ON THE EXPERIMENTAL ANALYSIS OF NAMING AND THE FORMATION OF STIMULUS CLASSES

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This article makes clear the need to clarify the conditions under which stimulus classes form, especially classes that involve verbal events. Horne and Lowe propose a "naming hypothesis" of stimulus class formation that is, arguably, a verbal mediation account, contrary to the authors' claim: If the reinforcement contingencies require a child to match a printed word comparison to a picture sample, and the child consistently supplies an audible "name" during a trial, Horne and Lowe apparently assume that the child's production of the name caused the selection of the printed word. If the child says nothing during the trial, they apparently assume that a name caused the selection anyway. The interpretation of behavioral data in this way may run counter to the objectives of understanding the behavior of individual organisms.

The tradition of behavior analysis has been characterized by interpretation of data that is quite different from that proposed by Horne and Lowe, and the differences are important to the extent that they influence the nature, scope, and significance of subsequent research. As Shimoff noted, "An experimental analysis of behavior generally seeks causes of behavior in the environment, not in other behavior" (1984, p. 1; cf. Shimoff, 1986). This means that the origins of stimulus classes in general and equivalence relations in particular do not lie in naming relations. Likewise, the origins of naming relations do not lie in equivalence relations. The origins of both, and any functional relations between them, will be found in the environment-behavior relations, such as contingencies of reinforcement, that give rise to the stimulus control involved. The danger in straying too far from this credo is that data may be misinterpreted, overlooked, or both (cf. Perone, 1988). With the focus removed from environment-based relations, one may fail to appreciate fully the complex repertoires called concepts, categories, equivalence, and naming relations. The implications may be profound, particularly if the aims of a basic research program include application.

I am reminded daily how remarkable the formation of classes of verbal events can be in the normally developing child. The authors' description of a naming relation clearly applies: Teaching receptive name-referent performances typically yields the expressive referent-name performances without further teaching. The reverse will also be true; teaching expressive performances typically yields receptive ones. Expansions of this repertoire will include performances consistent with the development of *feature classes* and *arbitrary classes*; the former involve stimuli with common physical attributes, whereas the latter do not (cf. McIlvane, Dube, Green, & Serna, 1993; Stromer & Mackay, in press). Subjects who demonstrate such naming performances are, undeniably, uniquely equipped to learn new arbitrary relations and satisfy the properties of Sidman equivalence.

I am also reminded daily that the formation of classes involving verbal events may be unusual in individuals with mental retardation, autism, and head injury. An analysis of the literature does reveal a correlation between linguistic prowess and success during training and testing, and that naming *can* both facilitate class formation and serve as its basis. But such data "do not allow a conclusion beyond that dictated by parsimony: that both [naming and class formation] were the result of the training procedures" (Spradlin & Saunders, 1990, p. 249). The analysis also

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suggests that naming relations do not necessarily underlie success on tests of equivalence. Individuals with developmental limitations may succeed during testing even though the constituents of a potential naming relation seem to function independently: Examples come from research involving receptive and expressive tasks (Anderson & Spradlin, 1980; Guess & Baer, 1973), mands and tacts (Lamarre & Holland, 1985; Lee, 1981), tacts and intraverbals (Watkins, Pack-Teixteira, & Howard, 1989; cf. Partington & Bailey, 1993), and verbal behavior in nonverbal memory tasks (Constantine & Sidman, 1975; Gutowski, Geren, Stromer, & Mackay, 1995). In this population, naming relations may be the exception rather than the rule.

Regardless, Horne and Lowe assert that a subject who does not satisfy the requirements of the naming relation will not form classes. Granted, class formation in individuals with developmental disabilities may require enhanced training methods to establish the first instances of visual-visual matching (Saunders & Spradlin, 1989; Zygmont, Lazar, Dube, & McIlvane, 1992). On their face, such performances may appear to be "artificial" and irrelevant to the study of verbal behavior. Researchers with an eye on practice, however, recognize the importance of analyses of visual classes. Indeed, whether some individuals ever develop functional communication may depend on what we learn about classes of arbitrary visual stimuli (e.g., McIlvane, 1992; Remington, 1994; Shafer, 1993).

To highlight some specific problems that face the naming hypothesis, consider a hypothetical study of class formation in individuals with mental retardation. Subjects in Group VIS learn to match forms A1 and B1 to the printed sample *omni* and to match A2 and B2 to *delta*. Group AUD learns to match A1 and B1 to the dictated "omni" and A2 and B2 to "delta." Group NAM learns to name aloud A1 and B1 "omni" and A2 and B2 "delta." If subjects are capable of naming relations, the following should happen: (a) Nearly all subjects in each group should match the forms B1 to A1, B2 to A2, and vice versa; (b) the majority in each group should supply relevant names; (c) nearly all in Group AUD should pass a naming posttest; and (d) nearly all in Group NAM should match the forms to dictation. Published data, however, suggest the outcomes may be otherwise: Group VIS may or may not "spontaneously" supply names during matching tasks (Eikeseth & Smith, 1992). Moreover, they generally will not produce names on direct posttests (Sidman, Willson-Morris, & Kirk, 1986; cf. Lazar, Davis-Lang, & Sanchez, 1984). Regardless of whether naming occurs, most subjects will match the forms (Sidman et al., 1986; Stromer & Osborne, 1982; cf. Lazar et al., 1984). If naming does occur, however, it should be considered to be functionally related to matching performance, not the origin of it.

Similarly, Group AUD, even though they hear the relevant names, may or may not exhibit naming spontaneously during training and during tests; they will match the A and B stimuli nonetheless (Green, 1990; Maydak, Stromer, Mackay, & Stoddard, 1995; Sidman, 1971; Sidman & Cresson, 1973; Sidman, Cresson, & Willson-Morris, 1974; Sidman et al., 1986). Group NAM may or may not exhibit naming during testing (Eikeseth & Smith, 1992). Subjects may even fail to match to dictation (Anderson & Spradlin, 1980). Only subjects who name during testing may succeed on the form matching test (cf. Constantine & Sidman, 1975; Gutowski et al., 1995; and see below). However, some who produce names may fail the form matching test (Constantine & Sidman, 1975). Performance of Group NAM may actually be *inferior* to that of Groups VIS and AUD.

In summary, existing data suggest that either receptive name-referent or expressive referent-name performances may yield stimulus classes. However, neither receptive nor expressive performances are prerequisite for, or necessary outcomes of, the formation of classes. Even in cases in which a naming intervention facilitates performance, the naming may not have linguistic properties (Eikeseth & Smith, 1992; Saunders & Spradlin, 1990, 1993; cf. Dugdale & Lowe, 1990). Nonverbal differential responses may achieve some of the same effects as naming in matching tasks (Saunders & Spradlin, 1989; cf. Parsons, Taylor, & Joyce, 1981; Torgrud & Holborn, 1989). The appropriate conclusion to draw from all this is that the repertoire encompassed by the naming relation may suffice but is not necessary for class formation.

History has not been kind to research guided by verbal mediation accounts of behavior.

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. Indeed, 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

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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

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