Increasing Tact Control and Student Comprehension through such New Postcedent Terms as Added and Subtracted Reinforcers and Punishers

Stephen F. Ledoux

State University of New York at Canton

Editor's Note: Occasionally, *Behaviorology Today (BT)* includes a piece that has gone through a full peer–review process. According to *BT* policy, when this is the case, a very clear notice to that effect is to be included with the piece. In compliance with this policy: **THIS PAPER HAS BEEN FULLY PEER REVIEWED.**

The material in this paper evolved as the author regularly presented it to his classes starting in 1988. The material achieved its present form in early 1992. Some additional years of use with students showed little need for further revision. The paper was then submitted to *The International Behaviorologist* (TIB) for formal peer review. In August 1994 the editor of TIB, Joe Cautela, accepted the paper for publication in the second issue of that journal. However, by the time the book of readings, *Origins and Components of Behaviorology* (Ledoux, 1997/2002) was being assembled, the *first* issue of TIB had not yet been published (nor has any issue yet appeared). Hence this paper was first included in that book of readings before now appearing here in this journal.—Ed. ❧

The verbal behavior of scientists plays a crucial role in their continuing to operate effectively with respect to the principles and practices of their science. As behaviorology changes through advances in research and technology, the terms used to describe the parts and processes of the science may also change. If newer terms enable more accurate tacting of those parts and processes than the older terms, if newer terms enhance effectiveness and reduce confusion, then the newer terms may become widely adopted.

The concern with terminology is also often felt in circumstances where behaviorological scientists need to describe research variables, experimental findings, and the resulting implications and technological applications to persons not yet familiar with even the fundamental laws discovered by their science (e.g., students). If confusion is not avoided at this early point, it becomes even harder to deal with later when more complex issues receive scrutiny.

Over the last two decades, this author has considered the suggestions of various authors (e.g., Comunidad Los Horcones, 1987; Vargas, 1984, 1985) regarding the terms to use when describing the variables involved in behaviorological processes, especially in the fundamental selective processes of reinforcement and punishment. This author has also tried a variety of terms in the classroom. These efforts to improve terminology have been focused on terms which concern events in the position of the third term of the three–term contingency, the events that follow the occurrence of some type of behavior. In the last couple of years, a particular set of systematically related terms—some old and some new—has evolved from these efforts. This set of terms has been used successfully in the author's classroom. These terms evoke less confusion than other terms evoke; they seem easier to learn and use.

This paper presents that systematic set of terms. To start, it considers the problems addressed by these terms. Then it considers solutions provided both by particular terms and by the organization of this set of terms. This set also respects, and in a small way extends—through the use of the term "selector," the evolutionary perspective shared by the different levels of life–science disciplines (see Glenn & Madden, 1995).

Problems

Different terms have different histories. Some terms have had a long and useful history, such as reinforcers and punishers which denote the stimuli whose post–behavior energy change at receptor cells ultimately selects physical changes that appear later as changes in the frequency of behavior. Other terms, such as positive and negative that have been used to describe certain types of reinforcers and punishers, have a history of causing confusion. This long–standing problem needs a solution.

The confusion occurs because the terms positive and negative have connotations in non–technical language that compete with their technical usage. In everyday usage positive connotes good or pleasant while negative connotes bad or unpleasant. As a result people have some difficulty with the concept of a *negative* reinforcer strengthening behavior. They have even greater difficulty with the concept of *positive* punishment; they have trouble imagining much that is positive about punishment.

Another question is more of an issue than a problem. This question concerns how to integrate the various proposed terms that have arisen from the expansion of the

science, and especially its conceptualization of causality, into a systematic set of terms.

Solutions

A solution to the problem of the terms positive and negative is to replace them with terms having the same technical connotation but not having other, competing connotations. The terms that the author has found to work the best with his students are the terms *added* to replace positive and *subtracted* to replace negative. These terms lack the complicating connotations of positive and negative. Yet at the same time they are consistent with the signs (i.e., + and –) used in the symbols for the several types of reinforcing and punishing stimuli. Furthermore, by using the terms added and subtracted, the replaced terms of positive and negative are still available to be used in their non–technical sense without confusion. That usage would no longer cause confusion with their technical usage because they would no longer have a technical usage. For example, using the common, non–technical connotations of the terms, one could speak non–technically of rewards and punishments as positive and negative consequences respectively without fear of automatic confusion with technical terms.

Alternative solutions to the problems of the terms positive and negative are available. The author has also tried replacing positive and negative with *plused* and *minused*, and with *additive* and *subtractive*. But each of these pairs had its own difficulties, and neither worked as well with students the way added and subtracted worked. Another suggestion, for which this author cannot claim originality, is simply to drop the terms positive and negative. But this alternative seemed to cause even more confusion for students, not less.

An answer to the question of how to integrate various proposed terms into a systematic whole comes from the hierarchical nature of the different questions about events that different terms can address. The focus narrows onto more and more specific characteristics of the events as these questions are asked: Does the event precede or follow the behavior? Does the event affect subsequent responding? Is the event produced by responding? Is the effect of the event to increase or decrease the frequency of the type of behavior the event followed? Does the effect occur when the event occurs as a presentation of a stimulus or as the reduction of a stimulus? (Each possible an-

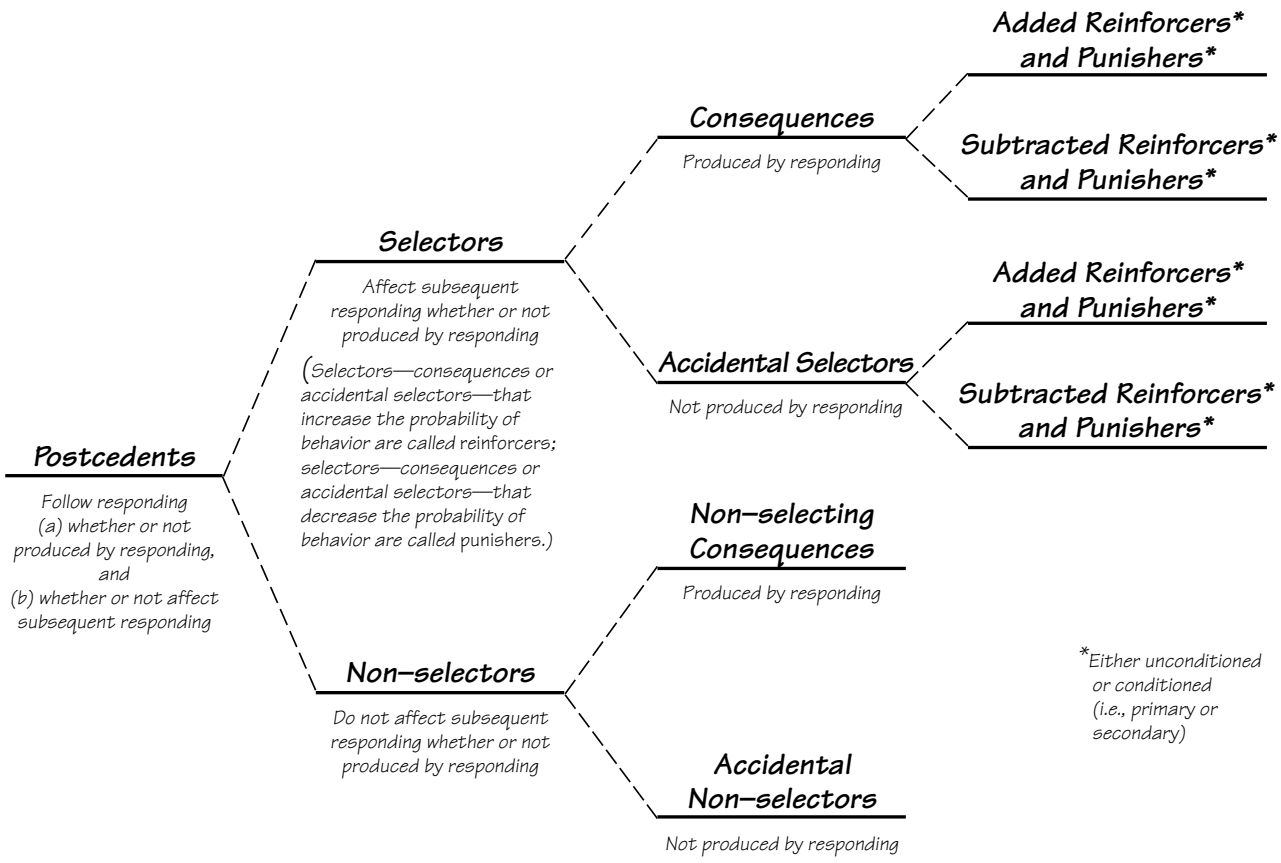

Figure 1. Diagram of the interrelated terms for various postcedent events in increasing specificity.

swer, of course, requires the next question to be asked more than once, with a corresponding increase in the number of terms properly applicable to a particular event.)

Different terms can be used to differentiate all the different types of events implied by the possible answers to those questions; the definitions of the terms also derive from the answers to those questions. The terms so used here are postcedents, selectors, consequences, accidental selectors, and the opposites of these (plus added and subtracted reinforcers and punishers as already described).

Postcedents (following Vargas, 1984, 1985) are events that follow responding regardless of whether or not they are produced by responding *and* regardless of whether or not they affect subsequent responding. The opposite of postcedents is "antecedents" (which will be discussed elsewhere).

Selectors are postcedents that affect subsequent responding regardless of whether or not they are produced by responding. The opposite of selectors is "non–selectors"; non–selectors are postcedents that do not affect subsequent responding regardless of whether or not they are produced by responding.

Consequences are selectors (affecting subsequent responding) that are produced by responding. The opposite of consequences is "non–selecting consequences"; non–selecting consequences are non–selectors (not affecting subsequent responding) that are produced by responding.

Accidental selectors are selectors (affecting subsequent responding) that are not produced by responding. The opposite of accidental selectors is "accidental non–selectors"; accidental non–selectors are non–selectors (not affecting subsequent responding) that are not produced by responding.

Figure 1 provides a diagram of these systematically related old and new terms for various postcedent events, in increasing specificity. Figure 2 provides even further specific details concerning consequences and accidental selectors.

The hierarchy of the terms can also be seen in the breakdown of the sixteen varieties of the selector type of postcedents. Of these sixteen, eight are produced by responding (called consequences) and eight are not produced by responding (called accidental selectors). Of each of these eight, four are types of reinforcers and four are types of punishers. Of the four types of either reinforcers or punishers (regardless of whether they are consequences or accidental selectors), two have their reinforcing or punishing effect when they are added to

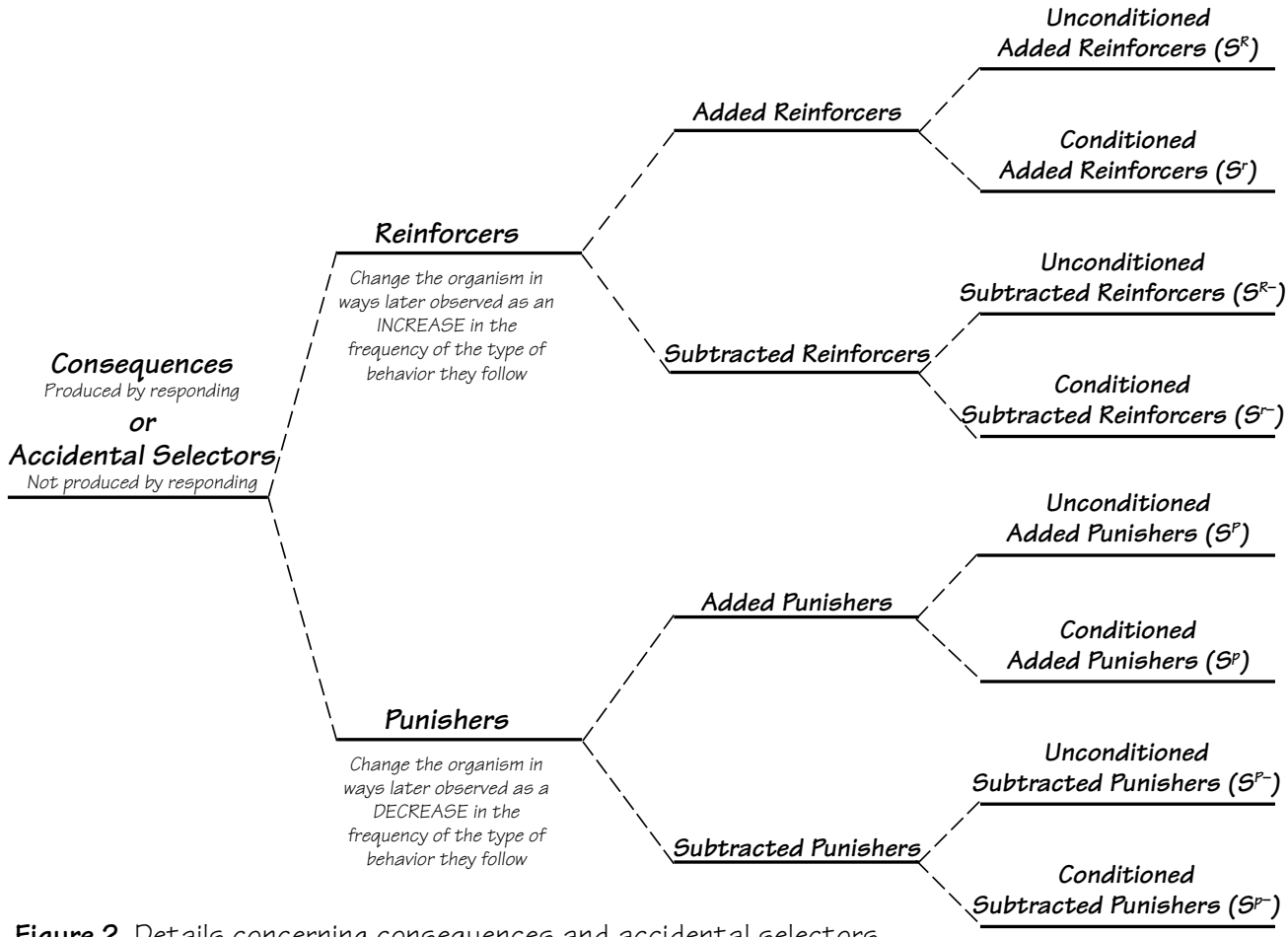

Figure 2. Details concerning consequences and accidental selectors.

the situation while the other two have their reinforcing or punishing effect when they are subtracted from the situation. Of each two types of added or subtracted reinforcers or punishers, one is unconditioned (primary) and the other is conditioned (secondary).

A more general perspective is achieved by returning to antecedents, the opposite of postcedents. Antecedents occupy the first position in the three–term contingency as events that precede the occurrence of some type of behavior. Antecedents can be one of two types. (1) Antecedents can be events that both precede a behavior and affect that behavior; in this case they can be called setting events. Leigland, 1984, argued that the nature of the term *setting events* was rather general. He pointed out:

> The functional relations that *are* subsumed by the term include what may be complex or conditional discriminative stimuli, deprivation/satiation variables, and perhaps others left unspecified. (p. 42)

Yet this general nature is what makes the term usable here (also, see Vargas, 1985). Or (2) antecedents can be events that precede a behavior but do not affect that behavior; in this case they may be called *non–setting events.* Antecedents that are setting events can be of several types, including discriminative stimuli, establishing operations (Michael, 1982), abolishing operations (Leigland, 1984), etc. While this pattern addresses questions similar to those raised in the discussion of postcedents, further elaboration of antecedents goes beyond the scope of this paper.

Summary

In summary, the following conventions are offered as an adjusted elaboration of those provided by Vargas (1985, p. 132):

For the placement of events in time, use: antecedent—current event—postcedent.

For the general three–term contingency, state: setting events—behaviors—selectors.

For more specific three–term contingencies, indicate: one or more setting events—an overt or covert action, response (etc.)—a consequence or accidental selector.

For an explicit three–term contingency, specify (for example): a discriminative stimulus—a response class—an added reinforcing stimulus.

The author has found that the set of terms used in those conventions reduces the confusion about terminology that students in the past experienced on their initial contact with behaviorological science. Others who teach the science may find this set to be of similar value. Perhaps researchers in the science will also find their tacting to be more accurate, and hence their effectiveness enhanced, through use of this set of terms.☘

Endnotes

The author sent this paper to *The International Behaviorologist* on 11 February 1994. After full peer review, it was accepted by early May 1994. However, that journal's publication schedule had fallen behind (see Fraley & Ledoux, 1997/2002, Ch. 4), so the paper received further minor revisions both for presentation at the ninth annual convention of The International Behaviorology Association in Plymouth, MA, March 1997, as well as for inclusion in *Origins and Components of Behaviorology* (Ledoux, [1997/2002]).

The author thanks Joe Cautela and the other reviewers for their help on this paper. Address correspondence regarding this paper to the author at SUNY–CTC, Canton NY 13617–1096 USA.

References

Cominidad Los Horcones. (1987). The concept of consequences in the analysis of behavior. *The Behavior Analyst, 10,* 291–294.

Fraley, L.E. & Ledoux, S.F. (1997/2002) Origins, status, and mission of behaviorology. In S.F. Ledoux. (2002). *Origins and Components of Behaviorology—Second Edition* (pp. 33–169). Canton, NY: ABCs. Reprinted (2006–2008) in five parts in *Behaviorology Today:* Chs. 1 & 2: *9* (2), 13–32. Ch. 3: *10* (1), 15–25. Ch. 4: *10* (2), 9–33. Ch. 5: *11* (1), 3–30. Chs. 6 & 7: *11* (2), 3–17.

Glenn, S.S. & Madden, G.J. (1995). Units of interaction, evolution, and replication: Organic and behavioral parallels. *The Behavior Analyst, 18,* 237–251.

Ledoux, S.F. (1997/2002). *Origins and Components of Behaviorology—Second Edition.* Canton, NY: ABCs.

Leigland, S. (1984). On "setting events" and related concepts. *The Behavior Analyst, 7,* 41–45.

Michael, J.L. (1982). Distinguishing between discriminative and motivational functions of stimuli. *Journal of the Experimental Analysis of Behavior, 37,* 149–155.

Vargas, E.A. (1984). A new term and some old advice. *The Behavior Analyst, 7,* 67–69.

Vargas, E.A. (1985). The ABP noncontingency: A reply to "The ABP contingency." *The Behavior Analyst, 8,* 131–132.☙