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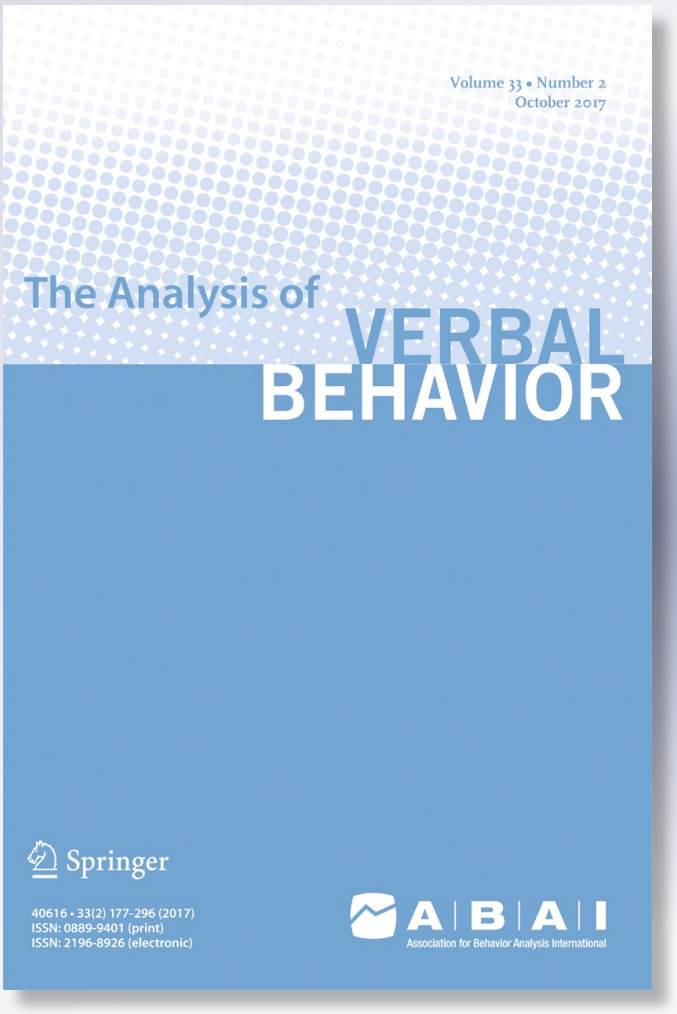

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DISCUSSION/REVIEW ARTICLE

Can Collateral Behavior Account for Transitions in the Stimulus Control of Speech?

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Abstract The task of extending Skinner's (1957) interpretation of verbal behavior includes accounting for the moment-to-moment changes in stimulus control as one speaks. A consideration of the behavior of the reader reminds us of the continuous evocative effect of verbal stimuli on readers, listeners, and speakers. Collateral discriminative responses to verbal stimuli, beyond mere echoic or textual behavior, are potential sources of control and must be included in any complete account of both verbal and nonverbal behavior.

Keywords Autoclitic frames · Grammar · Textual behavior · Verbal behavior

On the occasion of the 60th anniversary of the publication of *Verbal Behavior* (Skinner, 1957), one might ask what major interpretive frontiers remain to be explored in the domain of verbal behavior. My own speculations have drawn me to puzzles of grammar—specifically, the moment-to-moment changes in stimulus control that occur as we speak, particularly when we utter novel arrangements of familiar terms. Speech is commonly rapid. Stimulus control must shift just as rapidly as sequences of operants, and that is very fast indeed. As I have argued elsewhere (Palmer, 1998, 2008, 2014), possible controlling variables include the stimulus properties of one's own speech as well as the blizzard of correlated discriminative responses to both one's own speech and the present context. These discriminative responses are commonly covert, and to invoke them renders the relevant interpretive exercise open to charges of circularity, particularly if they are merely invented to plug an explanatory gap in one's account. Nevertheless, discriminative responses are implied by one's history of verbal conditioning, so they are no doubt real, whether overt or

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covert; to leave them out of account is justified only if we can do without them, and I do not believe that we can.

The behavior of the reader offers a window, albeit a small one, into the domain of these covert discriminative responses. Skinner (1957) defined textual behavior as vocal (or subvocal) behavior having a point-to-point correspondence with a nonauditory stimulus, as when a child says "basket" in response to the printed word *basket*. Ever careful, he distinguished textual behavior from reading: "Since the term 'reading' usually refers to many processes at the same time, the narrower term 'textual behavior' will be used here. In the textual operant, then, a vocal response is under the control of a nonauditory verbal stimulus" (pp. 65–66). It requires only a small interpretive step to assume that subvocal textual behavior is occurring when we read silently.

As Skinner (1957) says, "reading" usually refers to "many processes" that are concurrent with textual behavior. Our behavior is much richer than is suggested by our textual behavior or by an inventory of those other responses that can be measured with our conventional set of tools. We are not at present able to measure, to put it loosely, the cascades of imagination that a text evokes in a reader—and that speech evokes in a listener—but without reference to those cascades of discriminative responding, we will be unable to make sense of the repertoire change of either reader or listener as revealed by his or her subsequent behavior. Indeed, the whole point of reading for pleasure is to evoke such discriminative responses.

Skinner (1957, pp. 170–171) made the point with an elaborate pair of examples. The first example evokes relatively pure textual behavior and little correlated discriminative responding:

Thus it ease lep't bean ethers know we man till.
Coal dance eye lent was thick wrist ill lair,
Why lone least are lie tanned a sing gull ant earn
Broke thug loom. A long thud rear erode
Ash abbey fig your maid it sigh lent weigh,
Sea king sum shell turn ear. Atlas teas topped
Tune ah cup honest rangers dark end o'er.
Up stare sub right league low wing lamb pup eared.
A mow meant air reap awe such ear eek all,
A doe run bard, thick lass puff rend leach ear.

The second passage evokes nearly identical textual behavior in the sense that the movements of tongue, lips, larynx, diaphragm, and so on are the same, but it evokes much more coherent and elaborate discriminative responding:

The city slept beneath her snowy mantle.
Cold and silent was the crystal air,
While only star light and a single lantern
Broke the gloom. Along the dreary road
A shabby figure made its silent way
Seeking some shelter near. At last he stopped

To knock upon a stranger's darkened door.
Upstairs a brightly glowing lamp appeared.
A momentary pause, a cheery call,
A door unbarred, the clasp of friendly cheer.

The two passages differ markedly in their effects on discriminative responding, but the relevant point in the present context is that the responses evoked by the second passage become part of the complex of variables controlling subsequent behavior. It is easy to demonstrate this by asking a reader to summarize the passages after each has been read. Moreover, if the second passage were read aloud, it would affect the behavior not just of others, but of the speaker as well, for our ongoing speech is commonly affected by the evocative effect of our own verbal behavior. Now consider the following examples:

Only the brave man the ramparts.
As I bathed my three-year-old son stole my towel.
When Clarissa played the violin string snapped.

I presume that in each case you went astray and had to go back and reread the sentences with a different prosody before they made sense. They illustrate what William Fowler (1926) in *Modern English Usage* called "false scents," constructions in which the beginning of a sentence leads the reader to an interpretation that is not supported by the rest of the sentence. To put the matter in standard grammatical terms, we initially assign *the brave man* the role of grammatical subject of the sentence only to discover that *brave* alone is the subject, and *man* must be assigned the role of the verb. *Bathed* and *played* are commonly used as transitive verbs; consequently, *son* and *violin* are mistakenly assigned the roles of direct objects of the actions rather than as terms in the following independent clauses. Translating this into behavioral terms, we note that *the X man* is a common autoclitic frame that can take a wide variety of variable terms such as *brave*, and readers have long histories of responding with that interpretation. Alternatively, *the brave man* could be an intraverbal chain, as it is likely to have been encountered before. *Man the ramparts* is another common intraverbal chain, but in this context, it was encountered too late to rescue the correct interpretation for the reader. *X bathed Y* and *X played Y* are common frames appropriate to parenting and musical performances, respectively, so they are initially interpreted accordingly.

If reading were mere textual behavior, one would not falter in the middle of these sentences. The faltering implies a conflict of stimulus control in the collateral behavior of the reader; that is, our discriminative responses to the early parts of the sentences are incompatible with those occasioned by the later parts. *The brave man*, as a complete autoclitic frame at the beginning of an utterance, sets the occasion for several kinds of discriminative responses in the listener or reader, such as those entailing action (.. . *stormed the ramparts*), being the object of some action (.. . *was captured on the ramparts*), or having some property or state (.. . *was frightened in spite of himself*); that is, the phrase would enter into multiple control with the following speech or text, making any such response especially likely. But *the ramparts* by itself is a fragment incompatible with those various response tendencies. Likewise, the clause *As I bathed my three-year-old son* evokes tendencies to respond that are incompatible with the fragment *stole my towel*; that is, *stole* commonly appears in the autoclitic frame *X stole*

Y, but in this case the initial variable term is missing. It appears, then, that various elements of the sentences play characteristic roles in the correlated discriminative responses of the reader. Indeed, the layperson would shrug at such an obvious point.

My thesis here is that the speaker also engages in discriminative responses correlated with, and in part evoked by, ongoing speech, and that this behavior participates in the stimulus control of the speaker's own verbal behavior. Notice that the three previous ambiguous examples are only ambiguous as textual stimuli. A speaker would provide prosodic cues that would guide the correct interpretation, and the listener would not be led astray. A child being bathed is a different stimulus from a child stealing a towel and evokes different autoclitic frames marked by different prosodic cues. But when the child is absent and the speaker is recounting a past event, the burden of providing the relevant stimulus control must be carried by the ongoing discriminative behavior of the speaker (cf. Palmer, 1991).

The claim that the discriminative responses of the speaker enter into multiple control of subsequent verbal responses with other contextual variables may prove to be helpful in solving a formidable puzzle for behavior analysts—namely, explaining the "behavioral reality" of grammatical terms. Our verbal behavior appears to be controlled, in part, by what is conventionally called the grammatical categories of words. For example, consider the autoclitic frames *tore X up*, *looked X over*, and *filed X under Y*, as in *He angrily tore the letter up*, *He looked me over and decided to let me go*, and *He read the list and filed it under "things to do later."* Recall that an autoclitic frame is one or more fixed verbal terms that are constant from one example to the next, intermixed with variable terms that change according to context. For example, the frame *X is on top of Y* comes to strength whenever the relation of superposition is relevant, but the elements entering into those relationships can vary nearly without limit. The interplay of autoclitic frames, under control of relational aspects of a context with tacts, under control of physical features of the context, is responsible for much of the novelty characteristic of verbal behavior. Most extended utterances are unique, but the autoclitic frames that provide the skeleton of such utterances are not.

The challenge for the behavior analyst is to account for shifts in stimulus control as novel utterances are emitted. In the example *tore X up*, two fixed terms are separated by a variable term, *X*. In examples such as *tore the letter up*, *tore the summons up*, and *tore the poster up*, the term *up* is immediately preceded by a verbal response that might never have occurred in that context before. A clear case would be one in which the variable term is newly acquired.

"What are those changes to the will called?" asked the heir of the estate.
"A codicil," replied the executor, as he ripped it into little pieces.
"And then he tore the codicil up!" shouted the heir to his lawyer the next day.

Our behavioral principles predict that a response will come to strength, under suitable motivating conditions, in the presence of appropriate discriminative stimuli. Working backward, we must assume that the utterance *up* occurred at the moment it did, and not earlier or later, because of momentary shifts in discriminative stimuli. But what could those stimuli be? One obvious candidate is *tore*. Because autoclitic frames include fixed terms, there will be intraverbal control between terms. But in this case, *up* does not directly follow *tore*; it follows the variable term *codicil*. The intraverbal

control by *tore* is conditional upon the emission of an intervening term. But the intervening term varies from case to case, and in the present instance it is novel. How can a novel term participate in the orderly stimulus control of behavior? Note that the intervening term could consist of a long phrase or clause: *He tore the codicil of my great-grandfather's will up and threw it into the wastepaper basket!*

The linguists have a ready answer to our puzzle. The variable term is a noun phrase; *up* comes to strength whenever *tore* is followed by a complete noun phrase. This neatly solves the problem for the linguist, but not for the behavior analyst. What are the stimulus properties of a noun phrase? A noun phrase is not a unit of behavior or of a verbal stimulus; it is a term from a formal system, rather like *asymptote* or *limit of a function*. In this case, the formal system is a grammatical model of the language. To play a role in the determination of behavior, it must be translated into physical or behavioral terms. Our task is not to provide an adequate operational definition of a term in a formal analysis but to identify the critical controlling variables, in the domain of interest, of those things the formal system attempts to model (cf. Donahoe & Palmer, 2011, pp. 312–317; Palmer, 1998, 2008).

One possibility is simply that the variable term, putatively a noun phrase, takes time to utter. One way to see the possible relevance of duration alone is to imagine listening to two versions of the same utterance, one with the variable term excised, the other with it masked by a sneeze or some other loud noise.

He tore up!

He tore [sneeze] up!

The first example will baffle us, but the second instance will sound natural, and we will quickly ask, "Wait, what was it he tore up? I couldn't hear you. Somebody sneezed."

As a first approximation, then, perhaps the response *tore* followed by any verbalization is sufficient to evoke *up* in the behavior of the speaker. But although any verbalization might indeed contribute to the strength of *up*, it is not a sufficient solution to our problem. Recall that the intervening term can vary in length, not just in phonemic content, but we do not find ourselves tending to say *up* until the variable term is "complete"; that is, we don't say, *He tore my grandfather's up!* At least one additional property of the variable term is necessary.

A second relevant variable is prosody. Prosody is the cadence of speech, the rhythm and stress pattern. In an utterance containing an autoclitic frame and variable terms, the latter tend to be slightly stressed, whereas the frame itself is unstressed: In *X gave Y to Z*, prosodic stress falls on *X*, *Y*, and *Z* (e.g., *The doctor gave the prescription to the mother*). If the variable term is complex, then the final element tends to be stressed: *The doctor gave the prescription for codeine to the twins' mother*. Likewise, *The codicil of my great-grandfather's will* ends with a stressed term that might serve as a discriminative stimulus to the speaker for a transition to an element of an autoclitic frame.

Prosody and duration are two behavioral variables that might play a role in the stimulus control of complex utterances without appealing to abstract formal units like noun phrases. They are suitably objective and might be quantified in a naturalistic study of typical speech. Nevertheless, they are still insufficient. The prosodic properties of variable terms in autoclitic frames, although suggestive, are not invariant. In the

example *He tore the codicil of the will up*, the variable term has two stressed elements. It is true that such extended examples sound awkward. We are much more likely to say *He tore up the codicil of the will*. If the variable term is long, the last fragment of the autoclitic frame loses strength, and if it is sufficiently long, all control over the transition in the autoclitic frame is lost. This is consistent with our suspicion that duration and prosody are important. Unfortunately, awkwardness is an unreliable criterion. Many autoclitic frames sound natural even with extended variable terms (e.g., *The doctor gave prescriptions for codeine, penicillin, and an antihistamine to the boy's mother*).

A third possibility is that the controlling variable for *up* is *tore* followed by a tact. Because the defining features of tacts are objective, a speaker can, at least in principle, come under control of the generic properties of the emission of a tact as a stimulus. This solves the problem of novelty, for a particular tact need not have been emitted in that autoclitic frame before in order to exert appropriate stimulus control over the rest of the frame; it is sufficient that it have the generic properties of a tact. Unfortunately, not all noun phrases are tacts. The codicil was absent when the man complained to his lawyer. As in this example, much verbal behavior bears no obvious relationship to the immediate context.

As I foreshadowed previously, a final variable that might control transitions from variable terms to autoclitic frames in speech is the correlated behavior of the speaker. Just as reading is much more than mere textual behavior, speaking is much more than mere vocalization. When describing a room to a person on a telephone, speakers will doubtless look around the room for prompts as they speak. When describing a different room, however, such supplementary stimulation is unavailable. In such a case, the speaker might visualize the room and respond partly under control of his or her own behavior. If you and I were now asked to summarize the second of Skinner's two aforementioned examples, we would be likely to respond discriminatively, perhaps by visualizing the scene, and these responses would participate in the multiple control of our own behavior. What, indeed, is the alternative? *To tear something up*, *to look something over*, and *to put something down* all evoke discriminative responses, just as *Along the dreary road a shabby figure made its silent way* evokes responses in a reader of *Verbal Behavior* (Skinner, 1957). These discriminative responses are a potential source of controlling variables (Skinner, 1945). In interpreting the faltering of the behavior of the reader of the aforementioned ambiguous passages, we appealed to the possible roles played by terms in the passages. To extrapolate to the present case, we note that the variable term, *X*, in *tore X up* plays the role of object of the action; it is something that can be torn; it is something that smoothly participates in the multiple control of concurrent behavior. If these properties can be discriminated, they would be sufficient to account for the transition in stimulus control to the final term in the autoclitic frame *tore X up*. Such a claim is highly speculative and difficult to put to an experimental test, given our current set of laboratory instruments, but if the correlated behavior of the speaker is real, it must eventually take its place in a complete analysis of verbal behavior.

Grammatical categories appear to be real and appear to serve an explanatory function. But such terms are well defined only in terms of formal structural models of language. The behavior analyst must either operationalize them in behavioral terms or do without them altogether. I am inclined to believe that if we accept that the

behavior of speakers, like the behavior of readers, typically consists of myriad discriminative responses to the context and to their own behavior, including their own speech, then we can account for verbal behavior without appealing to such categories and terms. Unfortunately, much of this putative behavior is likely to be covert, so its actual role must remain an interpretive exercise until laboratory technology can provide a more direct account. Can it account, in principle, for the apparent reality of grammatical terms? These are among the questions that remain to be resolved in the next 60 years of inquiry into the moment-to-moment stimulus control of verbal behavior.

Compliance with Ethical Standards

Conflict of interest The author declares that he has no conflict of interest.

References

Donahoe, J. W., & Palmer, D. C. (2011). *Learning and complex behavior*. Richmond, MA: Ledgetop Publishing (Original work published 1994).

Fowler, W. (1926). *Modern English usage*. Oxford: Oxford University Press.

Palmer, D. C. (1991). A behavioral interpretation of memory. In L. J. Hayes & P. N. Chase (Eds.), *Dialogues on verbal behavior* (pp. 261–279). Reno: Context Press.

Palmer, D. C. (1998). The speaker as listener: The interpretation of structural regularities in verbal behavior. *The Analysis of Verbal Behavior, 15*, 3–16.

Palmer, D. C. (2008). Verbal behavior: What is the function of structure? *European Journal of Behavior Analysis, 8*, 161–175.

Palmer, D. C. (2014). Verbal behavior. In F. K. McSweeney & E. S. Murphy (Eds.), *Handbook of operant and classical conditioning* (pp. 369–391). Chichester: Wiley-Blackwell.

Skinner, B. F. (1945). The operational analysis of psychological terms. *Psychological Review, 52,* 270–277. https://doi.org/10.1037/h0062535

Skinner, B. F. (1957). *Verbal behavior*. New York: Appleton-Century-Crofts.