

Conceptions of Determinism in Radical Behaviorism:

A Taxonomy

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Abstract

Determinism has long been a core assumption in many forms of behaviorism, including radical behaviorism. However, this assumption has been a stumbling block for many — both within and outside the field of radical behaviorism — resulting in misunderstanding and misrepresentation. The following paper provides a descriptive taxonomy of four kinds of determinism assumed or asserted in the radical behavioral literature. This taxonomy is intended to organize these deterministic positions, provide working definitions, and explore their implications. Through this work, it is hoped that behaviorists and nonbehaviorists alike will possess a clearer understanding of determinism in behavioral analysis.

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In his introduction to About Behaviorism, B.F. Skinner alluded to problems that many have experienced in understanding radical behaviorism. Skinner provided a list of twenty criticisms commonly leveled at his research program and remarked, “These contentions represent, I believe, an extraordinary misunderstanding of the achievements and significance of a scientific enterprise” (1974, p. 5). Although Skinner did not mention the notion of determinism per se in this passage, it clearly underlaid many such criticisms. Skinner was keenly aware of how misunderstandings of determinism had obstructed a true understanding of his work. He showed, for example, how many had (mis)understood behaviorism to mean that a radical behaviorist “formulates behavior simply as a state of responses to stimuli, thus representing a person as an automaton, robot, puppet, or machine” (Skinner, 1974, p. 4).

Not surprisingly, Skinner sought to clarify the radical behaviorist stance on determinism through his many writings. However, these understandings of his work have persisted, particularly outside radical behaviorism (cf., Rychlak, 1981; 1988; Ryckman, 1989; Viney & King, 1998). Other radical behaviorists have lamented the apparent permanence of these questionable understandings, arguing that their accounts of causation, determinism, and related conceptions have been regularly misconstrued (Chiesa, 1992; Moore, 1990). Moreover, several authors have observed that misunderstandings of radical behaviorism, including those pertaining to causation, are extremely resistant to change, even in a college course that was designed to dispel such myths (DeBell & Harless, 1992; Lamal, 1995).

These misunderstandings raise two obvious questions: (a) Why have critics so persistently misunderstood the determinism implicit in radical behaviorism?, and (b)

What exactly is the radical behaviorists' stance on determinism? Although a complete answer to the first question is more complex than space allows, an important part of this answer will stem from our response to the second question. As this paper will illustrate, there seems to be no standard definition of determinism in the radical behaviorist literature. A number of researchers have debated the meaning, importance, and implications of a deterministic outlook on the experimental analysis of behavior (Chiesa, 1992; Marr, 1982; Moore, 1990; Rockwell, 1994; Vorsteg, 1974). Indeed, varying conceptions of this core idea are taken for granted by different authors, fostering an ambiguity that may, in fact, preclude a wider understanding in the general discipline.

The purpose of this article, therefore, is to clarify what is meant by determinism in the radical behaviorist literature. A brief, descriptive taxonomy is proposed that will systematize four basic types of determinism seen in the literature — metaphysical determinism, metaphysical probabilism, scientific determinism, and functional interdependency — thereby providing psychologists with a conceptual framework for interpreting radical behaviorist claims. Accompanying this taxonomy is a discussion of the implications of the various categories of determinisms. These categories, along with their implications, should help researchers and theorists select the deterministic position most applicable to their own theoretical orientation and philosophy of science, while at the same time clarifying a core theme of radical behaviorism for its students and critics.

The Nature of Taxonomy

Taxonomies have long served to reduce ambiguity in psychology generally, and in radical behaviorism particularly. One example is Skinner's (1935) simple taxonomy of conditioning types, drawing the helpful distinction between operant and respondent conditioning. Other taxonomies have been more elaborate, such as the ones that categorize different kinds of environmental operations (Schlinger & Blakely, 1994) or

stimulus functions (Michael, 1993). The general purpose in every instance is to provide a classification system that clarifies terminology, promotes precision in the laboratory, and facilitates discussion.

The purpose of the present taxonomy is no exception. Our review of the radical behaviorist literature revealed a variety of deterministic conceptions, so a taxonomic approach seemed appropriate. However, these conceptions varied greatly among those writing on the topic. Some authors, for instance, attempted to be prescriptive, asserting how radical behaviorists ought to view determinism, while others attempted to be descriptive, showing how behaviorists actually use the concept in their studies. Given the diversity of perspectives and contexts in this literature, it was difficult to categorize all possible forms of determinism exhaustively. Still, we consider the categories proposed here to be representative of the main currents within radical behaviorism. Thus, we contend that this taxonomic system will be heuristic to many readers, despite its possibly limited scope.

There was also difficulty in categorizing research programs, theoretical positions, and even scientists and theorists themselves. Complexity of theorizing can make categories seem stereotypic and oversimplified. In this sense, we view our taxonomic effort as merely the first step in a dialogue that should converge on a more precise and parsimonious account of deterministic assumptions in the literature of radical behaviorism. Although we welcome modification of the taxonomy we propose, we hasten to add that our proposal should facilitate this process by prompting such clarification and providing a nascent language for accomplishing it.

Metaphysical Determinism

Perhaps the determinism most commonly associated with radical behaviorism — however correct or incorrect this association may be — is metaphysical determinism.

This position holds that all events in the universe, including organismic behavior, are the necessary outcome of antecedent conditions. Nothing but the behavior that did occur could have occurred, given the antecedent causal circumstances. Skinner has often been considered to espouse metaphysical determinism (e.g., Rychlak, 1981; 1988; Viney & King, 1998). And, as commentators such as Delprato and Midgely (1992) have shown, Skinner has seemed to support metaphysical types of determinism throughout his career. Consider two of Skinner's statements on the issue:

[Science] is more than the mere description of events as they occur. It is an attempt to discover order, to show that certain events stand in lawful relation to other events. . . . If we are to use the methods of science in the field of human affairs, we must assume that behavior is lawful and determined. (Skinner, 1953, p. 6) (Emphasis added)

To have a science of psychology at all, we must adopt the fundamental postulate that human behavior is a lawful datum, that it is undisturbed by the capricious acts of any free agent — in other words, that it is completely determined. (Skinner, 1947, p. 23) (Emphasis added)

Although Moxley (1992) has correctly noted that Skinner attempted to move from a mechanistic to a functionalist behaviorism in his later work, he has also shown how Skinner continued to have sympathy for metaphysical determinism, such as:

. . . environmental history is still in control; the genetic endowment of the species plus the contingencies to which the individual has been exposed still determine what he will perceive. (Skinner, 1974, p. 82) (Emphasis added)

The behavior occurs because appropriate mechanisms have been selected in the course of evolution. The feelings are merely collateral products of the conditions responsible for behavior. (Skinner, 1974, p. 52) (Emphases added)

Nevin (1991) and Baum (1994) have also uttered statements that appear to be compatible with metaphysical determinism. Nevin (1991), for instance, has made clear: "According to the most central tenets of our creed, all behavior is determined by genetic and environmental processes" (p. 36). Similarly, Baum's (1994) straightforward remarks on determinism are easily interpreted as metaphysical in nature. Baum is undaunted in considering determinism to be "the notion that behavior is determined solely by heredity and environment (p. 11, emphasis added). Baum even rejects attempts to reconcile determinism with "libertarian free will" (p. 11 - 14), because "determinism asserts that free will is an illusion based on ignorance of the factors determining behavior" (p. 15). For Baum, as for Nevin, science itself requires the "idea that all behavior originates from genetic inheritance and environmental effects" (p.15).

Although we cannot know for sure what kind of determinism any of these scholars was intending from these quotations alone, metaphysical determinism seems a viable interpretation. This interpretation is bolstered by clear statements that persons are genetically governed organisms to be further molded through experience with the environment. According to these behaviorists, the capabilities of a child, throughout his or her development, result from the confluence of environmental and genetic pressures. No third category of self-initiated (and internal) variables, such as free will (e.g., Howard, 1994), oppositional reasoning (Rychlak, 1994), or reflective awareness (Tageson, 1982) is postulated. Behavior is the necessary outcome of two sets of causal forces, the environment and genetics. This straightforward approach to determinism might be the one most commonly criticized or caricatured in humanistic and cognitive accounts (e.g., Bandura, 1989; Rogers, 1970; Rychlak, 1981, 1988).

However, authors who seem to assume this type of metaphysical determinism disagree about how exacting our knowledge of this deterministic world can be. Some

authors (e.g., Baum, 1994; Czubaroff, 1991; Moore, 1990, 1992; Nevin, 1991) argue that complete and perfect (or nearly perfect) knowledge can be obtained if behavioral analysts have sufficient time to isolate the relevant variables, exercise control, and make informed predictions. This epistemological approach roughly matches the traditional view of science which maintains that lawful regularities, as discerned through rigorous empirical analysis, can accurately represent physical reality (Moore, 1985, 1992; cf. Polkinghorne, 1983).

Other behavior analysts argue that current instrumentation and measurement devices severely limit the precision with which behavioral predictions can be made (Espinosa, 1992; Fraley, 1994; Kanekar, 1992). Still, many of these researchers recognize that fairly accurate probabilistic estimates of physical events are achievable. Thus, these behavior analysts pursue increasingly accurate predictions regarding behavior, while aiming to overcome measurement limitations in the future.

Despite such disagreements over the accuracy of instrumentation and measurement, all metaphysical determinists seem to concur that nature itself is fundamentally determinant, and that all physical events occur as a result of lawful, natural causes. Fraley explains:

The notion that physical limitations in measurement processes compromise determinism appears to require an unjustified inferential leap that would posit nature (the environment) as a function of knowing--that ontological status is acquired only through someone's knowing of it.... But behaviorological principles posit the reverse direction for the control, namely, that knowing is behavior and is therefore controlled by an extant nature. (1994, p. 73, italics included in the original).

Thus, metaphysical determinists remain committed to the determinacy of natural events, including human behavior, and reject the more radical claim that physical reality is itself inherently probabilistic. This claim, made by some physicists and psychologists, is taken up in the second of our four taxonomic categories. However, we must first explicate the implications of metaphysical determinism.

Implications of Metaphysical Determinism

One implication of this form of determinism, as suggested above, is that conventional notions of freedom and choice— notions often taken for granted in popular discourse—are not possible. Conventional free will requires the potential to act otherwise than the environmental or genetic forces would dictate (Howard, 1994; Rychlak, 1992; Slife & Williams, 1995; Valentine, 1992; Van Inwagen, 1986; Viney & King, 1998). However, metaphysical determinism leaves no room for any self-determination in the sense of a free will. Some behaviorists discuss self-determinative factors (e.g., Skinner, 1953), but they do so in the sense of prior causes (and thus determinants) which are themselves caused (and determined) by prior causes in a cause-effect chain that ultimately originates before (and outside) the "self" in any conventional sense. This kind of determinism assumes that antecedent environmental and genetic factors are necessary and sufficient to control behavior. People may seem to make choices, i.e., they may seem to do otherwise, but all those "choices" are ultimately determined by past environmental and genetic causes (see Slife, 1993).

A related implication of metaphysical determinism involves the issue of personal responsibility (e.g., Rychlak, 1979). According to the customary notion of responsibility, there is no point in giving praise or blame to individuals if they are determined in the metaphysical sense described here. Praise or blame only makes sense if there exists an agent who initiates an action that was not ultimately caused by

environmental and genetic factors (Baum, 1994, p. 166-171). In this sense, Mother Teresa should not have been praised for her charitable behaviors. These behaviors are really just her genetic endowment in some way interacting with her environment to cause her actions. By the same token, a murderer should not be blamed for murderous behavior. Some interaction of genetics and environments must cause these murderous actions.

We should note that not all aspects of responsibility are cast aside by such deterministic conceptions. As Staddon (1995) has shown, predictability is important to some forms of legal responsibility. He states:

If criminal behavior is predictably deterred by punishment, the justly punished criminal is less likely to disobey the law again, and serves as an example to other potential lawbreakers. This is the only objective justification for punishment. But if behavior were unpredictable and unaffected by “reinforcement contingencies” — if it were uncaused, in Skinner’s caricature of freedom — there would be absolutely no point to punishment or any other form of behavioral control, because it would have no predictable effect. In short, legal responsibility requires behavioral determinism. (1995, p. 93).

Of course, this requirement of “behavioral determinism” does not tell us what type of determinism this behavioral determinism is. This is one of the purposes of the present article -- to clarify what deterministic options are viable and available to the radical behaviorist. At this juncture, metaphysical determinism is only one of four different forms of predictability. Whether or not behavior must be metaphysically determined to be predictable, and whether or not responsibility is merely the use of certain reinforcement and punishment contingencies are still open questions. In any

event, the customary notion of personal responsibility, where a person is held accountable as a self-initiating agent, is obviated by metaphysical determinism.

Those radical behaviorists who endorse this form of determinism do not balk at these provocative implications. Indeed, those theorists argue that such implications must be accepted, and that conventional notions of free will and volition must be abandoned, if we are to have an accurate understanding of the human condition and on the way to an improved society. Baum, for instance, asserts: “Behavior analysts argue that as long as we go on assuming free will, we will fail to solve our social problems” (1994, p. 152; see also Howard, 1994; Rychlak, 1979; Sappington, 1990; Slife & Williams, 1995 for more on free will and determinism in psychology). B.F. Skinner is, of course, also famous for his acceptance of similar implications (e.g., Skinner, 1971, 1974). As we shall see, however, Skinner’s approach to determinism is more complicated or more ambiguous than simple metaphysical determinism.

Metaphysical Probabilism

Metaphysical probabilists, in contrast to metaphysical determinists, have looked closely at, and based their metaphysical assumptions on, developments in contemporary physics (Alessi, 1992; Marr, 1982; Neuringer, 1991a, 1991b; Zeiler, 1979). These radical behaviorists have contended that the concrete instrumentation involved in measurement not only limits the ability of scientists to make accurate predictions (as claimed by some metaphysical determinists) but also tends to codetermine the phenomena under investigation (cf. Bohr, 1935; Heisenberg, 1958; Rychlak, 1993; Snyder, 1983). These behavior analysts have noted that the accuracy of scientific prediction is compromised, in principle, by limitations in instrumentation, limitations in current knowledge, and so forth.

Moreover, behavior analysts who call for metaphysical probabilism typically assume that natural events occur in a metaphysically chaotic or stochastic fashion, rather than a metaphysically determined fashion. From this perspective, the unpredictability of behavioral events results from an interaction between the nature of physical reality and our observational techniques, rather than from flawed instrumentation alone. Alessi (1992), for example, has argued that different levels of evolution (i.e., phylogenetic, ontogenetic, and cultural) produce random variation and that such random variation is then selected by environmental pressures.

Although these theorists assume the existence of deterministic forces — *viz.*, evolutionary processes that produce random variation and perform the selection — the net result of such forces is more akin to probability than traditional (metaphysical) determinism. Neuringer (1991a, 1991b), for instance, argues that an endogenous random variation generator, which constitutes an underlying deterministic process, results in random, and thus to some degree unpredictable, behavior. As he asserts (1991a, p. 10), “Thus we could be secure in the belief that every instance of behavior is determined, in part by the workings of a chaotic generator, but unable to discover its characteristics and therefore unable to predict instances.”

The underlying deterministic system described by Neuringer is unique in that it inherently produces randomness. This means that even if the determinant conditions were known, something unforeseen could happen. And indeed, researchers who endorse metaphysical probabilism contend that this is often the case. Many such researchers have attempted to show that spontaneous or unpredicted behavior occurs frequently among the behavior of organisms, and that only aggregate or probabilistic estimates of behavior can be obtained in principle (Marr, 1982; Zeiler, 1979). As one author put it: “Random

variations in behavior are clearly revealed even under the highly controlled conditions used to study reinforcement contingencies” (Marr, 1982, p. 206).

Implications of Metaphysical Probabilism

Metaphysical probabilism thus assumes that psychology will never be able to attain perfect predictability and that some variable relations will always be uncertain and unknowable. At least some behavior is unpredictable in principle. One obvious implication of this position is the limitation it places on scientific understanding and on what can be known about physical reality, including individual behaviors. Though our knowledge may increase as scientific measuring techniques and equipment become more accurate and precise, such accuracy and precision is ultimately and inherently limited by the nature of the observation and/or reality itself.

It appears that Skinner himself recognized the probabilistic properties of his data. In an apparent contrast to his statements on metaphysical determinism (above), Skinner (1974) described the process of operant conditioning in this way:

When a bit of behavior has the kind of consequences called reinforcing, it is more likely to occur again. A positive reinforcer strengthens any behavior that produces it: a glass of water is positively reinforcing when we are thirsty, and if we then draw and drink a glass of water, we are more likely to do so again on similar occasions. A negative reinforcer strengthens any behavior that reduces or terminates it: when we take off a shoe that is pinching, the reduction in pressure is negatively reinforcing, and we are more likely to do so again when a shoe pinches. (p. 51)

In this sense, Skinner seemed to clearly recognize that data yielded likelihoods rather than exacting determinations. The question is: Did Skinner assume that these likelihoods were the result of measurements (a metaphysical determinism limited by

instrumentation) or the actual state of the variables in question (metaphysical probabilism)? The answer appears to be the former, though we will discuss the possibility of the latter as well.

Regarding the former, Skinner appeared to have assumed that for a science of behavior to be possible, and for scientists to be able to predict and control, human behavior must be completely determined (e.g., Skinner, 1974, p. 208). Although he readily admitted he could not know this determinism absolutely, research had convinced him of its veracity. As he put it in About Behaviorism:

We cannot prove, of course, that human behavior as a whole is fully determined, but the proposition becomes more plausible as facts accumulate, and I believe that a point has been reached at which its implications must be seriously considered. (1974, p. 208) (emphasis added)

If Skinner assumed that human behavior was ultimately “fully determined,” as this quote suggests, then it is interesting to note that this position was arrived at without observation. As he himself admitted, the data of his experiments cannot prove determinism; they can only show that reinforcement increases the likelihood of a certain behavior being emitted in the future. These data can never show that the variables are metaphysically determined, because only probabilities are available from the method employed. What Skinner did, as this quote indicates, is make inferences from the data, because he could not actually observe what he inferred. In this sense, Skinner could be described as holding an assumption about how he believed nature was operating — as opposed to what he could actually observe in his data (Moxley, 1992).

On the other hand, if Skinner were a metaphysical probabilist, then other potentially problematic implications arise. As we noted, metaphysical probabilism holds that specific environmental factors do not elicit the exact same response every time.

Environmental factors may incline an organism towards a certain behavior without necessitating it. This permits crude or gross predictions, but rules out refined or exact predictions, because probabilistic events could always have occurred otherwise, as Rockwell (1994) has noted. Of course, if events really can be otherwise, then a person's behavior can be otherwise than would be predicted probabilistically. That is, the radical behaviorist would only be able to predict certain general tendencies or inclinations of the person, given his or her conditioning history, but even this prediction could be violated in any particular instance.

Thus, the person would be unpredictable in principle, because the person's behavior is always and everywhere comprised of particular instances. The experimenter could never know with certainty when the person would behave in consonance with his or her predicted tendencies and when the person would behave otherwise than the predicted tendencies. Indeed, according to metaphysical probabilism, the person could act otherwise at each moment and thus can thwart even “increasing likelihood” statements, because the person can always act otherwise than a behavior that is increasingly likely.

Most metaphysical probabilists would hold that this “acting otherwise” is unlikely; they believe that people do tend to remain consistent with their tendencies (Alessi, 1992; Neuringer, 1991b). Still, this is an assumption, rather than an empirical fact, because metaphysical probabilism can never rule out the possibility of a completely unpredictable turn of events, at any point. In this sense, research can only indicate what has occurred, not what will occur. And although predictions of behavior may become fairly accurate — with, say, a person acting in accord with his or her conditioning history for years — this person may do otherwise than predicted at any point with the help of an ever-present chance factor.

Some have suggested that this unpredictability and “acting otherwise” factor provides researchers with the conceptual space necessary to admit the possibility of free will. Rockwell (1994) has contended, for example, that because operant conditioning is only probabilistic, it provides no reason to reject free will. He argued: “But if the impact of operant conditioning is only probabilistic, each [organism] could have done otherwise even if their environments were exactly the same” (p. 64). Indeed, “being able to do otherwise, everything else being the same” is a common definition of free will (cf. Slife & Fisher, in press; [list other authors from this pub]). Rockwell goes on to argue that Skinner’s own data show that human and animal behavior, unlike the movement of inanimate objects, are not causally determined in the same naturalistic and deterministic sense.

The problem is that free will typically means some sort of uncaused cause, some sort of internal agency that is itself the initiating cause of events (cf. Slife & Fisher, in press). Radical behaviorists who endorse metaphysical probabilism usually postulate some generator of the unpredictability that determines the variation (e.g., Neuringer, 1991a). Although this variation is, in principle, unpredictable, it is still produced by another source that determines how it is unpredictable. No free will in any conventional sense seems possible. Further, even those who advocate a free will (e.g., Howard, 1994; Rychlak, 1979; 1994) do not view it as complete unpredictability, but rather as a different kind of causation and thus determinism (e.g., “final causation” as opposed to “efficient causation”). Free will, for them, requires a purposefulness (and a teleology) that chaotic and stochastic processes would have difficulty producing (Howard, 1994; Rychlak, 1981; 1988).

Scientific Determinism

Metaphysical issues, such as the foregoing, have led some radical behaviorists to reject metaphysical forms of determinism (above) (e.g., Gazda & Corsini, 1980; Mazur, 1986; Vorsteg, 1974). They consider it unnecessary to isolate a set of physical variables and assert that they determine or probabilistically cause other variables. Loosely following a distinction laid out by philosophers of science such as Toulmin (1953) and Watkins (1958), these behaviorists opt for scientific or methodological determinism. Scientific determinists distinguish the results of their methods from metaphysical statements about reality. They believe that the world is best studied through the careful application of the scientific method. Accurate prediction can follow from this systematic study, as historical trends are used to anticipate an organism's as yet unevoked responses.

However, these assumptions (e.g., predictability) are purely methodological for the scientific determinist; they inhere in the scientific method and its use, and need not be extended to reality itself. Scientific determinists thus hold that the prediction of future states of a system is possible, but that no statement regarding the metaphysical status of reality or the ontological status of determinism is required. Mazur (1986) has put it this way:

Is it necessary to be a [metaphysical] determinist to pursue the sort of scientific analysis of behavior that is described [here]? Certainly not. Regardless of your religious beliefs or your philosophical convictions, you can profit from reading this book as long as you are willing to observe that there is some regularity and predictability in the behavior of both humans and nonhumans.... We can proceed in this fashion without taking any particular stand on the free-will/determinism controversy. (p. 17)

Others in the literature concur with Mazur. Gazda and Corsini (1980), for example, have argued that free will might have a place in behavior analysis as an evolutionarily generated aspect of our phylogenetic endowment. Still, they contend that the metaphysical status of free will or determinism is mostly irrelevant to the advancement of behavior analysis:

That human behavior is determined, or at least predictable, is not, of course, an empirical fact to be confirmed or disproved. It is an assumption with which a scientific account typically proceeds... Nevertheless, operant theory has provided many applications of its principles in practical human situations. Predicting and controlling human behavior in such settings is a severe test of the adequacy of behavioral principles. (1980, p. 170)

Scientific determinism (or scientific probabilism¹) provides a position that many in the discipline might consider to be the most palatable, because it assumes a “neutral” method — a method that supposedly makes no claims on (or assumptions about) the world it is supposed to investigate. The method converges on scientific facts, but it does so without predeciding the nature of those facts, or legislating any a priori metaphysical view of reality. Such an approach has been called for by a wide variety of psychologists, from humanists (e.g., Rychlak, 1988) to behaviorists (e.g., Mazur, 1986), as a means of avoiding speculative metaphysics.

Implications of Scientific Determinism

This avoidance of metaphysics is attractive to some radical behaviorists for several reasons. Foremost perhaps is the unity and objectivity that could be brought to psychology and behavior analysis. Proponents of even unconventional theories in psychology, such as free will and spirituality, could conceivably work within the community of behavior analysts, because the metaphysically neutral nature of behavior

analysis would not rule out these conceptions a priori. In this sense, advocates of scientific determinism could promote a kind of scientific unity through the adherence to commonly accepted rules and assumptions of science, rather than to any particular philosophical or metaphysical stance. Moreover, investigation — instead of philosophy — would be the primary adjudicator of validity.

As positive as this may sound to some, several obstacles would have to be overcome before this type of unity and adjudication can be accomplished. Some psychologists, for instance, have argued that experimental methods have been inappropriately confounded with certain theories (e.g., Rychlak, 1988). That is, the basic neutrality of these methods — necessary to any scientific determinism — has, in some contexts, been compromised by the illicit overlaying of theory onto method. As the historian and philosopher Edwin Burt (1954) once put it, there is a “strong and constant temptation to make a metaphysic out of [one’s] method” (p. 229). In other words, researchers are tempted to confound their own theories and philosophies with their methods, and thus bias an otherwise neutral tool of inquiry.

Rychlak (1988), for example, has argued that the essentially neutral IV-DV pairing of experimental method has been historically confounded with the stimulus-response theorizing of certain kinds of behaviorism. Method and theory have become, in effect, synonymous: Independent variables are simply stimuli, and dependent variables are simply responses (e.g., Rychlak, 1988). As a result, a metaphysical notion (that stimuli and responses actually exist, and that one determines the other) has been forced onto a supposedly neutral IV-DV experimental arrangement.

As such, the method can only corroborate stimulus-response hypotheses, and theories that do not subscribe to stimuli and responses are ruled out before any investigation can occur. Moreover, stimulus-response approaches become difficult to

falsify, because they are assumed a priori and confounded with the method being used. In this sense, a principal obstacle to the project of scientific determinism is the untangling of such theoretical (and metaphysical) commitments from an ostensibly neutral investigative tool.

Other contemporary scholars have called into question the very idea of metaphysical neutrality (Hesse, 1980; Kuhn, 1970; Kukla, 1989; Lakatos, 1970; Robinson, 1985; Slife, 1993; Slife & Williams, 1995, 1997). Indeed, these scholars have contended that it is naive, if not entirely specious, to argue that method — any method — acts as a metaphysically neutral investigative tool (cf. Czubaroff, 1991). To be effective, all methods make assumptions about the nature of the world they are intended to investigate. All methods were formulated to be effective in a particular world that was assumed before the methods were used to investigate that world.

According to these commentators, all methods are the products of philosophies, and all philosophies have certain biases that the methods embody, whether or not we (as users of the method) are aware of them. These assumptions — ontology, causality, time, epistemology, and so forth — are themselves metaphysical notions that inform and shape the kinds of accounts rendered through the application of these methods. Different methods, based on fundamentally different assumptions about the world, will produce different kinds of results. Methodological assumptions, and thus metaphysical commitments, cannot be avoided.

From this perspective, the attempt of scientific determinists to objectify method, at least to disentangle metaphysics from method, is doomed to failure. As the philosopher Karl Jaspers (1954) once observed, “There is no escape from philosophy. The question is only whether [a philosophy] is conscious or not, whether it is good or bad, muddled or clear. Anyone who rejects philosophy is himself unconsciously

practicing a philosophy” (p. 12). In this sense, the notion that one has a metaphysically neutral method is worse than a bald metaphysical commitment, because it is the practicing of a commitment without awareness.

If these commitments truly exist and are not specifically recognized in radical behaviorism, then they cannot be discussed, examined, or compared in the broader context of learning theory. An explicit metaphysical commitment is thus preferable to an implicit metaphysical commitment that is manifested unknowingly through a particular method. If these scholars are correct and metaphysical commitments are unavoidable, then the claiming of scientific determinism must be considered with careful deliberation.

Functional Interdependency

A fourth and final category of determinism concerns the notion of functional interdependency. This notion originates in the work of the noted physicist Ernst Mach (1959) and involves another approach to avoiding metaphysical assumptions. Mach’s contention about causation, which was itself influenced by the empiricist philosophy of David Hume, was that we can never know cause and effect. Rather, what we can know is the constant conjunction of physical events.

For example, if we were to see a billiard ball roll across a pool table and hit a second ball into a pocket, we could not say that the first ball caused the motion of the second ball. Hume says that we do not actually see the first ball producing the motion of the second. All we see is one ball rolling across the table, a noise when this ball approaches the second ball, and then the second ball rolling into the pocket. These sensory experiences certainly suggest that the motion of the first ball produced the motion of the second. However, the same sensory experiences are also consonant with events that do not yield such a production. For instance, both balls could be controlled by hidden magnets and the noise generated by a loudspeaker. Moreover, according to

Hume, conducting this billiard ball experiment many times and attaining a perfect correlation of these sensory experiences would never provide sufficient evidence for granting causal status.

When this perspective is applied to behavior analysis, the job of the radical behaviorist is not to discover causation, but to describe functional relations occurring between the organism and the environment (Chiesa, 1992, 1994; Delprato & Midgely, 1992; Miller, 1994; Moxley, 1992; Smith, 1986). A prominent example is the three-term contingency conception (e.g., Baum, 1994; Chiesa, 1994; Skinner, 1957, p. 31). From this conception, scientists should only — and, in some cases, can only — look for the contingent or functional relations between the environment and behavior, as they systematically covary. Moreover, the traditional “cause and effect” vocabulary of science is abandoned within this view. As Chiesa has put it: “. . . a cause is replaced with a change in the independent variable, and an effect with a change in the dependent variable, which in turn replaces the cause-effect connection with functional relation” (1994, p. 113). From this functional interdependency perspective, then, explanation is replaced with description. The need to explain how one event causes another is eliminated, because it is a description of function rather than a cause-effect relation.

Implications of Functional Interdependency

The most obvious implication of functional interdependency is that traditional determinism, as based on cause-effect relations, is eliminated. Theorists who advocate functional interdependency specifically reject causality, arguing that it places an unwarranted status on any given event. To say, for example, that the environment is responsible for, or the determinant of, behavior grants causal status to the environment. However, as Mach, Hume, and others have contended, this status cannot be observed; only the covariance between the environment and behavior can be observed. Even most

statistical tests are based ultimately on a linear, and thus a correlational model. How, then, can the researcher justify the claim of causal status? From the perspective of functional interdependency, the researcher can only focus on how events correlate or covary.

The implications of functional interdependency for radical behaviorism have been explored by Chiesa (1992, 1994) who claims that functional interdependency necessitates a shift in the focus and world view of many behavior analysts. Functional interdependency researchers must avoid granting any sort of privileged (or causal) status to certain variables over other variables. The job of a scientist is to discover relations among observable variables, while eschewing the many variations of cause-effect relations, such as “responsible for,” “determinant of,” and so forth.

Skinner himself hailed Mach as one of his primary influences. Did Skinner entertain functional interdependency? Chiesa seems to believe so (see also Moxley, 1992 on this point). For example, she quotes Skinner as saying that:

We may now take that more humble view of explanation and causation which seems to have been first suggested by Mach and is now a common characteristic of scientific thought, wherein, in a word, explanation is reduced to description and the notion of function substituted for that of causation. (1994, p. 113)

One of the difficulties with functional interdependency is remaining consistent with its tenets. As Hume (1911) and recent commentators have observed (e.g., Moxley, 1992), there is a great temptation to grant causal status to certain factors. Skinner himself may have suffered from this inconsistency. (This may account for his possible inclusion in at least three of the four categories of determinism.) Even in Skinner’s later work, we see all sorts of cause-effect assertions:

Operant behavior is called voluntary, but it is not really uncaused; the cause is simply harder to spot. (Skinner 1974, p. 60)

The experimental analysis of behavior goes directly to the antecedent causes in the environment. (Skinner, 1974, p. 34)

Chiesa's own approach to functional interdependency also seems to evidence this inconsistency. Similar to Skinner, she cannot seem to resist the temptation of granting causal status to the environment. This is perhaps most clear in her contention that, "Behavior (the person) stands in a dependent variable relation to environmental events as independent variables" (p. 122). Although she does not use cause-effect or deterministic terminology *per se*, her methodological terminology clearly betrays the status she grants to the environment.

Establishing the environment as independent variable endows it with causal status for two reasons. First, the independent variable is manipulated and thought to determine changes in the dependent variable. This dependency on the independent variable is, after all, the reason this variable is called the "dependent" variable. Second, there is no reciprocity of the independent variable-dependent variable relation. As experimental design has come to be known and understood, the dependent variable is never considered to be the cause of the independent variable, nor is the methodological relation between independent and dependent variables thought to be reciprocal or bi-directional. In this sense, Chiesa's use of the methodological metaphor for describing a functional relationship suggests that the cause-effect meanings of traditional science have at least been implicitly supported in functional interdependency.

Another problem of functional interdependency concerns the issue of antecedence. Antecedence involves the temptation to grant some type of status — whether through causation, determinism, or an independent variable — to the event that

occurs first (Slife, 1993). Because the environment seems to act first upon the organism, and then (later in time) a behavioral change occurs, the temptation is to consider the environment as the causal agent. A functional interdependency theorist, however, cannot endorse events with causal status just because they precede other events in time (e.g., the first billiard ball to roll). Mach (1959) used the enmeshed gears of a windmill to illustrate this problem. Just because we observe one of the gears move first does not mean that it causes the gears' mutual motion. The observation of this motion could be the first event of a functional interdependency rather than a causal relation.

The physicist and philosopher Mario Bunge (1963) notes how often this confounding of antecedence and causation occurs: "The confusion between antecedence and causation is so common that philosophers found it necessary, very long ago, to coin a special phrase to brand this fallacy — namely, *post hoc, ergo propter hoc*" (after that, hence because of that) (p. 189). The point is that those who hold a functional interdependency view of determinism cannot give in to this fallacious temptation. The very point of functional interdependency is that events are just that, functionally interdependent. All the factors in question require the other factors to exist functionally, so that none can claim a privileged status, regardless of their observed order in time (Slife, 1993).

Part of the temptation to grant a privileged (or causal) status may stem from the nature of a purely functional interdependency account of the world: i.e., it is not very heuristic. At some level, the assertion (or conclusion) that behavior and the environment are "functionally interdependent" states the obvious. What is gained from such an assertion? This may be the reason that researchers, such as Skinner and Chiesa, inevitably slip into a cause-effect language and metaphors in their accounts. These researchers may sense that functionality does not fully explain the interdependency of

variables or add sufficiently to what we already know. Some sort of causal or deterministic metaphysics may be necessary to a useful and heuristic empirical understanding. As Skinner himself asserted:

[Science] is more than the mere description of events as they occur. It is an attempt to discover order, to show that certain events stand in lawful relation to other events.... If we are to use the methods of science in the field of human affairs, we must assume that behavior is lawful and determined. (Skinner, 1947, p. 6)

In this sense, the problems of functional interdependency may originate from the wish to escape metaphysical concepts. This wish is reflected in the attempt of some researchers to be purely descriptive, and thus to avoid metaphysics altogether (e.g., Chiesa, 1994, p. 113). As mentioned in regard to scientific determinism, many philosophers of science, however, question whether this wish can ever be fulfilled (e.g., Popper, 1959; Lakatos, 1970). They contend that scientific method is itself an instrument of metaphysics (e.g., that the dependent variable is "dependent"). This instrument was not itself created from a purely descriptive or objective method; scientific method has not itself been empirically validated. Traditional scientific method was invented by philosophers with certain assumptions about the world (Polkinghorne, 1983). As such, this method is not a transparent window to reality, and thus cannot render a transparent description thereto.

The upshot is that scientific method may not be capable of a pure, functional interdependency account of the behavior/environment relationship. Method may have too many metaphysical conceptions embedded within it to allow for such a descriptive endeavor. Even if these metaphysical elements could be extricated from the methods used, it is not at all clear that a purely descriptive account would be desirable. Science,

and by extension behavior analysis, may need to provide more than the many ways in which behavior and the environment are functionally interdependent. Scientific investigation may require some explanation of this “functional interdependence” and thus a richer understanding for use in therapeutic and educational settings.

Conclusion

The foregoing has identified four broad categories for organizing the various kinds of determinism apparent in the radical behaviorist literature. The implications that accompany each of these categories are intended to clarify the meaning of each category and alert researchers to possible problems that arise at the theoretical or methodological level. We hope that this taxonomy will facilitate open discussion about the potential strengths and limitations of each category, as well as a better understanding of the theoretical precepts that underlie radical behaviorist ideas. While no category of determinism is devoid of implications, we hope that this taxonomy will enable researchers to select the position (and implications) that provides the best theoretical foundation for their particular research and theorizing.

We suspect that more categories may need to be added to this classification system, or that some revision may be necessary with continued research and theorizing. We also suspect that some theorists or researchers will fit, at least loosely, into more than one category. Skinner’s overlap is especially noteworthy in this regard. As one of the originators of radical behaviorism, his many writings can be plausibly included in at least three of the taxonomic categories. The reasons for this overlap, however, would require another paper. They range from the complexity of Skinner’s theorizing to the possible ambiguity of his conceptions to the problems inherent in this taxonomy. Certainly, a pivotal issue is the orthogonality of these categories. Although these categories are widely used in theoretical and philosophical circles (cf. Valentine, 1992), their

independence is clearly at issue. Is it possible, for instance, to embrace both metaphysical determinism and functional interdependence?

Finally, some flux in the categories over time is anticipated. History indicates that general trends in how determinism is conceptualized changes and evolves with the changing contexts of science (e.g., Chiesa, 1992). Indeed, the changing face of science, and continued exploration and discovery, demand that any theoretical taxonomy be open to revision or outright rejection. The flexible nature of the present taxonomy assures that alteration and revision are possible as dialogue regarding these issues continues.

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Footnotes

¹A division between scientific determinism and scientific probabilism could parallel the division between metaphysical determinism and metaphysical probabilism. Scientific determinism would have psychologists pursue complete and perfect understandings in principle, while scientific probabilism would argue that only probabilistic trends can be adduced (even though nature itself is assumed to be determined). That is, some researchers could assume determinism as a methodological convenience, yet believe that only probabilistic — rather than perfect — estimates and predictions of future behavior are obtainable via our current methodology and instrumentation. Thus, the subcategory of scientific determinism (as described in this article) would include theorists who view determinism as a reasonable methodological starting point, but who do not wish to make ultimate-cause statements about human beings and who do not believe that behavior analysis will yield anything more than probabilistic estimates of an organism's behavior.