

For example, inspired largely by Miller and Dollard's (1941) notion of response-mediated generalization, decades of laboratory investigation focused on the possible relationships between normal children's verbal and nonverbal behavior. Overwhelming empirical support for verbal mediation was never found: (a) The positive effects thought to be unique to verbal behavior were also observed with nonverbal manipulations (Corsini, Pick, & Flavell, 1968), and (b) even when an appropriate verbal repertoire existed, it often was not displayed spontaneously (Birge, 1941, as cited in Reese & Lipsitt, 1970, pp. 226–227; Flavell, Beach, & Chinsky, 1966; Kendler, 1972), and when it was displayed, it sometimes had no effect on the nonverbal behavior being examined (Kendler, 1972). Such findings led Reese and Lipsitt (1970; and see Gibson, 1969; Stevenson, 1970, 1972) to say the following about the research:

One should not belittle the role of language at a practical level for without question language can serve very important functions. Nevertheless, it is obviously not the only stuff of which symbolic processes are made. In-

deed, it may be the potential for the formation of other symbolic processes that permits the development of language rather than the reverse. (p. 261)

Thanks to Sidman, the tools of behavior analysis were brought to bear on the classic issues of equivalence, response-mediated generalization, and other symbolic processes. Explaining where all those processes come from remains elusive. Horne and Lowe's naming hypothesis will be a useful descriptive and conceptual guide in future examinations of classes of verbal events and the contingencies of reinforcement that actually give rise to them (cf. Baer, 1982; Catania, 1992; Hall & Chase, 1991; Stromer & Mackay, in press). The endeavor will have relevance for theories of human development (cf. Baer, 1970), solving practical problems, and the issue of species generality. Nevertheless, inferences about *necessary* roles of verbal relations in other behavior must be made only with the greatest caution, because they risk overinterpretation by nonspecialist readers whom we hope to address and loss of the parsimony and coherence that have been hallmarks of our approach.

JOINT CONTROL AND WORD-OBJECT BIDIRECTIONALITY

BARRY LOWENKRON

CALIFORNIA STATE UNIVERSITY, LOS ANGELES

Through their notion of the *naming* relation, Horne and Lowe seek to provide a comprehensive account of the origin of novel, untrained, bidirectional relations between words and objects. The operants that must be trained to produce this relation are uncontroversial, but I do not believe the naming

relation successfully explains where novel word-object relations come from. So, after examining their formulations, I propose an alternative.

According to Horne and Lowe, two kinds of behavior must be trained in order to produce the naming relation. To train listener behavior, attempts by a child to orient toward and point to an object in response to its spoken name (name-object relations) are differentially reinforced as the object is placed in new locations and among other objects. To

Address correspondence to Barry Lowenkron, Department of Psychology, California State University, Los Angeles, Los Angeles, California 90032 (E-mail: zlowenk@calstatela.edu).

train speaker behavior, the child's rehearsals of the name spoken by the trainer, both in response to the sight of the object (object-name relation) and in response to prior repetitions (self-echoic responding), are reinforced. With sufficient training, Horne and Lowe suggest, these two relations merge into a higher order, bidirectional naming relation such that "the presence of either . . . [relation] presupposes the other" (p. 207). As a result, when one new relation (name-object or object-name) is acquired, the alternate relation will appear without additional training.

It is here that I find problems. The emergence of new alternate relations, they contend, is a result of the covert practice of the elements of the naming relation. Thus, during object-name training, subjects also orient to the new object in response to their own and to the experimenter's pronunciations of the new name. As a result of this spontaneous name-object pairing, they are then able, in a conditional discrimination, to select the new object in response to its spoken name. Thus, while the new object-name relation is being trained, the new name-object relation is also strengthened.

This last does not seem tenable, however, because during spontaneous name-object pairing, responding to the object under the control of its name is never differentially reinforced. As I understand it, subjects are said to just rehearse the new name while looking at the new object. But what behavioral process is this? Memory? Sensory preconditioning? Without a history of differentially reinforced responding to the object under the control of its name, why (excluding primary generalization) should the name ever cause the corresponding object to evoke a selection response? What behavioral process is at work here? Whether the selection response is looking or pointing is not the issue. The problem is simply that the name of the object evokes no differential responding to one object vis-a-vis any other. It seems to me, that despite their protestations, Horne and Lowe solve the problem of emergent bidirectional relations by simply asserting they happen.

Joint Control

Interestingly, the problem is not difficult to solve. Several studies using overt, directly observable mediating responses have obtained

a reasonably close view of the means by which the tact (object-name relation) and self-echoic components of the naming relation may interact to produce bidirectional responding (Lowenkron, 1984, 1988, 1989). To illustrate the process, consider a task (Figure 1, Panel A) in which a subject is presented with a page full of randomly ordered six-digit numbers and is told to find the sequence 135476. The subject then begins to scan the page while repeating the sample as a self-echoic. At some point the subject will encounter a six-digit number that, when read from the page, evokes the same topography as the currently rehearsed self-echoic. At this moment the self-echoic response topography comes under joint stimulus control: It is still a self-echoic, but is now also a tact for the sequence on the page.

With training, this event, this change in the sources of stimulus control over a verbal behavior, may serve to interrupt scanning and evoke a pointing response to the stimulus that caused the change from self-echoic to joint self-echoic/tact control. Technically, the pointing response would then be a descriptive autoclitic (Lowenkron, 1991; Skinner, 1957). Unlike listener behavior, this autoclitic is never under the control of features specific to any single stimulus; rather, it is under the control of the elements common to the transition from self-echoic to joint control. Thus, it necessarily generalizes to performances with novel stimuli, and serves to report any stimulus that produces a transition to joint control.

The Symbolic Function

Words and objects may thus become related to each other bidirectionally through their joint control of a common topography. The auditory "135476" necessarily specifies one, and only one, sequence of printed numbers: the sequence that evokes the same spoken topography as the sample. (No concept of sameness is implied here. By *same topography*, I mean simply that a printed sequence of digits allowed self-echoic rehearsal of the sample to continue unmodified under joint self-echoic/tact control.)

In the same fashion (Figure 1, Panel B), the self-echoic verbal stimulus produced by rehearsals of the textual (reading) response to the printed phrase *dot in circle* specifies one

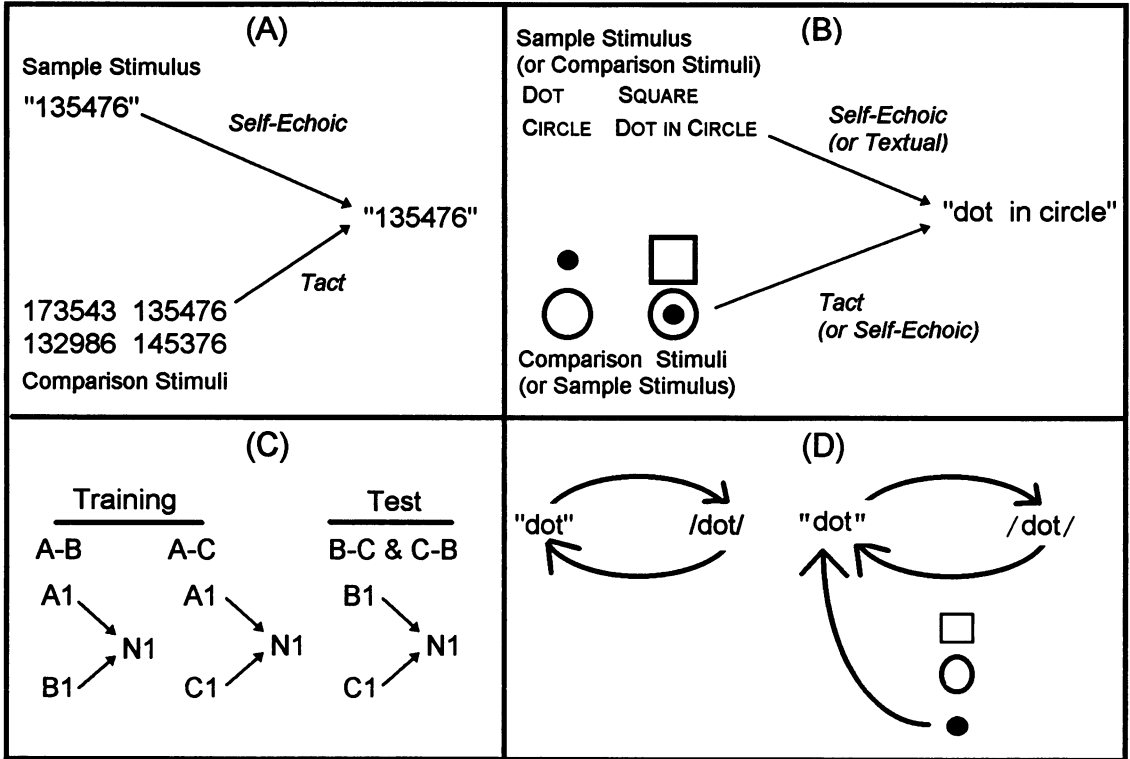


Fig. 1. (A) In response to the spoken sample phrase 135476, the subject rehearses the phrase first as an echoic and then as a self-echoic. When the printed sequence is encountered that evokes the rehearsed topography as a tact, it is selected. (B) The bidirectional selection of a picture in response to a printed phrase (and a phrase in response to a picture). (C) The stimulus equivalence relations. (D) Joint control exists within the naming relation. On the left, the word *dot* is rehearsed as a self-echoic. On the right, the topography has come under joint self-echoic/tact control.

particular picture because only that picture evokes a tact of the same (i.e., unmodified) topography. Conversely, as illustrated, if shown the *dot in circle* picture as the sample, the subject could formulate its verbal description as a tact, rehearse it as a self-echoic, and then select the printed phrase that evokes the same topography as a textual. Thus, printed words, spoken words, and objects may all become associated with each other because they evoke common topographies in their respective roles as textuials, self-echoics, or tacts. This commonality, in turn, allows for their joint control and the selection of any one, given any other. The bidirectional symbolic function is thus mediated by the occurrence of joint control over common topographies.

Amending Horne and Lowe's Account

The notion of joint control provides a simple solution to the problem with Horne and

Lowe's account. Let us assume that when speaker and listener behavior are first acquired, children learn (although not necessarily exclusively) to select stimuli under joint control. (This involves learning the same relations and responses that Horne and Lowe propose, but with different sources of stimulus control.) Later, as Horne and Lowe suggest, when a novel object-name pair is first presented, the child learns to emit the name in response to the object; correct and incorrect pronunciations of the tact are differentially reinforced. Later still, when given that name as a sample and asked to select the corresponding object in a name-object conditional discrimination, accurate selection will merely depend on the occurrence of joint control over the child's self-echoic rehearsals of the sample name by the addition of tact control evoked by the object so named.

Responding to novel class names can be ex-

plained in a like fashion. Thus, when a set of already-named objects (chair, table, etc.) are given an additional and common name (i.e., "furniture") and the subject is then asked to select the furniture objects from a mixed set, he or she may simply do so by selecting each object that evokes a tact that enters into joint control with the self-echoic of the sample name "furniture."

As illustrated in Figure 1 (Panel C), the capacity of joint control to mediate generalized bidirectional responding extends to stimulus equivalence as well. Let us assume, along with Horne and Lowe, that during training subjects apply common names to both sample and comparison stimuli. So, during A-B training Name 1 (N1) is generated for both A1 and B1, and during A-C training, for A1 and C1. Thus all the stimuli of Class 1 evoke a

common naming topography. Given this, each should control selection of the other under joint control, thereby producing all the relations that define stimulus equivalence.

Conclusion

Horne and Lowe have identified the component responses of the bidirectional word-object relation but not their articulation, because the joint control event resides within their formulation of the naming relation. Thus, in Figure 1 (Panel D), before the correct comparison stimulus is encountered, the subject's behavior is illustrated by the self-echoic loop on the left. When the named object is then encountered, the self-echoic comes under joint control of the tact emitted to the object, as illustrated on the right by the converging arrows. Joint control is thus a fundamental component of the naming relation.

ON THE ORIGINS OF MISGUIDED THEORIES OF NAMING AND OTHER SYMBOLIC BEHAVIOR

GROVER J. WHITEHURST

STATE UNIVERSITY OF NEW YORK AT STONY BROOK

Horne and Lowe's lengthy treatment of the origins of symbolic behavior has two general themes. The first is criticism and ultimately dismissal of the paradigm of stimulus equivalence and its associated conceptual framework. They say it is "a highly artificial set of circumstances of a sort infrequently, if ever, encountered by most children and thus is an odd experimental paradigm upon which to

base a general understanding of new . . . relations or language itself" and "an elaborate set of abstractions" that create "a false sense of security" and "introduce conceptual confusion and impede research" (p. 238). The second theme is a presumptive developmental account of the origins of naming. Naming, as defined by Horne and Lowe, is said to account for the emergent phenomena that have generated so much interest in the stimulus equivalence paradigm and to be a worthy target of a systematic program of developmental behavioral research.

I am sympathetic to the gist of Horne and Lowe's criticisms of the stimulus equivalence paradigm. It is a paradigm that does not pass the Aunt Sarah test, which has become for me an important first line filter of the prom-

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Address correspondence to the author at the Department of Psychology, SUNY, Stony Brook, New York 11794-2500 (E-mail: gwhitehurst@mail.cc.sunysb.edu).