

IN RESPONSE

COMMENTARY ON “COMING TO TERMS WITH MOTIVATION IN THE BEHAVIOR-ANALYTIC LITERATURE” BY ALÓ AND CAÑADO

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Aló and Cañado’s (this issue) primary argument is that motivation should be described in terms of an intervening variable. Furthermore, they raise secondary points concerning the status and usage of technical terms and the scope of the motivational concept in behavior analysis. We agree with Aló and Cañado that a clear definition of motivation is essential. However, we disagree with their analysis on a number of fundamental points, such as the correct use of technical terms, the range of phenomena that should be considered as motivational, and we argue that the concept of the intervening variable is incompatible with radical behaviorism. We contend that motivation is best conceptualized as factors that influence the rate of operant responding but that are not part of the operant contingency and that, as with the term reinforcement, the terms operation and process are useful distinctions that should be employed.

Key words: motivation, consequence-valuing operation, consequence-valuing process, intervening variable

Aló and Cañado (this issue) make the case that the concept of motivation is best described in terms of an intervening variable. Although we agree with some aspects of Aló and Cañado’s arguments, such as the need to have a clear definition of motivation, we disagree with their analysis on a number of fundamental points. In this commentary, we stress the importance of using of technical terms correctly, we discuss what phenomena should be considered as motivational, and we argue that the concept of the intervening variable has no place in radical behaviorism. We contend that motivation is best conceptualized as factors that influence the rate of operant responding but that are not part of the operant contingency (Whelan & Barnes-Holmes, 2010). That is, the value of the consequences should be described in terms of the level of responding that occurs relative to some previously measured baseline and that, as with the term of *reinforcement*, the terms *operation* and *process* should be employed.

Terminological Issues

Correct Use of Technical Terms

According to Catania (1969), “the vocabulary of reinforcement includes at least three nouns: reinforcer as a stimulus, reinforcement as an operation, and reinforcement as a

process or as a relationship between an operation and a process” (p. 845). As an operation, reinforcement is the delivery of a reinforcer; as a process, it is the increase in responding produced by the operation. Thus, Catania argued for a clear distinction between operation and process. In contrast, Aló and Cançado suggest that distinguishing clearly between operation and process may be problematic because “given the strength of verbal traditions in behavior analysis . . . this may be difficult to implement” (p. 646). Furthermore, they write that “even though the de facto approach in behavior analysis is to differentiate between operations and processes, the same term is frequently used to refer to both”—for example, *reinforcement*, *punishment*, and *extinction*. However, we disagree fundamentally with Aló and Cançado on this point: Using inaccurate scientific terms, or using terms loosely, cannot be justified simply because such practices have been employed in the past. Distinctions between operations and processes are well established in behavior analysis, perhaps even to the extent that they can be considered axiomatic. Indeed, we believe that it is useful to keep an explicit distinction between operation and process because it helps to avoid confusion due to the circular nature of the definition of *reinforcement* (see Catania, 1969, p. 846).

Two Terms, but One Concept

Aló and Cançado write, in relation to our conceptualization of motivation in terms of operation and process, that “the adoption of two new terms to refer to motivational variables based on the argument that operations and processes need to be explicitly differentiated could call for the same differentiation regarding other behavior-analytic terms” (p. 646). We found this criticism puzzling, given that there would be no loss in parsimony: Behavior analysts already use the terms *operation* and *process*, notwithstanding the previous point regarding their misuse. Perhaps the issue simply involves the use of acronyms. *Reinforcement*, *punishment*, and *extinction* are long-established terms, and describing them in terms of operation and process is well established. We assigned the acronyms CVO and CVP to consequence-valuing operation and consequence-valuing process, respectively, to emphasize the operation/process distinction. Our use of acronyms was influenced by the previous use of acronyms in the motivational literature (e.g., EO, CEO, MO, etc.). Note, however, that endorsement of the acronyms CVO/CVP is not necessary for our concept of motivation; rather, the central notion is that motivation should be described in terms of a change in responding relative to some baseline, without the operant contingency being affected. Thus, when Aló and Cançado write that “the behavior-analytic community could be called to adopt two new terms to replace *reinforcement*” (p. 646), it is important to remember that the concept of reinforcement already encompasses both operation and process.

Scope of the Concept: What Phenomena Are Motivational?

Definition by Exclusion

Aló and Cançado write that defining motivation by exclusion—that is, by factors that are outside the operant contingency—is problematic for two reasons: first, because of the unaccounted effects of extraneous variables and second, because variables that are not part of the *n*-term contingency that affect responding may not necessarily be motivational. We deal with each of these points in turn.

First, “as the limits of this definition are loosely determined, the effects of extraneous variables could be inadvertently attributed to EOs” (p. 645). However, it is the experimenter’s role to isolate controlling variables to the extent that their effect on the target behavior is attributable to that variable. If a putative motivating variable is manipulated in a proper and systematic fashion, and the target behavior changes in accordance with that manipulation, then that variable was motivational. If the controlling variable was not clearly demonstrated, it is the experimenter’s “fault” and does not impinge upon the theoretical interpretation of motivation (whatever that may be). As an aside, it is worth noting that if one follows Aló and Cançado’s line of reasoning, in principle the

effects of noncontrolled or unknown variables could just as easily be attributed to discriminative stimuli in situations where experimental manipulations are not implemented in a careful and systematic fashion.

Second, Aló and Cançado write that definitions by exclusion—that is, “the idea that all events that are not part of Category X are necessarily a part of Category Y . . . may be dangerous” (p. 645). However, there are only two factors (or three, if we consider a combination of the first two) that can influence operant behavior: either consequences are more or less available, or they are more or less effective. In other words, what do Aló and Cançado propose as Category Z, a factor that influences operant behavior without affecting either consequence availability or effectiveness?

In a related vein, Aló and Cançado write that “this [Aló and Cançado’s] perspective also encourages the inclusion of procedures in applied settings that may not otherwise be defined as motivational, such as interventions in which rate, delay, and magnitude of reinforcers are manipulated” (p. 650) because “Mazur’s definition of value includes variables that are part of the *n*-term contingency” (p. 656). This is a clear point of difference between Aló and Cançado’s and our approach: Interventions affecting rate, delay, and magnitude of reinforcers should not be considered as motivational from our perspective. Including phenomena that regulate reinforcer availability rather than reinforcer effectiveness would seem to be contrary to the behavior-analytic concept of motivation (e.g., Catania, 1992; Skinner, 1953), and would likely lead to difficulty in isolating the source of the control over behavior.

Aló and Cançado also present a specific example (p. 646) of their thinking in this area:

An animal is exposed to a fixed-ratio (FR) schedule until stable, high-rate responding occurs. Then, a differential-reinforcement-of-low-rate (DRL) schedule replaces the FR schedule under the same discriminative stimulus, and response rates remain high during several sessions, even though reinforcement rates decrease significantly as a result. . . . Should the history under the FR schedule be considered motivational or consequence valuing, because it altered responding during the exposure to the DRL without changing the current contingencies arranged by the DRL schedule? Even though the FR history meets the criterion for defining a CVO, one could argue it should not be classified as motivational because it did not change the effectiveness of the *consequence*, but simply the probability that the animal would produce it.

It is important to note, however, that Whelan and Barnes-Holmes (2010) defined consequence valuing as *change* relative to a baseline measure, but in the previous example there is no change in response rate from baseline. Therefore, if there were no change in behavior, there were no motivational factors involved. As an aside, in the Cole (2001) study, responding rapidly decreased following the change of schedule, and Cole reported this effect as strong evidence for control by the immediate consequences of behavior. In this case, given a decrease in responding, we would not say that the effect was a CVP. Rather, factors within the operant contingency have been altered (i.e., the availability of the consequence) and hence this decrease in responding is not due to motivational factors.

Designed Versus Naturally Occurring Changes

Aló and Cançado write that “it seems that operations defined as motivational should include not only operations *designed* to alter the value of a consequence but also operations that happen without explicit manipulation (e.g., those in effect when a food-deprived animal forages in the wild)” (p. 646). They are correct that Whelan and Barnes-Holmes (2010) focused on behavior modification, that is, a focus on prediction and influence over behavior rather than a description of behavior. In the same way that the concept of

reinforcement is not necessarily restricted to explicit manipulations, our concept of consequence value is not necessarily restricted to operations designed to alter behavior. A common definition of an operation (here, for reinforcement) follows: "As an operation, reinforcement refers to the occurrence of a consequence subsequent to a behavior" (Cooper, Heron, & Heward, 1987, p. 257). Following Cooper et al.'s definition, we could describe the length of food deprivation as a consequence-valuing operation (i.e., length of deprivation does not make food differentially available, and foraging increases relative to some baseline). Nonetheless, we still strongly favor a definition of motivation that focuses on behavior change via explicit manipulation of environmental variables.

Conceptual Issues: Status of an Intervening Variable

Aló and Cançado write, "We propose that operations and processes are differentiated as independent and dependent variables that can be classified under the intervening variable *value* or *consequence value*" (p. 650) and that "consequence value would be nothing more than a name used when certain operations . . . produce certain behavioral effects" (p. 649). We believe that this approach is fundamentally incompatible with radical behaviorism, is not parsimonious, and is not pragmatic.

It is worth considering the history of the intervening variable and its important role in mediational neobehaviorism (Moore, 2010). In mediational behaviorism, unobservable mediational variables are allowed to bridge the gap between environment and response. That is, environmental variables affect unobservable internal variables (e.g., value), and these variables in turn affect responses. Therefore, understanding the nature of the mediational variable frequently becomes the primary focus of the analysis. The concept of the intervening variable was introduced so that concepts could be operationalized to be applied to a variety of situations. MacCorquodale and Meehl (1948) described intervening variables as having only the properties of the empirical data of which they are an abstraction (in contrast, a hypothetical construct has unobserved properties beyond its public manifestations).

The concept of an intervening variable (e.g., value) with some quantitative properties has been criticized. For example, Moore (2008) has written that "to contend that some usage of a theoretical term such as 'value' in a quantitatively oriented theory is permissible because it is merely a theoretical construct, or that it is just an intervening variable, with no surplus meaning, rather than hypothetical construct, with surplus meaning is mischievous and deceptive" (p. 657). According to Moore, this is because distinguishing between terms such as *intervening variable* and *hypothetical construct* assumes a referential view of verbal behavior and requires the adoption of a position called epistemological dualism. Epistemological dualism holds that scientific knowledge is acquired through the manipulation of variables in another dimension. The intervening variable, therefore, is an event "taking place somewhere else, at some other level of observation, described in different terms, and measured, if at all, in different dimensions" (Skinner, as cited in Catania & Harnad, 1988, p. 88). Given that the intervening variable exists in a dimension removed from the target behavior and the environment in which it occurs, it is inefficient because it adds extra complexity without additional explanatory power. In contrast, describing consequence value in terms of operations and process allows us to focus on environment-behavior relations, and it is recognized that our scientific descriptions of these events are simply verbal behavior, which are subject to verbal contingencies. In effect, the use of a quantitative intervening variable diverts attention away from prediction and influence over behavior and toward a post hoc estimation of the value of the intervening variable.

Conclusion

Motivational factors play a key role in the scientific analysis of behavior, and it is therefore important that the behavior-analytic treatment of motivation (a) is consistent

with behavioral principles and (b) explains behavior–environment relations with no more explanatory concepts than are necessary. Our main objections to Aló and Cançado’s conceptualization of motivation as an intervening variable are that it is inconsistent with widely established behavior analytic principles and that it is not parsimonious. Rather, we argue that extant concepts of behavior analysis can be used to adequately describe motivational phenomena. That is, a comprehensive and efficient behavior-analytic approach to motivation is possible by isolating the environmental factors that influence responding, measuring any change in responding, and employing the useful terminological distinction between operation and process.

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