Reactions to Reese: Lord, Let Us Laud and Lament

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Reese (1996) makes two incontrovertible points: Behavior analysis is not physiology, and humanity's current knowledge of physiological processes is inadequate to explain the kinds of behavioral phenomena that are of interest to behavior analysts. That these points require emphasis in an article published in *The Behavior Analyst* surprises us. Perhaps it should not. Skinner was at times enthusiastic about the promise of physiology, as in the following passage:

The physiologist of the future will tell us all that can be known about what is happening inside the behaving organism. His account will be an important advance over a behavioral analysis, because the latter is necessarily "historical"—that is to say it is confined to functional relations showing temporal gaps. (Skinner, 1974, p. 236)

It may merit mention, albeit in 25 words or less, that the future prophesied by Skinner in 1974 has not arrived in 1995 and is not likely to arrive soon. Those who await the day when physiologists explain behavior will no doubt derive comfort from an old hymn, "Farther Along." It goes something like this:

Farther along, we'll know more about it
Farther along, we'll understand why
Cheer up, my brethren, live in the sunshine,
We'll understand it, all by and by.

In the meantime—which may last forever—the best strategy is to isolate variables that influence important behavior and manipulate those variables to make life better. To do so is to be a behavior analyst. Reese seems to be arguing along these lines, and to that extent we support his views. We assume that most other behavior analysts

would do likewise, for there is no evidence in journal articles or textbooks that they are embracing physiological explanations of behavior or abandoning their traditional focus on environmental variables.

We do not, however, support Reese's criticisms of pseudophysiology, his concept of "products of physiology," or his analysis of the behavioral functions of those products. Moreover, we believe that understanding what is known concerning the relation between physiology and behavior is requisite for behavior analysts to interact profitably with other scientists, and that the techniques of behavior analysis are well suited for exploring what are fundamentally physiological questions. Though behavior analysts *need not* study physiological processes, there is no fundamental reason why they *should not* do so.

Real and Pseudophysiology: Setting Fire to Straw People

Most of Reese's discussion of explanation in behavior analysis is reasonable, although his coverage of reductionism reminds one of the adage against beating dead horses. Although it is true that at some level of analysis prediction and control of the phenomena of interest become impossible, it takes no special wisdom to stop short of that level. This is true regardless of whether the discipline is chemistry, pharmacology, physiology, or behavior analysis. For example, in drug discrimination studies in which subjects are trained to emit one response in the presence of morphine (a mu opioid receptor agonist) and another response in the presence of drug vehicle, one can safely predict that other mu agonists at appropriate doses will engender mor-

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phine-like patterns of responding, whereas drugs that affect other receptor subtypes will engender vehicle-like response patterns. One can predict and control how a subject will perform in drug substitution tests given foreknowledge of test compounds' affinity and efficacy at mu receptor sites, and can ignore entirely what happens at other, more reductionistic, levels.

Legitimate physiological explanations are based on empirical observations of actual physical events and do not involve explanatory fictions of any sort. Reese's extensive criticism of theories and models that appear to make reference to physiological events, but are in fact based on "hypothetical physiology," are gratuitous in a paper concerned with the relevance of physiology to behavior analysis. They may well offend legitimate physiologists, in the same way that we behavior analysts are offended by people who misrepresent our good works by selecting absurd interventions and weak theorizing for criticism.

*Products of Physiology:
What Are They and What
Do They Do?*

Reese makes the case that behavior analysts can safely ignore physiological processes but should attend to the products of physiology. These products may act as discriminative stimuli, reinforcing stimuli, and establishing operations, or in several other ways. As examples of physiological products, he includes instinctive drift, observer drift, hunger, birth, puberty, menopause, teething, facial wrinkling, and even behavior itself. What, if anything, these phenomena have in common is unclear. Surely they are not products in the conventional sense. Birth, for example, is a physiological process, the product of which is a baby. Hunger is a subjective state or an intervening variable. Behavior encompasses instinctive drift, observer drift, and perhaps hunger.

If the concept of physiological prod-

ucts is ever to be of use, there must be criteria for determining when a physiological process ends and a physiological product begins and ends. Puberty, for example, can be envisioned as a series of hormonal and other physiological changes that result in the development of secondary sexual characteristics, such as breast development in females. Seen in this sense, developed breasts may be a product of puberty. They persist, however, for decades. At what point do developed breasts stop being a product of the physiological process of puberty?

Grouping together the vastly different phenomena that Reese considers to be products of physiology does nothing to clarify the role of those phenomena in controlling behavior. One concept that behavior analysis definitely does not need is that of products of physiology. At best, the concept emphasizes that behavior is determined by physiological processes, and we all know that. Don't we?

Even less informative than Reese's explanation of products of physiology is his discussion of the possible behavioral functions of those products. For example, he posits that "secondary sex characteristics and visible signs of aging may function as discriminative stimuli for approach and nonapproach types of social behavior, respectively" (p. 62). They may, but they do not, at least not generally. If they did, puberty would be correlated with differential reinforcement of approach responses by all conspecifics, whereas wrinkles, graying hair, and other signs of aging would be correlated with extinction of the same kinds of behavior (producing nonapproach). If such consequences were arranged, appropriate stimulus control of approach and nonapproach behavior would be engendered. In reality, of course, the stimulus control of social behavior is subtle and interactive and characteristically involves verbal mediation. Although discriminative stimuli surely play a role in human social interactions and physical features can acquire discriminative functions,

they do so on an individualized basis. Young people provide reinforcement for some kinds of approach responses from certain people, young and not so young. They extinguish or punish similar responses by other people. The same is true of middle-aged and elderly individuals. The kind of experiment that Reese describes would fail utterly in examining the behavioral function of secondary sexual characteristics, and the analysis he proposes is a grand oversimplification, at best.

Biology, Neuroscience, and the Survival of Behavior Analysis

Unlike Reese, we consider behavior analysis to have more in common with biology than with psychology. Skinner at least occasionally shared our view, as is evident in his parallel discussions of natural selection and selection by reinforcement (e.g., 1981, 1984), and in passages like the following: "I must begin by saying what I take a science of behavior to be. It is, I assume, part of biology" (1978, p. 69).

Physiology, too, is a part of biology, and the tactics and strategies characteristic of the experimental analysis of behavior are well suited for exploring interactions between physiology and behavior. Examples of such research are apparent in published sources (e.g., Barrett, 1991) and at the yearly meetings of the Neuroscience Convention, where many of the papers describe operant procedures. It is noteworthy that over 22,000 people attended that convention in 1995. Moreover, there are currently over 300 neuroscience training programs in North America (Shatz, 1995). Fewer than 1,800 people attended the convention of the Association for Behavior Analysis (ABA) in 1995, and it is optimistic to claim that there are 10 training programs in behavior analysis.

As Glenn (1993) pointed out in her ABA presidential address, behavior analysis offers a unique approach to studying, explaining, and improving behavior, and is in that sense indepen-

dent of other disciplines. Nonetheless, substantial benefits have arisen from attempts to combine behavior analysis with the concepts and procedures of other disciplines, including pharmacology (e.g., Thompson & Schuster, 1968), cultural anthropology (e.g., Glenn, 1988), and economics (e.g., Hursh, 1984). Not the least of these benefits is increasing the likelihood that behavior analysis will survive and grow (Czubaroff, 1993). Three of the weaknesses of behavior analysis as a cultural system are its small size, its isolation, and its limited visibility (Glenn, 1993). Neuroscience today is large and visible, and there are ample opportunities for behavior analysts to influence the field, thereby reducing the isolation of behavior analysis and increasing the likelihood of its growth and survival. The goal, of course, is not for behavior analysts to become neuroscientists, but for neuroscientists to become behavior analysts, or at least to acknowledge the existence and viability of the Skinnerian approach. Physiology is not necessarily relevant to the activities of many behavior analysts, but those behavior analysts who choose to study physiological processes may contribute mightily to making our discipline relevant to the rest of the world.

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