directional relation can later become "higher order." Now any test that was previously deemed to require higher order naming for successful completion, including the various tests described on pages 205–208 and, most importantly, tests of stimulus equivalence, can be passed in its absence.

Evidence that subjects can covertly hear words without speaking, and that such responses can be functional, comes from the literature on remembering. Bishop and Robson (1989) tested 12 congenitally anarthric cerebral-palsied individuals on their ability to recall the order in which up to eight simple line drawings were presented per trial (a "memory-span" task). These subjects had never been able to speak because of a complete lack of control of the muscles involved in articulation, and their hand control was too poor for manual signing. Their memory span was much poorer for sequences of pictures with short but phonologically similar names (e.g., man, van, pan) or long names (e.g., elephant, airplane, kangaroo) than for those with short and phonologically dissimilar names (e.g., bath, pig, leaf). It seems, then, that when these subjects looked at the

pictures they "heard" the corresponding words, and these covert responses mediated their recall performances. How would such individuals perform on standard equivalence tasks? Note that the only kind of verbal behavior we could attempt to teach them to produce is stimulus-selection (i.e., matching-to-sample) based (see Michael, 1985). Is it really the case that, as Horne and Lowe's account demands, these people could never be capable of naming, verbal thinking, verbal consciousness, verbal meaning, and verbal understanding (see pp. 213–215)?

Despite the comments made above, I should end by making it clear that I am not about to abandon studying the very verbal processes that Horne and Lowe so elegantly bring to our attention in their extraordinarily ambitious and thought-provoking paper. Even if naming as they define it is not necessary for the emergent behavior we study via the equivalence paradigm, it is likely to be, by far, the most predominant means by which most humans accumulate such repertoires. I am therefore confident that their paper will guide my research efforts for many years to come.

NAMING, MEANING, AND VERBAL OPERANTS

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Horne and Lowe present a theory of the development of symbolic behavior in which naming is featured as the basic unit. Although their position has many points of contact with that of Skinner (1957), it contradicts central aspects of Skinner's analysis.

A central feature of Skinner's approach is the rejection of descriptions or explanations

based on meaning. Other major points of Skinner's formulation follow from this. First, for Skinner, verbal behavior is not in principle different from nonverbal behavior; it is operant behavior, shaped and maintained by reinforcers mediated by other organisms. Second, the role of the listener is central to Skinner's approach, because the listener mediates reinforcement for verbal behavior. The listener does so because of explicit conditioning by the verbal community; in this sense, the listener understands (i.e., reacts appropriately).

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The behavior of the listener is not conceived of as verbal in any special sense: There is not a special process whereby meanings are shared between speaker and listener, and the listener's reaction to verbal stimuli is discriminative behavior involving the same principles as discriminative behavior to nonverbal stimuli. Third, a functional unit, the verbal operant, replaces structural units of language, such as the word. Any segment of the speaker's behavior shaped and maintained by a specific effect upon the listener may be a verbal operant; verbal operants may be "as small as a single speech-sound, or even a pitch or stress pattern" (Skinner, 1957, p. 21). Larger units, like words, phrases, or whole sentences, may also be verbal operants. A fourth point follows from treating verbal behavior solely on the basis of the three-term contingency. Skinner recognizes several processes that give rise to novel forms or sequences of verbal behavior, such as extension (stimulus generalization), recombination of minimal units, transcription repertoires, and autoclitic frames. In all these cases, novel forms of verbal behavior are produced by recombination of acquired operants or their transformation by transcriptive operants; hence, the notion of emergent behavior is extraneous to Skinner's formulation.

The theory advanced by Horne and Lowe is contrary to all these points. The main reason for that is the centrality of the notion of meaning in their account. Horne and Lowe maintain that when humans name, they mean, and so names stand for, or refer to, objects, qualities, or events. Verbal behavior is thus conceived of as fundamentally different from nonverbal behavior. The behavior of the listener is considered to be verbal. Naming is conceived of as a relation rather than as a structure, but we may conclude from their definition and examples that names are basically words, and, moreover, as Skinner would say, "roughly the words with respect to which the doctrine of ideas could be supported by the appeal to images" (Skinner, 1957, p. 8). Therefore, a structural unit, the word, recovers its prominence as the basic unit of language, the one that carries meaning and represents the world. Also, naming frees the individual from the limits of the three-term contingency, thus generating many kinds of emergent behavior.

What might justify behavior analysts departing so fundamentally from Skinner's formulation? According to Horne and Lowe, Skinner neglected the role of the speaker as self-listener and failed to acknowledge the bidirectional relation in the basic verbal operants. It is this bidirectionality and the additional properties that it entails that require the concept of naming to be different from the verbal operants stated by Skinner. Horne and Lowe claim that names are more fundamental than tacts (and other verbal operants as well) because there is evidence showing that a child who can speak a word also shows appropriate listener behavior to this same word.

However, there is nothing in Skinner's concept of tact that precludes the "tacter" from showing appropriate listener behavior to his or her own tact (and the same may be said about other verbal operants). Quite on the contrary, Skinner gives particular emphasis to the fact that a speaker often is also a listener, so that speaker and listener, the two participants in the verbal episode, may be within the same skin. As Blackman pointed out,

It is inevitably difficult to talk of such dynamic and interdependent relations, so *Verbal Behavior* is sometimes discussed from a relatively static unidimensional perspective (the effects of the behavior of A on the verbal behavior of B). Nevertheless, it is the *reciprocal* interactions between people that essentially provide the context for the analyses explored by Skinner. (Blackman, 1991, p. 255)

This dynamic interaction may occur between speaker and listener within the skin, and this interaction is central to Skinner's analysis of phenomena like autoclitics, self-editing, composition, and thinking. The fact that the speaker often reacts as a listener to his or her own verbal behavior does not mean that this is always so. Skinner presents many convincing examples in which this does not happen, even with adult and fluent speakers. The analysis of the reader, for instance (cf. Skinner, 1957, pp. 169–171), shows that speaker and listener functions are not inextricably fused, although they may often occur together.

The bidirectional relation postulated in naming gives the word a status of symbol and enables it to represent some feature of the world. Names can, then, bring to consciousness, and hold there, representations of objects or events that are not in the current stimulating environ-

ment. The fact that words can evoke sensory images of objects or events, due to a process of Pavlovian conditioning, was acknowledged by Skinner. But, as Skinner adds, this leaves out a large number of words. Moreover, he points out that sentences do not just refer to objects, they say something about them.

It is hard to see how Horne and Lowe's notion of meaning could avoid the criticisms made by Skinner on the notion of words as symbols. Skinner's rejection of the notion of meaning, and the four consequent points mentioned above, on the other hand, made possible an extremely powerful analysis of how verbal behavior *says things about* objects, events, and so forth, and how the listener comes to understand that (thus shaping and differentiating verbal behavior), not to mention a host of powerful technological applications.

The empirical data supporting the notion of stimulus equivalence led several authors to propose extensions or revisions of Skinner's formulation that include a conception of meaning based on stimulus-stimulus relations. However, Horne and Lowe consider unnecessary the construct of stimulus equivalence and claim that emergent behavior documenting equivalence may be attributed to naming. But if emergent behavior in matching-to-sample situations is indeed verbally

controlled, it can be accounted for based on Skinner's verbal operants, especially the tact and the intraverbal, accompanied by self-listening behavior. Then, a notion of meaning and representation, as proposed by Horne and Lowe, seems to be superfluous.

However, it is far from proved that emergent performances in matching to sample are verbally controlled. It is true that data supporting the position against the necessity of naming may be considered relatively "soft," as Sidman (1994) acknowledged. On the other hand, many questions may be raised about data suggesting that language is *necessary* for equivalence (these questions cannot be treated here, but they will probably be made in other commentaries). Thus, as Horne and Lowe acknowledge, we need more data for a definitive answer to this question.

In spite of my considerable disagreements with it, I think Horne and Lowe's essay is a major contribution to the analysis of verbal behavior and stimulus equivalence. It is highly provocative and will certainly succeed in generating debate and research. It also presents an outstanding review of developmental data, especially data that have originated from other theoretical perspectives, and shows how these data can be accommodated within a behavior-analytic approach.

NATURAL CONTINGENCIES IN THE CREATION OF NAMING AS A HIGHER ORDER BEHAVIOR CLASS

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Horne and Lowe spell out in some detail the natural contingencies that may engender the various components of the complex be-

havior class called naming and cite research by investigators from a variety of developmental perspectives to illustrate how these natural contingencies might work. The operation of these contingencies within natural environments, so as to generate naming from ordinary interactions between children and their caregivers, is important to their case. As was

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