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verbal behavior that led to his future emphasis on the applications of behaviorism to complex (and verbal) human behavior in real world situations. In a sense, *Schedules of Reinforcement* (1957) was his swan song as a laboratory scientist; it was more Charles Ferster's product than his own. This is also described in the *Journal of the Experimental Analysis of Behavior's* special issue on the Harvard pigeon lab (2002, vol 77).

Thinking**Mark Sundberg, Ph.D.***STARS School- Walnut Creek, CA*

In Chapter 19 of *Verbal Behavior* Skinner presents a behavioral analysis of thinking. The content of these chapters, along with the chapters on the same topic in *Science and Human Behavior* (Skinner, 1953, chap. 16), and *About Behaviorism* (Skinner, 1974, chap. 7), present a behavioral analysis of what is traditionally referred to as "higher mental processes." It is common in traditional psychology to attribute the causes of complex behavior to these mental processes. Problem solving, memory, reasoning, language, understanding, perception, creativity, etc., are all considered to be a function of thought. Thinking is what produces correct answers, clever ideas, insight, comprehension, and effective solutions. Children are encouraged to think before they answer, employees are reminded to think about what they are doing, scholars are given plenty of opportunities to think about their subject matter. Skinner (1974) discusses how the concept of "mind" has become associated with thinking and granted the ultimate causal status:

The mind is said to play an important role in thinking. It is sometimes spoken of as a place where thinking occurs, where one image, memory, or idea leads to another in a "stream of consciousness." It can be empty or filled with facts, it can be ordered or chaotic....sometimes the mind appears to be the instrument of thinking; it can be keen or dull, muddled by alcohol, or cleared by a brisk walk. But usually it is the thinking agent. It is the mind which is said to examine sensory data and make inferences about the outside world, to store and retrieve records, to filter incoming information, to put bits of information in pigeonholes, to make

Peterson concluded by describing some of the many current applications of shaping, including teaching verbal behavior to autistic children. (an interest of his). He points out that the goal is to teach autistic children "the behavior of a speaker".

All in all, a fine tribute to B. F. Skinner, and an insight into the genesis of Skinner's particular analysis of verbal behavior.

decisions, and to will to act. In all these roles it has been possible to avoid the problem of dualism by substituting "brain" for "mind." The brain is the place where thinking is said to take place....both the mind and the brain are not far from the ancient notion of homunculus--an inner person who behaves in precisely the ways necessary to explain the behavior of the outer person in whom he dwells (p. 117).

But how do we explain the behavior of the inner person? What causes the inner person to behave? What is the mind? What is thinking? The answer to these questions has long been sought after since Plato is said to have discovered the mind. The topic is further complicated by the privacy of the primary controlling variables. Thinking is said to occur in the private world of the mind, accessible only to the thinker. Skinner's analysis of these topics represents a major element of his "radical behaviorism" (Skinner, 1974), and is essential for many of the standard arguments against behaviorism put forth by traditional psychologists. Clearly, verbal behavior is at the center of the analysis. Skinner (1957, chap 19) begins his treatment of this topic with an analysis of the origin of language and its relation to group coordination.

As soon as men began to work together in hunting, fishing, building shelters, or making war, situations must have arisen in which rudimentary verbal responses would be of use. In a co-operative fishing enterprise, for example, one man might be in position to see a fish while another could pull the net. Any

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response which the former might make to the fish might improve the timing of the latter, possibly with advantages for both....Verbal behavior extends both the sensory powers of the listener, who can now respond to the behavior of others rather than directly to things and events, and the power of action of the speaker, who can now speak rather than do (p. 432).

After considering several additional functions of verbal behavior, Skinner discusses situations where a group is not involved and a speaker becomes his own listener.

Once a speaker becomes a listener the stage is set for a drama in which one man plays several roles. The initial advantages for group co-ordination are missing, but there are several compensating gains. This has been recognized traditionally when the behavior of a speaker with respect to himself as listener, particularly when his behavior is not observable by others, is set aside as a special human achievement called "thinking" (p. 433).

The remainder of the chapter contains an analysis of thinking. Skinner describes four possible behavioral interpretations of thinking with each interpretation broader than the previous one. Michael (1991) suggests that these interpretations be represented as a set of four concentric circles. First, Skinner considers the possibility that thinking is just covert verbal behavior (pp. 434-438). Many problems are solved by covertly manipulating verbal stimuli, self tacts, mands and intraverbals can ultimately lead to a solution. For example, a broken bolt that won't come out of an office chair that needs repair presents a problem to the person who would like a functioning chair. A speaker may function as a listener as tacts of the problem are covertly emitted (e.g., "looks like the lip of the bolt is protruding and that's why it is stuck), self mands may occur (e.g., "How am I going to get that out"), as might intraverbal behavior, (e.g., "this is the same problem I had with the garage door and I fixed it with a file). In the absence of this problem solving verbal behavior a repaired chair is less likely. One could say that by thinking about the problem a solution was achieved, or one could say the problem was solved by emitting covert verbal behavior. However, Skinner rejects this formulation of thinking as simple covert verbal behavior. "The theory that thinking was

merely subaudible speech had at least the favorable effect of identifying thinking with behaving. But speech is only a special case of behavior and subaudible speech a further subdivision" (Skinner, 1957, p. 438).

Next, Skinner considers the possibility that thinking can occur at the overt as well as the covert level (pp. 438-446). That is, thinking can occur aloud even though the speaker and listener are within the same skin. This expanded definition includes thinking as covert behavior, thus this is the second of the concentric circles.

A better case can be made for identifying thinking with behaving which automatically affects the behavior and is reinforcing because it does so. This can be either covert or overt....When a man talks to himself, aloud or silently, he is an excellent listener in the sense of Chapter 10. He speaks the same language or languages and has the same verbal or nonverbal experience as his listener. He is subject to the same deprivations and aversive stimulations, and these vary from day to day or from moment to moment in the same way. As listener he is ready for his own behavior as speaker at just the right time and is optimally prepared to "understand" what he has said. Very little time is lost in transmission and the behavior may acquire subtle dimensions. It is not surprising then, that verbal self-stimulation has been regarded as possessing special properties and has even been identified with thinking (pp. 438-439).

However, Skinner rejects the view that thinking is just self-verbal behavior because "all the important properties of the behavior are to be found in verbal systems composed of separate speakers and listeners" (p. 445). Thus, thinking defined as self-verbal behavior is still too narrow.

The third possible interpretation of thinking (the next to largest concentric circle) is that thinking is verbal behavior in general (pp. 446-449). "Are we to be content with the rest of Plato's phrase: 'thought is the same as speech'? Disregarding the distinction between overt and covert and the possibility that verbal behavior may be especially effective upon the speaker himself, are we to conclude

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*that thinking is simply verbal behavior?
(p. 446).*

But again this view of thinking is too restrictive because thinking involves nonverbal behavior as well. Skinner concludes with (the largest concentric circle),

The simplest and most satisfactory view is that thought is simply behavior--verbal or nonverbal, covert or overt. It is not some mysterious process responsible for behavior but the very behavior itself in all the complexity of its controlling variables, with respect to both man the behavior and the environment in which he lives. The concepts and methods which have emerged from the analysis of behavior, verbal or otherwise, are most appropriate to the study of what has traditionally been called the human mind. (p. 449)

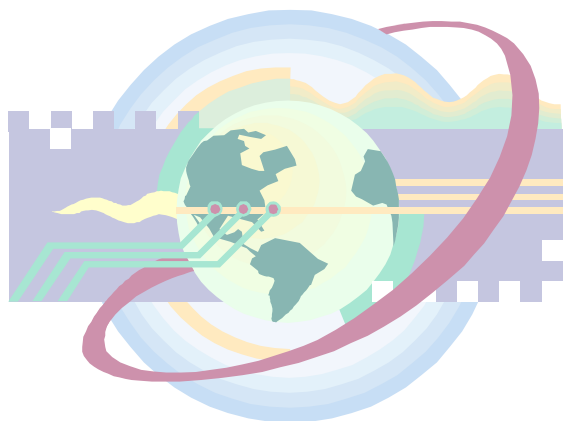
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