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Mentalism as a Radical Behaviorist Views It — Part 1

J. Moore

University of Wisconsin – Milwaukee

For radical behaviorism, mentalism is an orientation to the explanation of behavior in which the cause of behavior is attributed to phenomena in an extra-behavioral dimension. The extra-behavioral dimension is often characterized by such terms as mental, cognitive, subjective, or spiritual. Some representative terms for the mental phenomena are acts, states, mechanisms, processes, representations, and cognitions. Part 1 of the present review examines definitional issues associated with mentalism and provides further examples of mentalism. The review then examines some possible reasons for adopting mentalism, from the standpoint first of mentalists themselves and then of radical behaviorists.

Keywords: mediational neobehaviorism, mentalism, radical behaviorism

According to Moore (2008), a widely accepted view in the last quarter of the nineteenth century and first quarter of the twentieth century was that consciousness or subjective mental life was an appropriate subject matter for psychology, and introspection was an appropriate method for investigating that subject matter. Despite the widespread acceptance of this view, some researchers and theorists voiced concerns that research findings associated with the view were unreliable and failed to promote agreement. These concerns led to the rise of behaviorism by the end of the first quarter of the twentieth century. Behaviorists such as Watson (1913b) argued that psychology should discard its longstanding concern with conscious mental life as a subject matter and introspection as a method. Rather, psychology should objectively embrace behavior as its subject matter, and rely on experimental observation of that subject matter as its method. By emphasizing objectivity and observability, behaviorism claimed it would avoid such problems as the lack of reliability and agreement that seemed to be inherent in introspective reports.

The present article draws on themes in other work by the author, and includes revised portions of that work. Correspondence concerning this article should be addressed to J. Moore, Ph.D., Department of Psychology, University of Wisconsim – Milwaukee, Milwaukee, Wisconsin 53201. Email: jcm@uwm.edu

However, not everyone was convinced that the proposed form of behaviorism could make good on its claims, and the debate about the relative merits of mentalistic and behavioral approaches to psychology has continued ever since. In particular, scholars have debated whether behaviorism ignored something essential, or at least treated it in an incorrect way, for the purpose of causal explanations of behavior. Four comments are illustrative. The first is from Sober (1983):

> [M]ental states are inner. They are the causes of behavior and are therefore not identical with behavior . . . . Besides claiming that mental states cause behavior, mentalism goes on to say how these mental states manage to do so. (p. 113)

The second is from Fodor (1983; see also Fodor, 1968):

> Behavior is organized, but the organization of behavior is merely derivative; the structure of behavior stands to mental structure as an effect stands to its cause. (p. 2)

The third is from Haugeland (1981):

> Cognitivism in psychology and philosophy is roughly the position that intelligent behavior can (only) be explained by appeal to internal "cognitive processes." (p. 243)

The fourth is from Flanagan (1984):

> Any psychology, therefore, that fails to talk about mental events and processes will not be remotely adequate. The transformations which take place between our ears are the missing links needed to account for the regularities between stimuli and responses. The behaviorist's tactic of only attending to lawlike connections between observable events is comparable to resting satisfied with the knowledge that the Big Bang is responsible for the present state of the cosmos and not giving a hoot about what has gone on in between. (p. 243)

The implications that intelligent behavior can "only" be explained by appealing to cognitive processes, and that behaviorists of any stripe, presumably including contemporary radical behaviorists, "only" attend to observable events, amply testify to the strong feelings involved. To be sure, different mentalists conceive of the causal phenomena in different ways. Nevertheless, mentalism typically holds that a causal explanation of behavior is incomplete at best and defective at worst if it deploys only concepts from the observable behavioral dimension and fails to appeal to unobservable causal phenomena from an extra-behavioral, mental dimension.

For their part, behaviorists have also voiced the merits of their position, in opposition to mentalism. Watson was of course well-known for his arguments at the inception of behaviorism:

> All of these tendencies, initiated by the psychologists themselves, lead directly over to our principal contention, viz., that there are no centrally initiated processes. (1913a, p. 423)

A dozen years later, Watson continued his argument:

> Behaviorism claims that "consciousness" is neither a definable nor a usuable concept; that it is merely another word for the "soul" of more ancient times. The old psychology is thus dominated by a kind of subtle religious philosophy. (1925, p. 3)

In later years, Denny (1986) argued that

> The breath of fresh air provided by the S–R, behavioristic tradition, if overthrown, could set back an objective, scientific view of behavior many years . . . . We simply cannot afford a regression to dualism before we've even shed its remnants . . . .
>
> Finally, cognitive terminology is the language of everyday speech, and because of this, despite its advantage for communicating with the man in the street, is metaphorical and imprecise . . . . It also includes misconceptions that were built into the language over its long span of development. For all of these interrelated reasons, the innumerable evolutionary and experiential variables that determine behavior, of which conscious humans are generally unaware, can be seriously shortchanged within a strictly cognitive framework. (pp. 35–36)

The radical behaviorism of B.F. Skinner differs from the behaviorism advocated by Watson and Denny, but is no less opposed to the role of mentalism and cognitive orientations in psychology. In the passage below, Skinner (1987) was quite explicit about his concerns:

> *I accuse* cognitive scientists of speculating about internal processes which they have no appropriate means of observing. Cognitive science is premature neurology . . . .
>
> *I accuse* cognitive scientists of reviving a theory in which feelings and states of minds observed through introspection are taken as causes of behavior rather than as collateral effects of the causes . . . .
>
> *I accuse* cognitive scientists of relaxing standards of definition and logical thinking and releasing a flood of speculation characteristic of metaphysics, literature, and daily intercourse, speculation perhaps suitable enough in such arenas but inimical to science. (p. 111)

Clearly, behaviorists support their position just as ferociously as mentalists support theirs. The aim of the present review is to examine the relation between mentalism and behaviorism in contemporary psychology by addressing the following questions: (a) How is mentalism defined? (b) What are some examples of mentalism? (c) Why do mentalists say they embrace mentalism? (d) Why do radical behaviorists say mentalists embrace mentalism? Because of the complexity of this topic, I at times take a historical–critical approach and also engage a wide variety of correlated matters, to provide some historical and conceptual background for

the review. Some references are therefore foundational and range from early to mid- to late twentieth century. I do not take a tiresome "straw-man" approach, but rather seek to establish a necessary framework for analysis and evaluation. Overall, I hope to clarify the differences between mentalism and behaviorism, with the ultimate goal of realizing an effective and coherent science of behavior.

How Is Mentalism Defined?

In a sentence, mentalism consists in explaining behavior by attributing its cause to phenomena from a dimension beyond the one in which behavior takes place. More formally, an explanation may be said to be mentalistic when it subscribes to the four assumptions outlined below.

The first assumption is that an organism's psychological makeup includes a dimension that is beyond the one in which behavior takes place, such as by being inside the organism in some sense. The dimension of an explanation is at issue when its concepts are not expressed in descriptively consistent terms and cannot be confirmed through modes of analysis that are methodologically consistent with the behavioral facts for which they are said to account. Terms that are commonly used for this extra-behavioral dimension are mental, cognitive, subjective, spiritual, psychic, conceptual, hypothetical, mystical, and transcendental — in short, the dimension of mind. Henceforth, I use the single term "mental," recognizing that different forms of mentalism emphasize different terms related to this inferred dimension.

The second assumption is that this internal dimension contains certain phenomena that cannot be characterized in the same terms as observable stimuli and responses. The phenomena are unobservable and inferred to underlie behavior. Moreover, the phenomena are inferred to actively modify or transform an individual's experiences in the world at large, rather than merely reflect those experiences in any passive or neutral sense. Terms that are commonly used for these nonbehavioral phenomena are acts, states, mechanisms, processes, entities, structures, faculties, representations, and cognitions. Mentalism applies whether the dimension and its causal phenomena subscribe to either a dualistic or purely materialistic metaphysics. Henceforth, I use the phrase "states and processes," recognizing again that different forms of mentalism emphasize different terms related to these inferred phenomena.

The third assumption is that an explanation of behavior properly and necessarily consists in an appeal to these inferred, unobservable states and processes as causes of behavior, rather than to causes that are to be found in the same dimension as behavior or environmental events, variables, and relations. The way that these states and processes cause behavior differs across different versions of mentalism, and typically ranges from initiating to mediating. By initiating I mean that the states and processes themselves are the source of the behavior,

such that no source beyond them is necessary to explain the behavior. By mediating I mean that observable external stimuli activate or trigger some unobservable intervening or mediating state or process that is causally connected in some complex but systematic way to an ensuing observable response. In any event, the causal principles of mental states and processes differ qualitatively from those of observable events, variables, and relations.

The fourth assumption is that the proper focus of psychological explanations is the specification of the causal properties and capacities of the mental states and processes that are inferred to underlie behavior, rather than the functional relations between behavior and environmental events and variables. Observable behavior is important insofar as it provides evidence to support inferences about the causal properties of the postulated unobservable mental states and processes, rather than because it is a subject matter in its own right.

What Are Some Examples of Mentalism?

For radical behaviorism, mentalism is a common feature of many attempts in Western culture to understand an organism's behavior. Mentalism is sometimes invoked to explain nonhuman behavior, as in the field of "cognitive animal learning" (e.g., Zentall, Hogan, and Edwards, 1984). More often, however, mentalism is invoked to explain human behavior. Although some versions of mentalism subscribe to traditional mind–body or substance dualism, many others deny that they are dualistic and assert they are just as physical and materialistic as any other science, although certain of their analytic concepts may differ from those of other sciences. In what follows, I refer to these versions as ostensibly materialistic mentalism.

Ostensibly Materialistic Mentalism

I begin with perhaps the most common example of ostensibly materialistic mentalism among contemporary psychologists. This example involves a mediational approach. In a mediational approach, some sort of organismic mediator is assumed to be inside the organism in some sense, as part of its psychological makeup. As an illustration, consider the words of Neisser (1967):

> Whatever we know about reality has been *mediated*, not only by the organs of sense but by complex systems which interpret and reinterpret sensory information. The activity of cognitive systems results in — and is integrated with — the activity of muscles and glands that we call "behavior." (p. 3, italics added)

The organismic mediator is neither behavioral nor environmental. Rather, it is an unobservable feature of another dimensional system, though not a dualism.

An important concern is whether the mediator functions according to the same principles as observable stimuli and responses (e.g., Zuriff, 1985, pp. 104, 156). For mentalism, the answer is no. For example, Wessells (1981) argues that generally speaking, "cognitive explanations are biologically oriented, nonphysiological and mechanistic; they bear the unmistakable imprint of rationalism" (p. 155). In light of the negative answers, the mediator has the status of a functionally autonomous causal entity in a nonbehavioral system that underlies behavior. In some versions of a mediational approach, the organismic variables are presumed to be causal by affording "competence" and making the behavior in question possible. In other versions the environment is held to activate or trigger in some complex but systematic way an organismic variable, which in turn is held to activate or trigger in some complex but systematic way an eventual response. The organismic variable is causal in the sense that the mediators are what are temporally contiguous with the response. Regardless, the causal nature of the organismic mediator, such as its features and operating characteristics, is taken as the proper focus of psychological explanations, rather than a functional relation between environmental circumstances and behavior.

Mediational Neobehaviorism

Often, the mediational approach entails a formal commitment to an S–O–R model. Interestingly, this approach is also called mediational neobehaviorism. The prefix "neo" suggests it is a newer form of behaviorism, arising in the second quarter of the twentieth century as a successor to an original, unadorned classical S–R behaviorism (e.g., Watson, 1913b; see also Moore, 2008). Mediational neobehaviorism can be characterized as follows:

S (environmental stimuli) => O (organismic mediators) => R (response)

In straightforward language, the mediational model states that observable environmental stimuli (S) trigger some unobservable organismic mediator (O), which in turn causes an observable response (R). Unlike observable stimuli and responses, the O terms are unobservable states and processes that are inferred to be inside the organism and to mediate the relation between environmental stimuli and responses, as in Neisser (1967).

Following from the philosophy of science, many mediational neobehaviorists typically designate the S and R terms as observational terms, in the sense that the terms can be measured using standard observational methods and instruments. The terms are said to be "intersubjectively verifiable." In contrast, the mediating variables are unobservable. Again following from the philosophy of science, mediational neobehaviorists typically designate these variables as "theoretical terms." The mediating theoretical terms are then "operationally defined" with

respect to publicly observable variables in order to argue that the whole project is scientifically respectable and suitably objective, empirical, and capable of generating agreement. Different versions of this neobehaviorist mediational approach are distinguished by different conceptions of the organismic mediators.

The present review considers mediational neobehaviorism to be mentalistic. Again, some neobehaviorists may well assert that their mediational approach is behavioral, material, and nonmentalistic. For instance, neobehaviorists may argue that the appeal to an organismic mediator is scientifically appropriate and nonmentalistic because the mediator can always be operationally defined by referring to observable stimuli and behavior. Thus, they may argue that they are not proceeding in the same way as traditional introspective psychology, so they should not be considered mentalistic.

I suggest that grounds for viewing mediational neobehaviorism as mentalistic may be found in the words of representative mediational neobehaviorists themselves. For example, according to Kimble (1985),

> Even in Watson's day there were those, most notably Tolman, who attempted to bring mentalistic-sounding concepts back into psychology by means of what amounted to operational definitions. In a general way, the operational point of view did nothing more than insist that terms designating unobservables be defined in ways that relate them to observables. From there it proceeded to a further insistence that concepts defined in this way must have a relationship to behavior. In this way these concepts became intervening variables, ones that stand between observable antecedent conditions on the one hand and behavior on the other. The diagram below serves to summarize this point:
>
> Antecedent — Mentalistic — Behavior
> Conditions Concepts
>
> Independent — Intervening — Dependent
> Variables Variables Variables
>
> Obviously, there is nothing in this formula to exclude mentalistic concepts. In fact, the whole point of it is to admit unobservables. (p. 316)

And according to Amsel (1989),

> It has never been debatable — certainly not among neobehaviorists — that explanations should involve constructs [representing nonbehavioral states and processes that are inside organisms] . . . . And it is really not debatable either that stimulus–response theory refers, as it did in Hull's 21 papers in *Psychological Review* . . . , as well as his *Principles of Behavior* (1943), to hypothetical states and processes that "go on inside organisms." [T]he fact is that for the present S–R theorist, as I think for Hull and certainly for Spence, the mediating machinery defined as hypothetical Ss and Rs are no more or less permissible, and no more or less observable, than are the cognitive constructs the "emergent behaviorists" are now willing to permit . . . . It is an essential contradiction to refer to models of observables; and as I indicated earlier, such a characterization of S–R models does not fit the neobehaviorism of Hull, Spence, Miller, or Mowrer — or any other version of neobehaviorism, including my own. (pp. 50–51, 71)

The passages above reveal the unselfconscious commitment of representative mediational neobehaviorists to mentalistic causal variables and explanations (see also Moore, 1996).

Computer Metaphor

A common metaphor for mentalism in psychology is the computer (e.g., Dennett, 1984; Zuriff, 1985, pp. 160 ff.). To be sure, the computer may be of a very special kind, and some mentalists have come to challenge the metaphor, but nonetheless, the computer metaphor is often cited to rebut charges that mentalism is dualistic. Obviously, nothing of a dualistic ontology is involved in the computer.

A computer has both hardware and software. In simple terms, the hardware corresponds to the brain, and the software to the mind. With respect to its hardware, a computer has input and output devices. On the input side are such things as keyboards, USB ports, and network connections from other computers. These correspond to a person's sensory systems — the basis for registering the S as observable input in the S–O–R model. On the output side are such things as video screens, printers, and network connections to other computers. These correspond to a person's behavior — the R as observable output in the S–O–R model.

The more relevant component of the computer metaphor for the explanatory project of mentalism is its software. With respect to its software, a computer has an operating system that allows it to execute a program. On a given input, the computer's software moves information or "representations" among buffers, registers, and memory locations. The information or representations that are processed can be specified in terms of data structures. The software creates and changes functional machine states in the computer's hardware according to principles that can be described computationally. The internal processes and routines of the computer and the principles according to which the computer creates and changes states metaphorically correspond to the mental or cognitive acts, states, etc., of a person's mind as the person processes information — the O as mediator in the S–O–R model. At issue are the functional capacities, principles, and operating characteristics of the mediating elements in the information processing system as well as the functional architecture of the system as a whole. The processing systems in the person's mind are held to be relatively independent of experience, just as operating systems in a computer are relatively independent of experience, with the unfortunate exception one supposes of some influence of malware. The information processing functions and principles can be specified on a purely abstract and conceptual level, independently of whatever hardware realizes the design in any particular case, though many argue that whatever theory a mentalist proposes, the mentalist should *in principle* be able to describe how it could be realized in an actual mechanism.

Conscious or Unconscious?

In other respects, the phenomena typically cited in mentalistic explanations may be either conscious or unconscious. By conscious I mean that under appropriate circumstances individuals can talk about these mental phenomena, and by unconscious I mean that even under appropriate circumstances individuals cannot. In cases when individuals can talk about mental phenomena, an account of how they come to do so is not offered. Rather, the ability to do so is simply taken for granted as an inherent property of one's mental life.

Why Do Mentalists Say They Embrace Mentalism?

I next review three arguments that mentalists often make about why they embrace their position. The three arguments follow from assumptions and inferences that mentalists typically make about how other forms of psychology approach the matter of explanation, how mentalism offers advantages, and how mentalism is therefore superior. Mentalists particularly contrast their position with any form of behaviorism, regardless of whether it is classical S–R behaviorism, mediational S–O–R neobehaviorism, or radical behaviorism.

Argument 1: Observability

First, mentalists assume that other forms of psychology, particularly behaviorism, are committed to explaining behavior in terms of publicly observable relations between stimuli and responses. Mentalists argue that this commitment leads behaviorists to develop incorrect explanations. Explanations should emphasize unobservable mental states and processes.

To be sure, mentalists acknowledge that a behaviorism committed to observables may once have contributed in some marginally positive fashion to psychological explanations by questioning the reliability of introspection (e.g., Zentall, Hogan, and Edwards, 1984). However, mentalists argue, psychological theories and explanations should no longer be limited to observables. Instead, given such explanatory safeguards as formal hypothetico–deductive practices that were developed after early behaviorism, theories and explanations should now be freely permitted to make use of unobservables, which are inferred to be theoretical and inside the organism in some sense.

Indeed, when it comes to Skinner's radical behaviorism, mentalists often assume that the adjective "radical" implies a fanatical or extreme position that mandates the consideration of only publicly observable variables. One illustration of this assumption is Neisser (1967): "From Watson . . . to Skinner . . . , radical behaviorists have maintained that man's actions should be explained only in terms of observable variables" (p. 5). Another illustration is Nelson (1969):

> Roughly speaking, the behaviorist maintains that the proper subject of animal psychology is overt behavior, i.e., bodily movements, verbal responses, and glandular secretions, and that behavior should be (and hence can be) explained in terms of directly observable events affecting the animal, stimuli, reinforcements, and the like. Some behaviorists permit in addition the use of "intervening variables" or certain "theoretical constructs" — terms which designate inner organismic occurrences of certain kinds. If the behaviorist uses such terms he does so not to throw light on inner occurrences but only as tools for explaining externally observable events; for him terms about inner events must be eliminable and must have a merely heuristic or concept economizing role in inquiry. In terms more familiar to the philosopher, behaviorism advocates employment of observation predicates, including disposition predicates, and eschews nonreducible theoretical terms . . . . For a behaviorist explanation implies a detailed discovery never of how an organism responds, but only of what if [sic] responds to, of the intensity of its response, and of external reinforcements. To the behaviorist the organism is a "black box" and remains such to the end of inquiry . . . . His purpose is to force the relation to be a function (to find a law) without recourse to inner states or biases . . . . He does not look for higher laws containing terms referring to the inner workings of the man from which to deduce the low-level S–R relationships. (pp. 418–419)

Nelson continues as follows:

> It is simply not possible . . . to account for external behavior without asking how the animal works. Psychological explanations *have to be* deductions of laws about external behavior from higher-level theoretical laws about the inner structure of animals. This holds not only for explanations of linguistic and other kinds of intelligent behavior (contrary to Ryle and Skinner) but for very primitive animal–automaton behaviors as well. Animals come with built-in rules, for in a sense this is what an internal state is, whether a memory state or a grammatical category. And there is no finding out about performance, verbal or otherwise (insofar as an animal processes "information"), without investigating the rules. (p. 451)

Thus, many mentalists argue that behavior can and should be understood in terms of some other causes than observable antecedent environmental stimulation. Those causes must be the underlying, unobservable, mental phenomena that yield such features as variability and creativity. One example is Fodor (1981), who appealed to the metaphor of a vending machine to make the case. The input to the vending machine is money, say, in the form of coins. The output is some consumable product, say, a soda. Now suppose that someone has inserted one less than the required number of coins to purchase a soda, and leaves the vicinity of the machine. The next person comes along, inserts a coin, and receives the soda much earlier than expected (i.e., predicted). Fodor argued that this event is entirely understandable from an internalist point of view such as found in cognitive psychology, but not from the externalist point of view such as found in behaviorism. According to Fodor, the dispensing of the soda can be understood (i.e., predicted) as a function of the internal state of the machine. The machine is in the intermediate (n–1) state, such that the relevant property of this state is that the next coin will cause it to progress to the next and terminal state, in which it dispenses a soda. The dispensing of the soda

cannot be understood simply on the basis of inserting coins. Remember that the second individual did not expect (i.e., predict) that the machine would dispense a soda after only one coin.

Another example is Nelson (1969), who appealed to the metaphor of a Turing machine. Such a machine accomplishes some psychologically interesting task by progressing through a series of steps, where each step can be defined as an internal state that follows upon a given input. Progress through the steps may be understood in terms of transitions between internal states, where each state is computationally derived from the application of the rule to the previous state, given an input. Any particular state (and, as necessary, its output) can only be understood on the basis of the internal rule for the transition; it is not fixed by the input into the system.

Finally, according to some mentalist accounts, many if not most of these mental causes are uniquely specialized and "modular" for the particular type of behavior they cause. They are not general purpose mechanisms or processes that can be conscripted to support other forms of behavior (e.g., Fodor, 1983). As Pinker (1997) put it,

> The mind is what the brain does; specifically, the brain processes information, and thinking is a kind of computation. The mind is organized into modules or mental organs, each with a specialized design that makes it an expert in one area of interaction with the world. The modules' basic logic is specified by our genetic program. The operation was shaped by natural selection to solve the problems of the hunting and gathering life led by our ancestors in most of our evolutionary history. (p. 21)

In sum, mentalists regard behaviorism as at best only atheoretical and descriptive, rather than theoretical and explanatory, precisely because of the way behaviorism limits itself to observables. Again, mentalists argue that mentalism is correct and superior to behaviorism because it takes underlying, unobservable causes from another dimension into account in a unique and theoretical way. These mental states and processes are independent contributions of the organism, and reflect an active mind. Any position that does not take these mental states and processes into account, as mentalists assume any form of behaviorism does not, must therefore be dead wrong.

Argument 2: Token and Type Physicalism

Second and related to the first, mentalists assume that other forms of psychology, particularly behaviorism, are committed to the principle of physicalism in an incorrect way. This commitment leads the other forms to develop incorrect explanations of behavior. This section looks first at physicalism, and then at the mentalists' objections to the behaviorist view of physicalism.

As originally interpreted, physicalism is the thesis that for every sentence P

in the language of a branch of science, including psychology, there must be a sentence Q in the language of physics such that P and Q can be logically deduced from each other, without remainder. Physicalism was strongly emphasized in logical positivist philosophy of science at the beginning of the second quarter of the twentieth century, as the logical positivists sought to rationally reconstruct science in ways that did justice to the cognitive significance of important scientific terms and concepts. Smith (1986) has suggested that many wrongly assume behaviorism is very tightly connected with logical positivism, if not subordinate to it.

Suppose a mediational neobehaviorist explains behavior by appealing to something that is not directly observable, such as a mediating "internal state" as an organismic variable. The internal state may in turn be interpreted as a theoretical concept. According to original interpretations of physicalism, the mediational neobehaviorist must in turn be prepared to identify the measurements or readings on instruments that justify talk about the internal state and make such talk meaningful. Such a justification would consist in reducing talk of the internal state to publicly observable readings on meters, dials, counters, and so forth, with nothing left over, so that agreement can be reached.

Pain is a suitable example. Suppose I say some person engages in a particular form of behavior because the person is in pain, where being in pain implies being in some particular internal state. Just what does being in an internal state of pain mean, in terms that are scientifically appropriate? One form of a physicalistic statement might be that a particular type of neurons at stereotaxic location x–y–z inside the skull are firing, where the firing can be detected by the instruments used in physics. Because of these firings, the individual then has a disposition to engage in (observable) behavior, such as moaning and groaning, again where this behavior is detected by the measuring instruments used in physics.

At issue here is the distinction between token physicalism and type physicalism. This distinction was actually framed several decades after the logical positivists advocated their physicalistic approach. Nevertheless, I examine the distinction here because of its direct relation to discussions about how physicalism should be applied in psychological theories and explanations. The first concern is whether an *instance* of being in a mental state can be adequately described in terms of its physical properties. That is, the concern is whether mental terms *denote* physical properties of the organism. This sense of physicalism may be called "token physicalism." Mentalists, at least those who are not overt dualists, say yes and accept token physicalism. Mentalists say it is correct to do so, as token physicalism is consistent with a materialist orientation. At the risk of some debate, I suggest that mentalists say both logical positivists and neobehaviorists also agree and accept token physicalism. Consequently, token physicalism is really not a source of disagreement between mentalism, on the one hand, and either logical positivism or neobehaviorism, on the other hand.

The second concern is whether being in a *type* of mental state can be adequately defined in terms of the *type* of physical properties manifested in the organism said to be in that state. That is, the concern is whether mental terms *connote* physical properties of the organism. This sense of physicalism may be called "type–type physicalism," or more simply just type physicalism. Mentalists say no and reject type physicalism. Mentalists argue that even though instances (i.e., tokens) of mental phenomena surely do have physical properties, which may well involve such features as the firing of neurons and dispositions to engage in some form of behavior, types of mental phenomena are not properly defined in terms of the types of their physical properties. Rather, types of mental phenomena are defined in terms of their *functional* properties. As formally developed, this position is often called "philosophical functionalism." For example, mentalists argue the type of mental phenomenon called "pain" is defined by, or connotes, being in the type of mental state that is causally related to behavior in a particular way, rather than by the type of physiological state defined by the firing of, say, particular neurons at a particular stereotaxic location inside one's skull. Being in that causal state could well be realized in multiple ways. The defining property connoted by each of these ways is that they cause behavior, rather than that they have a common physical property (e.g., Putnam, 1980). In other worlds, silicon molecules might be involved in pain rather than neurons being involved. Similarly, particularly stalwart Spartans might be in pain but would actually laugh and smile, rather than moan and groan. The functionalist argument is that the defining property of the type of psychological state called pain is its causal relation to a particular form of behavior, not any physically observable property. Again at the risk of some debate, I suggest that according to mentalists, both logical positivists and neobehaviorists accept type physicalism. However, according to mentalists, the logical positivists and neobehaviorists are wrong to do so. Mentalists argue that any position that reduces the defining properties of types of mental phenomena to the types of their physically observable properties, as mentalists assume any form of behaviorism (or logical positivism) does, is just dead wrong.

Argument 3: Explanation

Third, mentalists assume other forms of psychology, especially behaviorism, explain behavior in an inadequate way. Following from an emphasis on observables, behavioral explanations take either of two forms: (a) instantiation and (b) the covering law model (see Moore, 2008, chapter 13). Neither is adequate because neither typically identifies the underlying mental states and processes that are responsible for the behavior. The result is that behavioral explanations are dead wrong.

In regard to explanatory practices in mentalism, Wessells (1981) stated that

> One of the chief points made above is that the two approaches [cognitive and behavioral] diverge sharply in their metatheoretical claims and their conceptions about explanation. The chief aims of radical behaviorism are to predict and control behavior . . . . In contrast, the principal aim of cognitive psychology is to explain behavior by specifying on a conceptual level the universal, internal structures and processes through which the environment exerts its effects.
>
> Some unfortunate misunderstandings [between cognitivists and behaviorists] have probably arisen from the failure to discern and to analyze these differences in goals and conceptions about explanation. From the behaviorist outlook, cognitive explanations appear fictional in that they do not refer ultimately to the environment. From the cognitive outlook, behavioral explanations appear incomplete and misguided because they describe but fail to explain the effects of the environment. In order to achieve extensive cooperation between behaviorists and cognitivists, these differences in conceptions of explanation will have to be reconciled. (pp. 167–168)

In addition, Wessells (1982) observed that

> The trouble is that, for cognitivists, functional relations between environment and behavior are not explanatory . . . . No amount of order among observables will satisfy the desire to discover the internal processes through which the environment influences behavior. (p. 75)

It is useful to provide some further background to this argument, as the argument is central to understanding the differences between mentalism and behaviorism. According to instantiation, such events as instances of behavior are said to be explained when they can be described using a general proposition, equation, or law, with variables as parameters in the statement. The parameters can then take on different values in different cases (e.g., they can be "estimated" after the fact from obtained data), with the result that the statement is said to explain the data in question by symbolically representing the data.

An illustration of instantiation in psychology is the psychophysical law of S.S. Stevens: $\psi = kS^n$. Here, ψ is said to represent the strength of the psychological, subjective sensation, as inferred from the participant's reported numerical estimate; k is an individual difference parameter; S is the actual magnitude of the physical stimulus — measured objectively as the physicist would measure it; and the exponent n is the critical term for "sensitivity," relating the subjective estimate of the stimulus to its objective measure. The data from any particular subject were considered to be explained when they were described by particular values of the variables, but the general form of the equation was what was regarded as important, rather than the particular values of the variables. Worth noting further is that at face value, this explanatory strategy speaks only of relations between observable data, and avoids direct appeals to anything unobservable, as when late nineteenth and early twentieth century structuralism appealed to consciousness via introspective methods.

For cognitive psychology, instantiation is inadequate because it doesn't identify the underlying mental states and processes that cause the data to turn out the

way they do. Instantiation might in some cases be considered as a starting point for an explanation, by suggesting that an organism might have some sort of underlying mental states and processes with some sort of functional properties and capacities that are responsible for the data. However, instantiation is not an ending point because it stops short of specifying what the functional properties and capacities of those mental states or processes actually are.

As an aside, I note that cognitive psychology also makes a similar criticism of dispositional approaches to the mental, such as found in philosophical behaviorism. According to this criticism, rendering the mental in terms of a disposition to engage in observable behavior is hardly an explanation because doing so is at best merely descriptive: the rendering fails to specify the mental states or processes that cause the disposition.

The second explanatory strategy is the covering law model (Hempel and Oppenheim, 1948). According to the covering law model, such events as instances of behavior are considered to be explained when their descriptions follow as a valid deduction in a logical argument in which at least one of the premises is a covering law and at least one of the other premises is a statement of antecedent conditions. Adherents to a logical positivist view of the unity of science, including most neobehaviorists, particularly favored covering law explanations.

An illustration of covering law explanation in psychology is the explanation below of why a rat pressed a lever:

Covering law:	Organisms engage in behavior that has previously been reinforced.
Statement of antecedent conditions:	Lever presses have previously been reinforced in the presence of the given antecedent conditions.
Conclusion–description:	The rat pressed the lever.

A noteworthy feature of covering law explanations is the explanatory symmetry between description and prediction. For example, if the statement of the antecedent condition and the conclusion of the argument are in the past tense, the conclusion is in fact a description of what has already been observed. The event — lever pressing — is said to be explained. If the statement of the antecedent condition and the conclusion of the argument are in the future tense, the conclusion is in fact a description of something that has not yet happened but will happen if the antecedent conditions are imposed. The event is predicted: the rat will press the lever. Individuals can then impose the antecedent conditions and determine whether the prediction comports with

the facts of experience. The covering law model accommodates all these matters by emphasizing simply that explanation is a matter of the logical structure of the argument. In addition, given that science is presumed to strive toward the development of laws, the logical validity of the argument is taken as support for the validity of the covering law itself, though it cannot prove the law is true, as saying so commits the fallacy of affirming the consequent. Perhaps the most that can be said is that confirmed predictions "corroborate" the law.

Cognitivists have in general equated behaviorism with covering law explanations (see discussion in Cummins, 1983). Even though the covering law model of explanation has been extraordinarily influential, it has not been without its challenges. Cognitivists have not always originated the challenges, but cognitivists have certainly used them in their own criticisms of what they construe as behavioral explanations. The challenges are of many sorts, but two sorts are relevant for present purposes: (a) conceptual matters relating to the notions of "events," "descriptions," and "laws"; and (b) implications of the explanatory symmetry between description and prediction.

Cognitivists maintain that behaviorism is concerned with events, and that the concept of event is suspect and always has been, from Hume to Mill to the present day (see discussions in Salmon, 1984, 1989). Suppose an individual turns on a light switch while going downstairs in the middle of the night to get a glass of milk. In the process of turning on the light switch, the individual scares away a prowler. One could argue that any of several aspects of this scenario is the event: going downstairs, flipping the switch, the light coming on, or scaring the prowler.

As for description, let us suppose John is a bachelor. Further, suppose John also has red hair. It is unclear whether the John described as a bachelor is the same as the John described as having red hair.

Similar concerns may be raised about laws. Suppose we state a "counterfactual" law, such as saying "If ravens were white, then event N will take place if conditions a, b, and c obtain." According to the technicalities of truth functional logic, any conclusion is true in such cases, and the conclusion cannot be said to possess truth content (Sosa and Tooley, 1993, pp. 205–207, 217–233). Indeed, in a classic article, Meehl (1970, p. 389) pointed out that the problem of counterfactuals pertains directly to the logic of orthodox experimental designs comparing data from one or more control groups with data from one or more experimental groups. The logic of control group methodology is to say that if the control group had been treated the same as the experimental group, its data would have been the same. Again, according to truth functional logic, this conclusion is vacuous, in that it is without truth content. Cognitivists charge that these examples all pose considerable challenges to covering law explanations.

A second challenge to covering law explanations concerns the symmetry of description and prediction (Salmon, 1984, 1989). Three cases illustrate this

challenge. The first starts with the observation that the elevation of the sun above the horizon determines the length of the shadow cast by a flagpole of a given height. If an individual knows the height of the flagpole and the angle of the sun, geometry allows the individual to predict and therefore explain the length of the shadow. In like manner, geometry also allows an individual to determine the height of the flagpole from the length of the shadow. Saying that the length of the shadow "explains" the height of the flagpole seems unreasonable, but according to the covering law approach, it does.

A second case is as follows. Suppose an individual knows that if the barometer drops, there will be a storm. As before, saying the drop in the barometric reading explains the storm, which is an appropriate sense of explanation in light of the covering law model, seems unreasonable. More reasonable is to say the barometer and the storm are simply two effects of a common cause.

A third case is as follows. Suppose John Jones, a male, takes his wife's birth control pills and does not become pregnant. Moreover, any other male who regularly takes oral contraceptives will avoid becoming pregnant. This case conforms to the requirements for covering law explanation. Again, however, it seems unreasonable to regard it as a bona fide explanation of why John Jones or any other male does not become pregnant.

Thus, cognitivists argue against regarding explanation as fundamentally concerned with observable events that are described and then considered to be explained when they are subsumed under a covering law. Cognitivists similarly argue against any position that relies on the covering law model, as they assume any form of behaviorism does.

As an alternative, cognitivists generally favor explanations identifying mental states and processes that are inferred to underlie behavior, which we have seen throughout the present review. These states and processes are inferred to possess the functional capacities and properties that can explain the observed events, in the appropriate and meaningful sense of explain. Overall, the concern is not with performance as an event, but with the internal structures that make the event in question possible (Cummins, 1983). The question of "Why does x occur?" is taken to mean "By virtue of what capacities and properties in the object(s) under observation does x occur?" As before, any position that does not explain behavior in these terms, as mentalists assume any form of behaviorism does not, must be dead wrong.

Why Do Radical Behaviorists Say Mentalists Embrace Mentalism?

In this section I examine how the three mentalist arguments above apply to mediational neobehaviorism and radical behaviorism. I argue that mentalism seriously misunderstands both mediational neobehaviorism and radical behaviorism, though in different ways. I conclude that mentalism and neobehaviorism

are actually compatible, not different from each other as each maintains, and that each differs from radical behaviorism.

Argument 1: Observability

Recall the first mentalist argument assumes that behaviorist explanations wrongly appeal primarily if not exclusively to publicly observable stimulus–response relations. Mentalists argue that explanations should appeal instead to unobservable mental states and processes.

With respect to mediational neobehaviorism, I point out that it actually does not assume explanations should be limited to observables. In fact the whole history of appeals to organismic mediators as theoretical terms in neobehaviorism is surely evidence that neobehaviorist explanations freely appeal to unobservables, as the previously cited passages from Kimble (1985) and Amsel (1989) indicate. The emphasis on operationism may make the appeal to unobservables in neobehaviorism indirect rather than direct, but the appeal is there nonetheless. Indeed, neobehaviorism favors its versions of unobservable organismic mediators for many of the same reasons that cognitive psychology favors its versions of cognitive states and processes. Ironically, cognitive psychologists are just as incorrect in arguing against neobehaviorists as neobehaviorists are in arguing against cognitive psychologists: cognitive psychology and neobehaviorism are comparably mentalistic precisely because of the way they both appeal to mediating causes from another dimension in their theories and explanations.

With respect to radical behaviorism, an important matter concerns the notion of antecedent causation. Roughly speaking, the notion of antecedent causation consists in the commitment to some antecedent factor as the principal if not exclusive cause of the event in question. Mentalism implicitly accepts the notion of antecedent causation, such that causal analysis consists in identifying one or another underlying mental state or process as the casually effective antecedent for behavior.

Moreover, mentalism assumes that radical behaviorism also accepts the notion of antecedent causation, but that it is committed to the wrong antecedent. That is, mentalists apparently assume that radical behaviorism is committed to the view that behavior is determined in a one-for-one way by an observable environmental stimulus, as some form of S–R psychology, rather than by an underlying mental state or process. The passage from Nelson (1969), cited earlier in the present review, is surely evidence of this assumption. Although there is a sense in which antecedent causation may be relevant in analyses of respondent behavior (recognizing that neither unconditioned nor conditioned respondent behavior is as simple as some take it to be), for radical behaviorism the important form of behavior is operant behavior, not respondent behavior. For operant behavior, the important causal mode is selection by consequences, not antecedent

causation. Thus, cognitive criticisms assume radical behaviorism is committed to antecedent causation in terms of observable antecedent environmental stimuli, when the very concepts of operant behavior and selection by consequences plainly indicate it is not. Once again, cognitive criticisms are wide of the mark, and the grounds for holding cognitive explanations to be necessary and superior are incoherent.

For its part, radical behaviorism suggests that the undeniable richness, novelty, and rapid development of verbal behavior can be a function of stimulus generalization as well as equivalence relations. Textbooks are full of common examples. Consequently, further examples are not offered here. Suffice it to note that the very notion of operant behavior suggests an organism that is actively operating on its environment. Once again, it is incorrect for mentalists to claim unique credit for their position. Radical behaviorism works according to the framework of operant behavior, which differs from the S–R framework of classical behaviorism. Many mentalists fail to recognize the difference, assuming all forms of behaviorism accept the S–R framework. Thus, the understanding that radical behaviorists have of the provenance and maintenance of both nonverbal and verbal behavior is very different from the understanding that cognitive psychology and mediational neobehaviorism have. Consequently, radical behaviorism ends up at a very different place.

Finally, I point out that radical behaviorism doesn't prescribe that theories and explanations of behavior should be limited to events, variables, and relations that are publicly observable, and has never claimed they should be so limited. For example, an important feature of Skinner's radical behaviorism is that of a private behavioral event. A private behavioral event occurs within the skin in a way that is not accessible to any other person. Nevertheless, a private behavioral event is regarded as within the behavioral dimension, and amenable to the same type of analysis as is a public behavioral event. Therein lies the difference between radical behaviorism, on the one hand, and both mentalism and mediational neobehaviorism, on the other hand. As Skinner put it,

> No matter how clearly these internal events may be exposed in the laboratory, the fact remains that in the normal verbal episode they are quite private . . . . There is, of course, no question of whether responses to private stimuli are possible. They occur commonly enough and must be accounted for. But why do they occur, what is their relation to private stimuli, and what if any, are their distinguishing characteristics? (1945, p. 273)

> When we say that behavior is a function of the environment, the term "environment" presumably means any event in the universe affecting the organism. But part of the universe is enclosed within the organism's own skin. Some independent variables may, therefore, be related to behavior in a unique way . . . . With respect to each individual, in other words, a small part of the universe is private.
>
> We need not suppose that events which take place within an organism's skin have special properties for that reason. A private event may be distinguished by its limited accessibility but not, so far as we know, by any special structure or nature. (1953, pp. 257–258)

Again, however, the radical behaviorist basis for including phenomena that aren't accessible to more than one person differs from that of mentalism and mediational neobehaviorism. The mentalist argument, whether by cognitive psychologist or mediational neobehaviorist, implicitly accepts the mentalistic view that words are things whose meanings are established by determining what the words symbolically represent or refer to: either observable objects or events in the world at large or unobservable acts, states, etc., in the minds of individuals. On this view, the term behavior is taken to refer to something that is observable. If something is not observable, it must not be behavioral. Rather, it must be going on in the dimension of mind, such that it must be dealt with in a different way than is observable behavior. Radical behaviorists reject this symbolic, referential view of verbal behavior and its assumption of events in the mind as erroneous. Readers may consult Skinner (1957) for a comprehensive treatment of how the functional view of verbal behavior in radical behaviorism differs from the symbolic, referential view in mentalism. Consequently, any verbal distinction between what is and is not publicly observable needs to be considered very carefully. In particular, radical behaviorism argues that the mentalist position about the role of unobservables in the history of science seriously misreads the nature of scientific behavior, especially scientific verbal behavior, for example, as found in Skinner (1957, chapter 18 on logical and scientific verbal behavior; and 1953, p. 275 ff., on the verbal process of abstraction). Thus, radical behaviorism finds the mentalist alternatives, based on the supposedly unique and theoretical way mentalism accommodates unobservables, as distinctly unsuitable.

As seen in the previously cited passages from Skinner (1945, 1953), radical behaviorism argues that some parts of the environment as well as some instances of behavior are private or covert, in the sense that they are not accessible to more than one person. However, there seems to be no good reason to label them as from a mental rather than behavioral dimension, simply because they are not observable from the vantage point of another person. The private, covert phenomena may be talked about and incorporated in the same way as observable stimuli and behavior.

As one example, consider the topic of introspection. Radical behaviorists argue that when individuals introspect they are behaving. Individuals introspect when the social community in which they live induces them to respond either verbally or perhaps even nonverbally to their own behavior and the circumstances that cause that behavior. Individuals introspect when they engage the full ecological context of their lives. Introspective terms do not mean individuals are reporting on as many as 42,415 different mental states and processes that cause their behavior. In the first place, the processes that would be necessary to establish such fine-grain verbal discriminations are not plausible. In the second, humans do not even have nerves going to the right places (e.g., in their brains) to make contact with the supposed causal states and processes.

As another example, consider terms held to manifest "propositional attitudes," such as beliefs, desires, and intentions. Radical behaviorists argue such terms are concerned with operant behavior. In these cases, behavior is guided by an actor's own verbalizations of what the actor is doing and why, particularly concerning the consequences of those actions, however incipient or inchoate such verbalizations may be. As with introspection, such terms do not mean that an actor's behavior is caused by mental phenomena in another dimension. Comparable analyses may be carried out on other nominally mental terms, such as agency or intensionality. Thus, radical behaviorism may well include explanatory and interpretive concepts that are occasioned by events, variables, and relations not accessible to others, but it does so very differently than does the mentalism of cognitive psychology and neobehaviorism.

Argument 2: Token and Type Physicalism

Recall the second mentalist argument assumes that behaviorist explanations wrongly subscribe to type physicalism. Mentalists argue that explanations can legitimately involve token physicalism but not type physicalism.

Interestingly, contemporary forms of mediational neobehaviorism don't actually hold to physicalistic definitions in the way that mentalists charge. To be sure, historical review suggests that mediational neobehaviorists do adhere to the distinction between observational terms and theoretical terms. As in logical positivism, observational terms can be measured using the instruments of physics. Theoretical terms are unobservable. At issue then is how to define theoretical terms. The common answer is through the operational definitions: by referring to the observable operations and calculations entailed in their measurement (Bridgman, 1927). Logical positivists had initially embraced the idea that theoretical terms were to be exhaustively defined in a physical-thing language. That is, on the basis of their interpretation of physicalism, logical positivists held that theoretical terms and concepts were to be defined *without remainder* by referring to observables. Similarly, mediational neobehaviorists initially embraced a particular interpretation of operationism that involved exhaustive definitions of theoretical terms and concepts in a physical-thing language. Such an approach implies that the position later called type physicalism was essentially correct.

However, logical positivism actually dropped the requirement for exhaustive definitions during the 1930s (e.g., Carnap, 1936, 1937; see Zuriff, 1985, chapter 4). The logical positivists instead came to favor partial definitions. Partial definitions explicitly allowed for the term to have meaning that applied to other situations. The logical positivists were particularly concerned about the existential status of a dispositional property if the test operation that was held to demonstrate or measure the property was not being carried out at literally that moment in

time. Suppose we ask why sugar dissolves when it is placed in a beaker of water. One answer is that it does so because it is soluble. This answer invokes solubility as a dispositional property, defined as the robustly high probability of dissolving when put in water. The answer carries a number of implications: (a) that solubility is a property that exists and is possessed by the sugar, even though the test operation to demonstrate solubility isn't being conducted at literally that moment in time; (b) that the solubility of sugar applies tomorrow just as much as today, even though the sugar hasn't yet been put in the water; (c) that sugar's solubility could be revealed by another sort of test operation, if only in a different beaker of water; and (d) that the meaning of any particular theoretical term is only partially rather than exhaustively established by any particular test operation, given that other test operations might be devised to demonstrate the property. Given such implications, the logical positivists came to embrace the idea of partial definitions, which allowed them to neutralize concerns about the generality and flexibility of theoretical terms.

An approach based on physicalism and mandating exhaustive definitions of theoretical terms ultimately proved as controversial in mediational neobehaviorism as it had in logical positivism. There was general agreement that scientific statements should in fact be general and broadly applicable. However, exhaustive definitions were problematic because they explicitly limited the range of application to the one case in which they were formulated. In a controversial article on operationism in *Psychological Review*, the psychologists Israel and Goldstein (1944) commented critically on the relation between operationism and the breadth of meaning of psychological terms, and how that meaning in turn affected research methods in psychology. The article caused such a stir that E.G. Boring, long an advocate of operationism, suggested to Herbert Langfeld, the editor of *Psychological Review*, that a symposium be convened under the auspices of the American Psychological Association to resolve some of the disputed points. Six individuals participated: E.G. Boring, P.W. Bridgman, H. Feigl, H. Israel, C. Pratt, and B.F. Skinner. Boring devised a series of questions that each participant might address. Participants were also asked to add their own questions. In their answers, participants danced around the questions, mainly restating entrenched positions. Regrettably, nothing of substance was actually resolved.

More than ten years after logical positivism had moved beyond the requirement for exhaustive definitions and three years after the aforementioned Symposium on Operationism, the psychologists MacCorquodale and Meehl (1948) published a landmark article in which they proposed a linguistic convention concerning unobservable theoretical terms. More specifically, they suggested one type of theoretical term be called an "intervening variable," and another a "hypothetical construct." An intervening variable was simply a summary term and did not refer to an entity that actually existed. For example, it might be the product of a mathematical function. It was exhaustively defined according to the processes

and operations in its computation. In contrast, a hypothetical construct was assumed to have some existential status. Importantly, it was not defined by a single referent or process. Rather, it had multiple referents, no one of which was all inclusive. Given its existential status, it was assumed to have properties and implications and extrapolations that hadn't yet been demonstrated. Any particular explanatory application only partially rather than exhaustively defined its meaning.

Mediational neobehaviorists looked favorably upon the MacCorquodale and Meehl (1948) distinction, as it resolved many of their earlier concerns. Under a hypothetical construct interpretation, psychological terms could now admit "surplus meaning," which they could not under exhaustive definitions. It was not that prior to 1948, all theoretical terms for mediational neobehaviorists were intervening variables, and after 1948, all theoretical terms were hypothetical constructs. Rather, the controversy was that psychologists had assumed all along that most of their theoretical terms were things that did actually exist, for example, as independent variables that influenced the behavior of subjects, but had to be exhaustively defined. However, given an exhaustive definition, psychologists expressed concern because they couldn't then use the term to develop general principles or build general systems. The advent of hypothetical constructs afforded the necessary flexibility. In this regard, readers may recognize that Miller (1959) later talked of how the meaning of psychological terms had become "liberalized" in mediational neobehaviorist theorizing.

In any event, because mediational neobehaviorism came to accept a hypothetical construct interpretation of theoretical terms that permits surplus meaning, especially concerning the mental (e.g., Amsel, 1989; Kimble, 1985), I argue that contemporary forms of mediational neobehaviorism accept token physicalism but not necessarily type physicalism, just as mentalists say is appropriate. Thus, mentalists err when they condemn contemporary forms of mediational neobehaviorism for their supposed acceptance of type physicalism. Cognitive psychologists are just as incorrect in arguing against contemporary forms of mediational neobehaviorism as contemporary mediational neobehaviorists are in arguing against cognitive psychology — cognitive psychology and contemporary neobehaviorism are comparably mentalistic.

For his part, Skinner was influenced a great deal by Bridgman and operationism, as he acknowledged later on: "In my thesis I had proposed an operational definition of a reflex, drawing upon Bridgman, Mach, and Poincaré" (Skinner, 1979, p. 116). What Skinner was talking about here was his dissertation from the winter of 1930–1931, and about the writing of which he had sparred extensively with Boring, one of his mentors in the Harvard Department. Skinner's interpretation of Bridgman and operationism as reflected in his 1945 Symposium contribution differed from that of the others, especially Boring. For Skinner, operationism entailed the functional analysis of verbal behavior. Early in his contribution to

the Symposium, Skinner (1945) argued that

> A considerable advantage is gained from dealing with terms, concepts, constructs, and so on, quite frankly in the form in which they are observed — namely, as verbal responses. There is then no danger of including in the concept that aspect or part of nature which it singles out . . . . Meanings, contents, and references are to be found among the determiners, not among the properties, of response. (p. 271)

For Skinner and his radical behaviorism, the determiners in a causal analysis of verbal behavior are the elements of the contingencies that govern the emission of the response (e.g., Skinner, 1957, p. 10). Particularly important are the antecedent circumstances that occasion the verbal response in question. In everyday language, the concerns focused on the events, variables, and relations with which the speaker was in contact, and that lead to the verbal behavior in question. Skinner's contribution rejected the idea that operationism should be interpreted from the standpoint of the symbolic, referential view of language. Yes, the question of how to engage the meaning of scientific terms was important, and yes, operationism contributed to an answer. However, it did so by assessing the extent to which scientific verbal behavior was occasioned by scientific operations and contacts with data, as opposed to other, incidental sources of control that were cherished for extraneous and irrelevant reasons. Verbal behavior under the latter source of control could be safely discarded because it did not lead comparably to effective action. In particular, operationism did not contribute as traditionally assumed, namely, by legitimizing the use of public observations as proxies to represent an unobservable but nonetheless causal mental process going on in a nonbehavioral dimension, just so people could agree. With regard to psychological terms, some of the determiners may well be private behavioral events inside the skin, but again they may be accommodated in the same way as such determiners as public behavioral events, outside the skin. The terms do not symbolically represent a mental process that differs from a behavioral process. This view of verbal behavior promotes an understanding of the relation between private behavioral events and both nonverbal and verbal behavior, and ultimately promotes effective action, such as prediction and control.

In his contribution, Skinner (1945) pointedly argued against the traditional view of operationism, which implied that any operation can be asserted after the fact to be the measure of any desired unobservable causal phenomenon, and that the approach should therefore be considered scientific. Surely, Skinner argued, this approach will not do. Thus, Skinner argued the traditional view of operationism only perpetuated rather than resolved the longstanding mental–physical distinction in psychology and the attendant view that mental phenomena caused behavior.

Later in his contribution, Skinner (1945) stated as follows:

> The public–private distinction apparently leads to a logical, as distinct from a psychological, analysis of the verbal behavior of the scientist, although I see no reason why it should. Perhaps it is because the subjectivist is still not interested in terms but in what the term used to stand for. The only problem which a science of behavior must solve in connection with subjectivism is in the verbal field. How can we account for the behavior of talking about mental events? The solution must be psychological, rather than logical, and I have tried to suggest one approach in my present paper. The complete lack of interest in this problem among current psychological operationists is nicely demonstrated by the fact that the only other members of the present panel who seem to be interested in a *causal* analysis of verbal behavior are the two non-psychologists (one of them a logician!). (p. 294, italics in original)

The passage above is noteworthy in its forceful commitment to a "*causal* analysis of verbal behavior" and reformulation of the relevance of a so-called "logical analysis," especially in cases of psychological terms. In another portion of his contribution, Skinner argued that "If it turns out that our final view of verbal behavior invalidates our scientific structure from the point of view of logic and truth-value, then so much the worse for logic, which will also have been embraced by our analysis" (p. 277). This entire orientation is decidedly at odds with a traditional orientation, certainly within philosophy but also psychology, that emphasizes language as inherently a symbolic, referential process, and logic as a kind of superordinate template from another dimension to which language must conform, such that specification of the logical status of terms is necessary for the proper determination of what language means. Indeed, to so view logic is part of the problem that mentalism causes.

Importantly, the functional approach recognizes that stimuli and responses are generic concepts — they belong to classes, and the functional relations (such as the one called reinforcement) obtain between classes of stimuli and responses. To be sure, radical behaviorism does accept that there is a physical, material world that affects the behavior of organisms: "What is lacking [in traditional mentalistic psychology] is the bold and exciting behavioristic hypothesis that what one observes and talks about it is always the 'real' or 'physical' world (or at least the 'one' world) and that 'experience' is a derived construct to be understood only through an analysis of verbal (not, of course, merely vocal) processes" (Skinner, 1945, p. 293). However, as before, radical behaviorism proceeds very differently with its explanatory concepts than does the mentalism of mediational neobehaviorism and cognitive psychology. Once again, the basis for the radical behaviorist position differs from the mentalism of both mediational neobehaviorism and cognitive psychology.

Argument 3: Explanation

Recall the third mentalist argument against behaviorism concerns explanation. For mentalists, behavioral explanations wrongly take the form of instantiation or more often deductions from covering laws involving publicly observable vari-

ables. Mentalists argue that explanations should appeal instead to the causal properties and capacities of mental states and processes.

The distinctions and practices of radical behaviorist explanation often do not map neatly onto traditional distinctions and practices. In the most general and conventional use of the term "explanation," radical behaviorism labels an instance of verbal behavior as an explanation when the verbal behavior in question is occasioned by the causal influence of environmental factors on behavior at the level of phylogeny, ontogeny, or culture (Moore, 2008, chapter 13). Typically, that influence takes the form of a functional relation. For instance, in talking of behavior that developed during an organism's lifetime, Skinner (1964) stated "When I said 'explanation,' I simply meant the causal account. An explanation is the demonstration of a functional relationship between behavior and manipulable or controllable variables" (p. 102). Thus, the radical behaviorist position is that an event is explained when a speaker's verbal behavior is under the discriminative control of the observed functional relation, that is, under the discriminative control of the functional relation between the variables participating in the event and the behavior of interest. Causal explanation plays a central role in Skinner's system, given the fundamental concern with practical outcomes, and causation is expressed as a functional relation, in the fashion of Mach and Russell. To say that an event is explained is equivalent to saying that the events, variables, and relations that caused it have been identified. The events may be described in abstract and economical terms using a minimal number of concepts, showing relations among the elements so described, but at the heart of the explanatory process is the identification of functional relations. When individuals are asked to explain what they mean, they are typically being asked to specify what has caused them to say what they have said.

In any event, radical behaviorism does not adhere to instantiation or covering law approaches to explanation in the same sense as does neobehaviorism. Instantiation fails to identify the contingencies responsible for the behavior being described. In the case of Stevens' psychophysics, the mentalistic assumption is that the verbal report (or a discrimination procedure more generally) veridically reflects the sensation as an internal cause. For a radical behaviorist, individuals clearly do have sensations, such as those caused by environmental circumstances. To say otherwise is to adopt the dualistic Cartesian view that individuals just do have such clear and distinct perceptions about phenomena inside them that the individuals could not possibly be incorrect when they talk about those phenomena. In this regard, the assumption is that individuals are just automatically able to correctly describe their internal events, by virtue of having a "private language" that enables them to do so. Day (1969, p. 495) argued that in many accounts, an appeal to a private language is a prime indicator of mentalism, if not dualism.

Regarding radical behaviorism and covering law approaches, I note that in principle, manipulation of verbal statements may well inform decisions about what interventions may be expected to produce what effects, as a pragmatic matter. Indeed, the derivation of empirically supported generalizations that can guide effective action without others having to go through the derivation is surely one of the goals of science. Often such generalizations are sufficiently abstract to be called "laws." Nevertheless, at issue is effective action, not the logical form of an argument. On the one hand, suppose an individual wants to have a flagpole of a given height. If so, the individual can just build it. Individuals can't independently manipulate the length of a shadow in a way that would allow them to predict whether its height meets their needs. On the other hand, suppose for some reason an individual wants to have a shadow of a particular length at a particular time of day. If so, the individual can independently manipulate the length of the flagpole, so that it does produce a shadow of the desired length. It isn't that logic is irrelevant, but rather that practical, effective action is the fundamental concern.

Simply put, the argument here is that radical behaviorism does not adhere to instantiation and covering law approaches to explanation as those approaches are traditionally conceived. Accordingly, attempts in cognitive psychology to discredit radical behaviorism by discrediting instantiation and covering law approaches and then implicitly linking radical behaviorist explanatory practices to these approaches is well wide of the mark.

Moreover, radical behaviorism calls attention to the continuing problem of the source of control over the supposedly unobservable, underlying acts, states, etc., of cognitive explanations. For radical behaviorism, much of the control over the verbal behavior called a cognitive explanation is to be found in extraneous sources that are cherished for irrelevant and incidental reasons: (a) social–cultural traditions as exemplified in "folk psychology," (b) linguistic practices in which adjectives and adverbs are reified into nouns and awarded causal status, and (c) mischievous metaphors. Such sources of control are at variance with the established observational foundations of science. Cognitive psychologists argue that the history of science reveals unobserved factors should not be ruled out of consideration — talk of atoms and subatomic particles is valid in physics and chemistry, talk of receptor sites is valid in biology, and so on. Radical behaviorists answer that it is necessary to examine the sources of control over any verbal behavior taken as explanatory. As Day (1969) noted, "To fail to view the problem of explanation . . . as *inescapably* an empirical and behavioral problem, is perhaps to miss the force of what well may be Skinner's major contribution to psychological thought" (p. 505). An instrumentalist orientation does not justify appeals to cognitive processes in another dimension any more than it justifies appeals to a luminiferous ether, phlogiston, or vitalism in other sciences.

To be sure, explanatory extensions of known processes in the one dimension are well accepted in science, even though formal laboratory or experimental analyses have not been conducted. Lyell had a principle of uniformitarianism. Geologists appeal to plate tectonics. Biologists appeal to evolutionary mechanisms. The laws of physics are taken to apply in outer space or the deepest depths of the ocean. Radical behaviorists call this practice "interpretation" (e.g., Moore, 2008, chapter 13). Indeed, in testimony to the importance of such interpretive extensions Skinner (1957) called his account of verbal behavior "an exercise in interpretation rather than a quantitative extrapolation of rigorous experimental results" (p. 11). The important point is that such interpretive extensions do not appeal to causal events that are assumed to be taking place somewhere else, at some other level of observation, which must be described in different terms and measured, if at all, according to a different ontology than known processes. Thus, cognitive explanations are not interpretive in the present sense. As Skinner put it, appeals to mediating mental states and processes in cognitive psychology "have nothing to do with scientific advances but rather with the release of the floodgates of mentalistic terms fed by the tributaries of philosophy, theology, history, letters, media, and worst of all, the English language" (Catania and Harnad, 1988, p. 447). If the hallmark of explanation is effective action, such as prediction and control, the radical behaviorist argument is that cognitive explanations do not sufficiently advise anyone what to do, or what to take into account, in order to secure a given outcome in the one, behavioral dimension.

Causes

The present argument is that to explain an event like behavior is to specify its cause. Aristotle's classic approach in terms of material, efficient, final, and formal causes may be reconstrued to outline the possibilities for variables and relations that can be manipulated to cause some desired outcome (e.g., Moore, 2008, chapter 13). Here, the material cause may be reconstrued as the physiology of the sentient organism. The efficient cause may be reconstrued as the contingency: the interrelation among antecedent circumstances, behavior, and consequence of the behavior. The final cause may be reconstrued as the consequence itself, providing a function of the behavior in the life of the organism. The formal cause may be reconstrued as the antecedent circumstance or source of discriminative stimulation in the contingency. Logic serves its valuable purpose by examining the boundaries of the classes of variables and relations participating in such actions. The concern is with identifying the circumstances under which a contingency (with such and such a discriminative stimulus and such and such a consequence) can be expected to produce such and such a behavioral effect. Again, the relations so expressed may be abstract, but in principle they can be traced to pragmatic concerns about what actions yield what outcomes.

Physiological manipulations literally change the state of an organism, as a material cause. For example, food deprivation brings about physiological changes called a state of hunger, and water deprivation brings about changes called a state of thirst. In this sense it is meaningful to say that depriving a rat of food or water *causes* it to press the lever when food or water is a consequence of doing so. In addition, there are other motivating operations that pertain to the concept of state. Social psychologists manipulate mood or attitude in an experiment by presenting stimuli correlated with various social practices in culture, such as what is likely to be reinforced or punished. These manipulations make some classes of actions more or less probable by changing the behavioral effectiveness of other consequences. Presumably, these manipulations have changed something physiological inside the behaving organism, although the locus of the change is typically not specified. Traditional psychology embraces these manipulations as affecting the internal state as a mediating organismic variable from another dimension in the S–O–R model. On a traditional view, operational definitions are held to safeguard the process and promote agreement, thereby making the whole process legitimate.

Zuriff (1985, p. 57) points out that a state can function as a parameter in expressing the relation between stimulus and response, and vice versa. Thus, statements 1 and 2 below are logically equivalent:

1. Given (state of organism), if (contingency), then R will occur
2. Given (contingency), if (state of organism), then R will occur

Suppose a covering law model of explanation is accepted. If statements 1 and 2 are logically equivalent, then radical behaviorism pragmatic considerations prevail for the purpose of explanation. At issue is what is to be done to cause the event in question, or what is to be done to predict and control. In principle, accepting either the state of the organism or the contingency as given and then imposing the other will suffice. With respect to statement 1, the pragmatic issues are (a) how to put the organism in the state in question, so that the desired behavior follows; and (b) how to discern that the organism is actually in some particular state, if a manipulation hasn't been performed to put it in the state. With respect to statement 2, the pragmatic isssues are (a) how to put the contingency in effect, so that the desired behavior follows; and (b) how to determine the range of states over which the contingency may be expected to produce the desired behavioral effect.

Behavior analysis has no particular problem with a pragmatic interpretation of states. Indeed, in a discussion of his own research, Skinner pointed out that "One of my first papers . . . was on the state of hunger (or 'drive'), and I have been interested in states off and on ever since" (Catania and Harnad, 1988, p. 122). Elsewhere, Skinner stated that "The organism behaves as it does because of its

present state" (Catania and Harnad, 1988, p. 305). The radical behaviorist concern about mentalism is that states are traditionally conceived as in an extra-behavioral dimension, and to follow different rules than variables and relations in the behavioral dimension. One problem with traditional psychology is that the logical equivalence of statements 1 and 2 above is taken to justify the reality of the state variable however it is conceived, even if from a mental dimension.

A radical behaviorist view leads on to different views of the epistemological role of theories, models, and equations in science. For radical behaviorism, they are typically verbal products called abstractions, continuous with or extensions of basic data. They are economical and abstract descriptions of organizations and relations among data, expressed in a minimal number of terms. The periodic table of elements is a suitable example. The periodic table is a statement about organizations of data. Similarly, the gas laws are abstract statements about relations among pressure, temperature, and volume, apart from the specific events that cause the changes in pressure, temperature, and volume. These forms of science obviously do not appeal to intervening or mediating acts, states, mechanisms, processes, entities, and so forth from a different dimension.

Material causes for radical behaviorism are about the physiology of the organism and its states, where states are interpreted as above. Information about material causes can be used to predict and control, recognizing that the organism is also always going to be in contact with some specific set of environmental circumstances. Being able to produce a given behavioral effect by putting an organism in a given state, even though environmental circumstances may vary widely, adds to the value of knowing about actual state manipulations. Being able to produce a given behavioral effect by imposing a given set of contingencies, even though an organism's initial state may vary widely, adds to the value of the contingency manipulations. Those questions and trade-offs are empirical.

Manipulations of environmental circumstances are the stuff of efficient, final, and formal causes. Obviously these causes are not independent of material causes. If the formal cause is the discriminative stimulus, an auditory stimulus of 30,000 Hz is not going to function as a discriminative stimulus for a human because of the limitations of the material cause. If the final cause is the reinforcer, a food pellet is not going to increase the probability of the response if the organism is not hungry, given that a state of hunger may be construed as a material cause. Thus, it is meaningful to say that turning on a discriminative stimulus *causes* a rat to press the lever, or the consequence of a food pellet *causes* a rat to press the lever, or the contingency involving discriminative stimulus, response, and consequence *causes* the rat to press the lever. As before, these variables and relations derive from the one, behavioral dimension, not a mental dimension. Importantly, they are relevant to prediction and control when manipulated or at least known about.

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