JOURNAL OF APPLIED BEHAVIOR ANALYSIS 1987, 20, 69–74 NUMBER 1 (SPRING 1987)

SAYING AND DOING: A CONTINGENCY-SPACE ANALYSIS

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Correspondences between verbal responding (saying) and nonverbal responding (doing) may be organized in terms of the classes of verbal/nonverbal relations into which particular instances of verbal/nonverbal response sequences can enter. Contingency spaces, which display relations among events in terms of the probability of one event given or not given another, have been useful in analyses of nonverbal behavior. We derive a taxonomy of verbal/nonverbal behavior relations from a contingency space that takes into account two conditional probabilities: the probability of a nonverbal response given a verbal response and that probability given the absence of the verbal response. For example, positive correspondence may be said to exist as a response class when the probability of doing is high given saying but is otherwise low. Criteria for other generalized classes, including negative correspondence, follow from this analysis.

DESCRIPTORS: contingency space, correspondence, generalization, verbal behavior

Experiments in both laboratory and field settings have been concerned with relations between saying and doing (e.g., Catania, Matthews, & Shimoff, 1982; Matthews, Catania, & Shimoff, 1985; Paniagua & Baer, 1982; Risley & Hart, 1968). Such research raises the problem of defining and measuring relations between verbal and nonverbal behavior. That problem has been addressed in various ways (Israel, 1978; Karlan & Rusch, 1982). Here, we continue to develop the terminology of verbal/nonverbal interactions by using a contingency space to specify the response classes implicit in various relations between saying and doing.

Israel (1978) distinguished two types of verbal/nonverbal behavior sequences: *positive correspondence,* defined as promising to engage in some nonverbal behavior and subsequently doing so (saying/doing), and *negative correspondence,* defined as making no statement about nonverbal behavior and subsequently not engaging in that behavior (not saying/not doing). Determining instances of not saying and doing is complicated by the difficulty of specifying opportunities for saying or doing. For example, does a specific instance qualify as a case of not saying only if there has been an occasion for saying, as when a question has been asked?

Karlan and Rusch (1982) suggested *noncorrespondence* as a term for two other types of sequences implied by Israel (1978), saying/not doing and not saying/doing. They also argued for distinguishing the relation between saying not and not doing from that between not saying and not doing. The Karlan and Rusch definitions provide a typology of particular verbal/nonverbal response sequences, but a typology of particular sequences will sometimes be inappropriate to the classification of verbal/nonverbal behavior relations in terms of response classes.

Consider an analogous problem in the description of respondent conditioning: A pairing between a conditional and an unconditional stimulus may occur either as a result of the stimulus/stimulus contingencies of a respondent conditioning procedure or as a result of random stimulus presentations (Rescorla, 1967). A single accidental pairing of tone and food may not be distinguishable from a pairing explicitly arranged by an experimenter, but the two pairings originate in different procedures and the histories produced by these procedures may have different behavioral effects. For this reason, pairings produced by contingent relations between stimuli must be distinguished from individual and perhaps accidental pairings. Similarly, it is important to distinguish an instance of say/

We thank Steven C. Hayes for helpful comments on an earlier draft of the manuscript.

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do correspondence that is a member of a generalized class of such correspondences from a specific say/do sequence that may not be a member of a generalized class.

The distinction between particular verbal/nonverbal sequences and verbal/nonverbal behavior relations maintained as response classes is fundamental. It is not enough to observe single instances of saying followed by doing. For example, if a child promises to complete a homework assignment and then does so, it would be improper to assume that correspondence exists as a response class, even though that particular verbal/nonverbal sequence may be classified as an instance of correspondence (cf. Neef, Shafer, Egel, Cataldo, & Parrish, 1983, on compliance as a behavioral class; the most important difference between correspondence and compliance is that in the former but not the latter the say/do sequence is the behavior of the same person).

Correspondence can be identified as a class only on the basis of observing a population of opportunities for say/do sequences in which the subject sometimes does not say. Consider a child who promises homework completion 12 times in response to 20 requests but then completes the assignment six times after the 12 promises as well as four times after the eight nonpromises. In this case, there is no evidence for verbal/nonverbal correspondence: the likelihood of homework completion is 0.5 whether or not the child has promised, and we must conclude that the child's saying and doing are independent.

Much of the relevant literature presents as data frequencies of say/do sequences under different experimental conditions. Often, children are trained or required always to say. In such procedures, the frequency of doing in the absence of having said cannot be assessed directly, nor can it be assessed indirectly by comparing different conditions within an experiment (Baer, Williams, Osnes, & Stokes, 1984, 1985; Israel & Brown, 1977; Karoly & Dirks, 1977; Osnes, Guevremont, & Stokes, 1986; Whitman, Scibak, Butler, Richter, & Johnson, 1982; Williams & Stokes, 1982). From such data alone, correspondence cannot be distinguished from independence.

Consider, for example, procedures used by Guevremont, Osnes, and Stokes (1986) to examine the development of verbal control over temporally and spatially distant nonverbal performances. In their "Reinforcement of Verbalization" phase, promises to engage later in a target nonverbal activity were followed by social consequences; appropriate verbalizations occurred whenever the promise was solicited. Subsequently, social consequences were arranged for nonverbal performances that corresponded to the promises made earlier. The behavioral relations observed—high probabilities of doing given saying—met the traditional criteria for correspondence of particular say/do sequences and yet provided no evidence for correspondence as a generalized response class. Such evidence would necessarily include the probability of doing given not saying as well as the probability of doing given saying; otherwise, we could not distinguish correspondence from the superficially similar case in which verbal and nonverbal responding both occur frequently but are functionally independent.

The definitional problems do not, of course, compromise the utility of the Guevremont et al. (1986) procedures, which, to the extent that saying occasioned doing, did in fact establish verbal control. It is uncertain, however, whether generalized correspondence was established; an equally tenable account is that the experimenter's prompts that occasioned saying also occasioned subsequent doing. The definitional difficulty is implicit in the labeling of the dependent variable in terms of observed target behavior rather than in terms of correspondences.

The problems of definition encountered in describing relations between verbal and nonverbal responding are not without precedent. They also apply to the study of respondent conditioning, where conditioning procedures must be described in terms of stimulus/stimulus contingencies rather than in terms of stimulus/stimulus pairings (Rescorla, 1967), and to the analysis of operant behavior, where relations between behavior and its

consequences are defined by contingencies between responses and stimuli (Catania, 1971). Similar issues arise in the study of elicitation: in specifying the circumstances in which particular stimulus/response relations can be referred to as reflexes, it is necessary to consider both the conditional relation between the stimuli and the responses (Skinner, 1931) and the nature of the stimuli and responses as classes (Skinner, 1935).

Consider a familiar stimulus/response relation: tickling that elicits smiling. To assert that a smiling reflex exists, it is not enough for us to observe that a child smiles when a feather is applied to the ribs. We must also determine the frequency with which the child smiles when not tickled. If the child smiles often when tickled but smiles equally often when not tickled, we cannot speak of a reflex. We may do so only if tickling increases the frequency of smiling relative to its frequency in the absence of tickling. The definition of the reflex requires that we determine the probability of the response (smiling) not only in the presence of the stimulus (tickling) but also in its absence. The smile-given-tickle probability must be high relative to that of smile given no tickle.

Tickling may also have other effects. For example, we might find that tickling lowers the probability of frowning; the child frowns often when not tickled but only infrequently when tickled. In that case, it would be appropriate to describe the effect of tickling on frowning as inhibitory.

These stimulus/response interactions may be described more formally in a contingency space that relates the probability of responses given the presence of stimuli to the probability of those responses given the absence of those stimuli (Figure 1). The vertical axis shows the probability of a response given a stimulus (e.g., probability of smile given tickle). The horizontal axis shows the probability given no stimulus (probability of smile given no tickle). The upper left corner of the contingency space defines the reflex relation; the probability of a response given a stimulus is high (the child smiles when tickled), and that given no stimulus is low (the child does not smile when not tickled). Reflex inhibition, in which the stimulus reduces the probability of the response, appears in the lower right corner of the contingency space; the probability of a response given no stimulus is high whereas given a stimulus it is low (as in the relation between frown and tickle). The diagonal corresponds to the set of points for which the two conditional probabilities of response (given a stimulus and given no stimulus) are equal; responding is independent of stimulus presentations. Stimulus/response relations falling in the lower left corner are those in which the response probability is low; response probabilities increase as one moves along the diagonal toward the upper right corner, but responses and stimuli remain independent. In other words, for a child whose probability of smiling is unaffected by tickling, the relation between smiling and tickling is represented by a point somewhere along the diagonal. (More detailed properties of contingency spaces, together with problems of de-

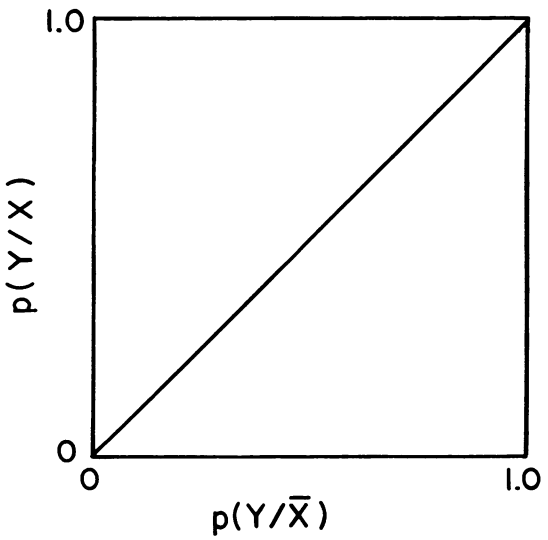

Figure 1. Contingency space representing intersections of two conditional probabilities: probability of event Y given that event X has occurred, and probability of event Y given that event X has not occurred. A contingency space describing stimulus/response relations is provided when X is a stimulus and Y is a response. A contingency space describing say/do relations is provided when X is saying and Y is doing.

Table 1
Typology of Verbal Response/Nonverbal Response Sequences

Verbal response	Nonverbal response	
	Do	Not do
Say	Positive correspondence	Negative correspondence
Say not	Negative correspondence	Positive correspondence
Not say	Do-only	Null

riving probabilities from time samples of behavior, have been discussed elsewhere, e.g., Catania, 1984, pp. 34–40, 71, 198–200).

An analogous contingency space, in which the vertical axis describes the probability of doing given saying and the horizontal axis describes the probability of doing given not saying or saying not, can be represented by Figure 1 simply by substituting conditional probabilities of saying and doing for those of stimuli and responses. The upper left corner then defines circumstances in which the probability of doing given saying is high while the probability of doing given not saying or saying not is low. When this combination of conditional probabilities is observed, it is appropriate to speak of the maintenance of the response class of *generalized positive correspondence* between saying and doing. *Generalized* is drawn by analogy from the imitation literature (Baer & Sherman, 1964; Gewirtz & Stingle, 1968), and is intended to denote correspondence as a response class subsuming an indefinite number of topographically different verbal/nonverbal sequences; *positive* occurs here in its purely correlational sense (as noted below, say not/not do sequences are assumed also to fall within the generalized positive correspondence response class).

In the lower right corner of the contingency space, the probability of doing given saying is low and the probability of doing given not saying or saying not is high. This corner defines the response class of *generalized negative correspondence*; *negative* here denotes an inverse correlation between what is said and what is done. Such generalized negative correspondence characterizes the relation between the verbal and nonverbal behavior of the habitual liar (these probabilities also characterize the behavior of the person who can be counted on to do what is expected only after having made no promise to do so; this verbal/nonverbal relation might be termed an inhibitory one). Finally, the diagonal, in which the conditional probabilities are equal, defines independence of verbal and nonverbal behavior: doing given saying is no more likely than doing given not saying or saying not.

One feature of this contingency space that may be counterintuitive is that saying not, saying other, and not saying are treated as equivalent in defining the say/do relation. Yet this grouping is necessary if the relation of interest is that between saying and doing. Generalized positive correspondence is demonstrated neither by the habitual liar nor by the child who never speaks. Other contingency spaces must be examined (e.g., between saying not and doing, or between saying and not doing) to distinguish among other verbal/nonverbal relations. Verbal behavior is multiply determined and particular topographies may therefore enter into a variety of verbal classes (Skinner, 1957).

A contingency-space analysis, an analysis in terms of conditional probabilities, serves to specify the verbal/nonverbal relations that may define response classes. For convenience, we have so far restricted our discussion to sequences involving doing rather than not doing and to sequences in which the verbal response precedes the nonverbal response. Such response classes, however, are maintained or altered only as environmetnal contingencies make contact with particular verbal/nonverbal sequences. A typology of sequence types is presented in Table 1.

Both say/do and say not/not do sequences define *positive correspondence,* because what is said and what is done are directly related in both sequences; conversely, both say/not do and say not/do sequences define *negative correspondence,* because what is said and what is done are inversely related. (Note that the table can be made diagonally symmetrical by subdividing not do into not do and do other or opposite, as when one says

"I'm staying" but leaves instead. That subdivision, however, is not critical to the definition of correspondence, because the latter depends on the verbal conventions established by the verbal community and not on the dimensions of nonverbal behavior.)

As already mentioned, the order in which the verbal and nonverbal components of a sequence appear is irrelevant to these definitions. The implications of distinguishing between verbal/nonverbal sequences (e.g., keeping one's word) and nonverbal/verbal sequences (e.g., accurately reporting one's past behavior) are a research issue; perhaps these sequences may enter into higher order classes (e.g., being truthful). Similarly, while the distinction between producing and inhibiting responding (Karlan & Rusch, 1982) may be significant in particular applications, the distinction need not be relevant to a typology of sequence types. Saying "I will do X" and subsequently doing X may be a member of the same operant class as saying "I will not do X" and subsequently not doing X. Both cases are appropriately called "honest" or "consistent" or "correct" relations between verbal and nonverbal responses, and both are likely to be similarly reinforced by the verbal community across a variety of responses and settings. If the distinction is not a fundamental one, it is probably wiser to begin with the simplest scheme and allow for such subsequent elaboration as may be suggested by empirical findings.

A *do-only* sequence (not say/do) is definable only in circumstances in which saying would be expected, as when a person is asked to describe his or her future behavior; not saying would certainly include refusals to answer, but might also include "I don't know" answers. Finally, not saying/not doing, again in circumstances in which saying and doing would be expected, defines a *null* sequence (the frequency of this class is most substantially affected simply by the frequency with which behavior is sampled).

The system of definitions proposed here is based on a contingency-space analysis of verbal/nonverbal behavior relations as response classes. This approach has proven effective in specifying other relations, such as those between stimuli and responses and between responses and consequences. Although the system will no doubt require further refinement, it takes into account the kinds of relations between verbal and nonverbal behavior that may be maintained as response classes while providing a parsimonious and intuitively appealing typology at the level of individual response sequences.

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Received January 9, 1986
Initial editorial decision March 19, 1986
Revisions received May 20, 1986; June 13, 1986; June 26, 1986
Final acceptance June 30, 1986
Action Editor, Nancy A. Neef

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