STIMULUS CONTROL IS AN INFERENCE: IMPLICATIONS FOR INSTRUCTIONAL PROGRAMMING

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I had the pleasure of talking with Murray Sidman at a conference not too long ago. I had something important to tell him.

“Murray,” I said, “I have been studying your work for nearly 30 years, and I’ve found something that you wrote that was wrong.”

“Only one thing?” he asked.

“Yes, one thing.”

“Well?”

“You said, ‘No one suffers under the misapprehension that the mere presence of a stimulus at the time of reinforcement is enough to establish control of the reinforced response’” (Ray & Sidman, 1970, p. 193).

“But everyone thinks that!” said Murray.

I used to refer to this “misapprehension” as the rookie stimulus-control error until I realized that people who are not rookies also make the error. That the error is made at all shows the importance of the current reprise of Sidman’s Remarks. The reprise is timely, given the widespread use of “discrete-trial” instructional procedures in the education of children with developmental disabilities. The conceptual points about measuring and establishing stimulus control made by Sidman throughout his career are of profound importance to the development of effective teaching procedures.

Critical to avoiding the rookie stimulus-control error is the conceptualization of stimulus control as an inference, discussed by Sidman in his 1979 column. Sidman describes stimulus control as an inference because the observation that a response occurs in the presence of a particular stimulus is not sufficient to conclude that the response is controlled by the stimulus. Additional observations must be made, and not just to find out whether the response always occurs in the presence of that same stimulus. It also is important to show that the response does not occur if the stimulus is not present. Skinner’s and Sidman’s writings on stimulus control use the phrasing “bringing the response under stimulus control.” This phrasing emphasizes the point. Stimulus control is an inference because it

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can only be confirmed by a number of observations of more than one type, which
taken together allow us to infer that the response is under stimulus control.

Teaching procedures that rest on the misapprehension are bound to be
ineffective with some learners. If a response is not controlled by the target stimulus
and a reinforcer is delivered, what is being strengthened? Take, as an example, a
child learning to select printed words from a choice pool of two or more printed
words when the teacher presents the corresponding spoken word. An instructional
sequence sometimes used involves teaching one word at a time. In the first
teaching step, the teacher presents the same spoken word (e.g., sun) on every
teaching trial. Thus, selecting the same printed word on every trial produces a
reinforcer. Once the child is reliably selecting the word sun, the teacher may
assume that the child has learned the relationship between the printed and spoken
words. Teaching a second word then commences. Again, teaching involves
presenting the same word (e.g., mat) on every trial. At first, the child might persist
in selecting sun (which, in a misattribution of process, is sometimes referred to as
“overgeneralization”). But the child eventually responds correctly to the word mat
on every trial, and the teacher may assume that the child has learned the
relationship between the printed and spoken word “mat.” So, in the third step, the
child still must choose between the two printed words, but sometimes the teacher
says the word “mat” and sometimes “sun.” One might expect the child to do very
well when the words are mixed, after showing near-perfect accuracy with each
individual word. In some cases, however, accuracy drops to chance levels. This
sometimes surprises people.

To be surprised at this outcome is the rookie stimulus-control error—the
misapprehension under which Sidman once thought no one suffered. In fact, when
the same spoken word is presented on every trial, the child can ignore the spoken
word while receiving a very high rate of reinforcement. The stimulus control that
is reinforced involves only the printed word, not the relation between the printed
and spoken words.

There is something good about the aforementioned teaching procedure. It at
least establishes an essential component of the relations between the spoken and
printed words. That is, selecting the same word on every trial shows that the child
is responding discriminatively to the two printed words (assuming that the
response is not prompted). It definitely is worthwhile to ensure that the child
readily makes this discrimination, but it is best to ensure the discrimination of the
two words prior to introducing the sample. In light of a potentially positive feature
of teaching one word at a time, let’s now turn to a teaching procedure that runs the
risk of establishing no control by the relevant stimuli at all. Let’s say that printed
word selections are prompted physically. For example, the teacher takes the child’s
hand and moves the hand until it touches the printed word. During physical
prompting, the child need not discriminate the printed word at all. If a reinforcer is
delivered for a “word selection” it is not at all clear what response is being
reinforced and what stimulus control is developing. Note, too, that physical
prompting was initially developed to teach motor responses (e.g., imitation), not
selection responses.
It is better to use a prompting procedure that, at least, requires the active discrimination of the choice stimuli. For example, prompting word selection by showing the identical printed word (i.e., the child selects the printed word that is identical to the prompt) requires discrimination of the printed words. The flip side of this point is that if the child is unable to match identical printed words, it is not a good idea to incorporate printed words into a more complex task. As Sidman points out in another Remarks column (1977, p. 111), “the basic principle of programmed instruction is to teach the student all of the prerequisites before asking for a new performance.”

Behavior analysis is a way of thinking, not a set of techniques. The knowledge base on stimulus control, as it applies to the development of instructional programming, should be among the core principles taught to every student. Besides being analytic to the core and stunningly applicable to socially significant problems, it provides a superb illustration of the importance of having a science of behavior. As it turns out, it is very, very difficult to apprehend that the mere presence of a stimulus at the time of reinforcement is not enough to establish control of the response.

References

