felt need to explain a particular set of facts, but if the theory explains only these facts and has no other implications, it is a one-pony circus. An example is the innate "language-acquisition device" that Chomsky postulated to explain known and suspected facts about language development (1965, pp. 30-37, 1986, p. 3). This device seems to have no implications beyond the facts it was intended to explain, but one of these implications—that language development has an innate basis—has forestalled mainstream linguistic research on environmental mechanisms, which other research (e.g., Moerk, 1989, 1996) has shown are important in language development.

By analogy to Chomsky's language-acquisition device, the capacity for operant conditioning, which Skinner (1974, chap. 3) speculated evolved through natural selection, could be called an innate "operant-conditioning device." It is a one-pony circus because it explains why operant conditioning is possible and it has no implications beyond the facts of operant conditioning. In fact, its only implications seem to be that the conditions under which operant conditioning occurs may be species specific but in any case are innately given and therefore the laws of operant conditioning are attributable to natural selection and are otherwise unexplainable. These implications seem not to have forestalled experimental and conceptual attempts to explain the laws, such as attempts to explain the reinforcing function (e.g., Catania, 1992, pp. 192-194), stimulus equivalence (e.g., Hayes, 1994), and the matching law (e.g., Shahan & Lattal, 1998).

Excessive speculation. The sexes tend to segregate during childhood, and Maccoby and Jacklin (1987) briefly discussed an unpublished sociobiological explanation that was suggested in a discussion group at Stanford University. The explanation was that incest generally does not promote adaptation, and therefore a genetic basis for avoiding incest might have emerged during evolution. This effect could be produced by a mecha-

nism that suppresses sexual attraction to members of the opposite sex with whom one interacted closely as a child, but the mechanism would also have an undesirable effect unless it or an associated mechanism induced children not to interact closely with members of the opposite sex who at maturity would be biologically appropriate sex partners. Any mechanism that had the latter effect would tend to segregate the sexes during childhood.

Maccoby and Jacklin questioned this sociobiological explanation on the ground that the outcomes of the hypothetical mechanism(s) appear not to be universal among human cultures. However, the part about suppression of sexual attraction to persons who were childhood intimates is supported by the fact that biologically unrelated age-peer Israelis raised in the same kibbutz seldom intermarry (e.g., Bettelheim, 1969, pp. 237-238) even though they are appropriate sex partners from a biological standpoint. Thus, the social intimacy that is characteristic of the kibbutz makes biologically eligible sex partners psychologically ineligible. Nevertheless, this outcome does not support the hypothetical mechanism noted above because this mechanism implies that the sexes segregate during childhood, yet the children in the kibbutz do not segregate by sex. Because the hypothetical mechanism does not have all the effects it should have, the psychological ineligibility of same-age kibbutzniks can be attributed to socialization (Bettelheim, *ibid.*) at least as plausibly as to the hypothetical mechanism. (I am indebted to Jacob L. Gewirtz for directing me to the Bettelheim reference in a personal communication, February 8, 1994.)

A further consideration is that if evolution had given the incest taboo a biological basis in humans, the incest taboo would presumably not need to be stated. In fact, if the incest taboo had a biological basis in humans, human incest would presumably not be as prevalent as it is. More likely, then, the incest taboo has a social rather than biological basis. This explanation also explains why certain male homosexual relations, which were institutionalized in some New Guinea tribes, were subject to incest taboos that forbade relations between males who were close kin (Williams, 1936, pp. 158, 204, 309).

Conclusion

A description is right or wrong depending on whether it is or is not an accurate description of

the phenomenon purportedly described, regardless of how "accuracy" is assessed. In contrast, the criteria determining whether an explanation is right or wrong depend on the type of explanation being used. The truth of a deductive type of explanation depends on (a) the truth of the theory serving as the major premise in the syllogism from which the to-be-explained phenomenon was deduced and (b) the validity of the syllogism. The truth of a pattern type of explanation depends on (a) the scope and cohesiveness of the theoretical network of facts that the to-be-explained phenomenon is argued to be consistent with and (b) the persuasiveness of the argument. This difference, and others discussed in the article, demonstrate that description and explanation are different activities.

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