

On Intraverbal Control and the Definition of the Intraverbal

David C. Palmer¹

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Abstract Behavior analysts should distinguish between the intraverbal, as a class of verbal operants, and intraverbal control, the potentiating effect, however slight, of a verbal antecedent on a verbal response. If it is to serve an explanatory function, the term intraverbal, as a class of verbal operants, should be restricted to those cases in which a verbal antecedent, as the result of a history of contiguous or correlated usage, is sufficient to evoke the putative intraverbal response. Intraverbal control is pervasive in verbal behavior, but since it is typically just one of many concurrent variables that determine the form of a verbal response, such multiply controlled responses are not usefully called “intraverbals.” Because intraverbals and their controlling variables have invariant formal properties, they are conceptually simple, but they nevertheless play a central role in the interpretation of complex phenomena such as the structural regularities in verbal behavior (i.e., grammar).

Keywords Autoclitic frames · Grammar · Intraverbal · Intraverbal control · Skinner · Verbal behavior · Verbal operants

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To call a verbal response a tact, a mand, an echoic, or another of Skinner’s primary verbal operants serves both to classify the response and to explain it. Classification may be important to the therapist who wishes to assess the verbal repertoire of a client, and it is a common preoccupation of students who first encounter Skinner’s taxonomy of

This article is part of a special section on the intraverbal relation in *The Analysis of Verbal Behavior*. The author thanks David Roth and Mark Sundberg for their helpful exchanges on the topic of intraverbal control.

✉ David C. Palmer
dcpalmer@smith.edu

¹ Smith College, Northampton, MA 01063, USA

verbal operants, but explanation answers a deeper question: *Why did a response of this form occur at this time?* Behavior analysts look for answers to such questions in the history of the organism. To call something a tact, for example, is to imply a history of generalized reinforcement for emitting that response in the presence of a particular set of stimuli, and a history of extinction for emitting it in other contexts. (If that history is a mere inference, the explanatory burden is carried by the plausibility of such a history.) An analogous claim can be made for Skinner's other primary verbal operants: Each class implies a particular kind of history *sufficient to explain its occurrence in the present instance*. Identifying the class is, in effect, plausibly to explain the behavior.

A possible exception, depending on how one defines it, is the intraverbal. Skinner devoted only a few pages of *Verbal Behavior* to the intraverbal, perhaps because in its simplest form it raises few troublesome questions. Moreover, he defined the term only obliquely: "The present chapter is confined to responses under the control of audible or written verbal stimuli supplied by another person or by the speaker himself... We are concerned here only with the effect of verbal stimuli in evoking verbal responses" (1957, p. 55). After discussing echoic, textual, and transcriptive behavior, which also fall under this umbrella, he introduced the intraverbal: "But some verbal responses show no point-to-point correspondence with the verbal stimuli which evoke them" (p. 71). Putting these strands together, we get, "A verbal response under the control of a prior verbal stimulus with no point-to-point correspondence with that stimulus." This has been taken, both explicitly and in practice, as the definition of the intraverbal (e.g., Axe, 2008; Carr & Miguel, 2013; Donahoe & Palmer, 2011; Eikeseth & Smith, 2013; Michael, 2004; Sundberg, 2007).

This definition permits both a broad reading and a narrow reading. Under the broad reading, an intraverbal response is any verbal response, of a different form, to a prior verbal stimulus. Any answer to a question is an intraverbal under this reading, for indeed the answer is clearly a response to a prior verbal stimulus. Under the narrow reading, an intraverbal is a verbal response directly under control of a prior verbal stimulus *as the result of a history of reinforcement for emitting that response in the presence of that stimulus* (Palmer, 2014). The difference is revealed in the following exchange:

Dick: What's six times four?

Jane: 24.

Dick: Now name some prime numbers between 70 and 100.

Jane: What??... Uh... 71... Uh... 73... 77... No, not 77...

Under the narrow reading, only Jane's first response is an intraverbal, for if Jane is a typical educated adult, there can be little doubt that she has had a history in which 24 was reinforced in the presence of *six times four*, and there can be little doubt that she has had no analogous history with regard to the second question. Her behavior was "under control of the prior verbal stimulus" only in the loose sense that the task occasioned behavior that introduced additional controlling variables (counting upward from 70; dividing each candidate, in turn, by one-digit primes, etc.). The relevant

responses offered as the “answer” were multiply controlled; the antecedent verbal stimulus was not sufficient to evoke them by itself.

In practice, the behavioral literature has not distinguished between the two definitions, thereby implicitly adopting the broader one. This practice may have arisen from the common misconception that all verbal behavior must fall into one or another category in Skinner’s taxonomy—(“If Jane’s response, *71*, isn’t an intraverbal, what is it?”). But this is indeed a misconception. Examples of pure verbal operants are rare outside the laboratory or classroom; almost all verbal behavior is multiply controlled (Michael, Palmer, & Sundberg, 2011; Palmer 2014; Skinner, 1957; Sundberg & Sundberg, 2011). Moreover, “classification is not an end in itself” (Skinner, 1957, p. 187); our task is not primarily to classify behavior but to identify its controlling variables.

It is possible to defend the claim that Skinner adopted the broader definition. In the *William James Lectures*, when discussing intraverbal behavior, he noted that “... a question is frequently the stimulus for an extended response which seems to have no other controlling variable” (1948, p. 46). As it is implausible that an extended response to a question would frequently be an intraverbal chain, this passage suggests that Skinner was comfortable with the broad definition. But that argument cuts both ways: When Skinner wrote the final draft of *Verbal Behavior*, he imported many sections of the *William James Lectures* verbatim, but in this instance, he retained the surrounding text and explicitly dropped the quoted passage. Perhaps this indicates that he had second thoughts about its merits. The *Lectures* were, after all, mere lectures; *Verbal Behavior* was his magnum opus, of all his books, first in his heart.

The only passage in *Verbal Behavior* that I find in favor of the broad interpretation of the definition is his off-hand remark that “‘Small talk’ is largely intraverbal, and serious conversation is not always clearly anything else” (1957, p. 71). This statement is hard to square with the narrow interpretation of the definition of intraverbal, for it is hard to imagine a serious conversation so banal that it is a mere concatenation of canned remarks. But this passage may have been mere irony—a sly dig against the conversation of tiresome and disputatious intellectuals—and not a serious claim, for all of Skinner’s many examples of intraverbals exemplify the narrow definition—standard responses to standard stimuli: poems, clichés, multiplication tables, social rituals, historical facts, etc. But his most telling endorsement of the narrow definition lies in his discussion of the origin of intraverbal operants:

The reinforcements which establish intraverbal operants are often quite obvious and specific. The contingencies are the same as in echoic and textual behavior: a verbal stimulus is the occasion upon which a particular verbal response characteristically receives some sort of generalized reinforcement. (1957, p. 74)

He then identifies ‘contiguous usage’ as one of the main sources of intraverbal control:

We may speak of the tendency to occur together as “contiguous usage.” In the usual word-association experiment, the clang associations are, as we have seen, either echoic, textual, or transcriptive operants. The remaining intraverbal operants appear to be explained by contiguous usage. (1957, p. 75)

Whether or not Skinner might have endorsed the broad reading of the definition, my purpose here is to argue that behavior analysts should adopt the narrow reading when discussing the term intraverbal as a primary verbal operant. Doing so reinstates the explanatory function of the term, and it can take its place alongside the other primary verbal operants. This is too precious a benefit to squander. In cases in which the verbal antecedent is, by itself, insufficient to evoke the relevant response, we should speak of “intraverbal control,” usually as one of a number of concurrent controlling variables. To call a multiply determined response an intraverbal is to give the illusion of explaining the response when we have not done so, and the practice tends to close off inquiry into the role of other controlling variables.

According to this policy, the term intraverbal would be restricted to cases in which a verbal response has been reinforced following a verbal stimulus of a different topography, where the antecedent can be written, spoken, or signed by someone else or by one’s self. This category would include seemingly trivial examples, such as memorized poems, historical facts, song lyrics, the dialog of plays, scientific and mathematical formulae, rehearsed speeches, cliché’s, word associations, innumerable common phrases (*in the car, on the shelf, over there, if possible, etc.*). But the term, so defined, would also embrace the more subtle examples of autoclitic frames, to be discussed later, in which intraverbals are intermingled with other verbal forms. To call something an intraverbal is implicitly to invoke a history of reinforcement for uttering the response under similar conditions in the past.

As Skinner noted, contiguous usage is a typical source of intraverbal control, but correlated usage appears to be sufficient as well. For example, the word *cow* might intraverbally evoke *bull* in a word association or semantic priming experiment. Although we seldom, if ever, encounter the two words strictly contiguously (*cow-bull*), they are likely to be evoked by similar circumstances and to occur in thematic verbal contexts: *We eventually found the missing cow in the upper pasture with the bull.*

We may assume... that, aside from intraverbal sequences specifically acquired, a verbal stimulus will be an occasion for the reinforcement of a verbal response of different form when, for any reason, the two forms frequently occur together. A common reason is that the nonverbal circumstances under which they are emitted occur together. (1957, p. 75)

Just how closely related such terms must be, temporally or thematically, for one term to intraverbally evoke the other is an empirical matter, but the phenomenon does not raise a formidable interpretive problem.

Another empirical matter is the size of the intraverbal: Is it a speech sound, a word, a phrase, a whole memorized soliloquy? Most of us can recite song lyrics, poems, and famous quotes, and some public speakers learn long addresses “by heart.” The Iliad is thought to have been passed down orally, from generation to generation, long before Homer put quill to papyrus, and recently someone is said to have recited over 67,000 places of pi. Presumably, these are examples of intraverbals under the control of intraverbals, concatenated, and perhaps nested, into chains (or as Catania, 2013, would have it, chunks). However, much we might marvel at remarkable feats of recall, the emergence of intraverbal chains raises no conceptual problems. Moreover, the size

of the intraverbal unit is of little interest, because it surely varies from one person to another. My intraverbal repertoire will be quite different from yours because of the different songs we listened to, the different poems we have memorized, the different authors we have read, the different things our friends have talked about, and so on. Some intraverbals are culture-wide, and those show up in tables of word associations, but they surely form only a small part of an individual's intraverbal repertoire. A given response form can be a part of many separate intraverbals: *mark my words... on your mark... the mark of Cain... make your mark... etc.*, so the number of intraverbals presumably vastly exceeds that of other verbal operants (Skinner, 1957).

Intraverbal Control

Intraverbals are presumably established by reliable contingencies; rarely do we say *four score* without also saying *and 7 years ago*. The chemical formula for water is H_2O , not CO_2 . But less reliable contingencies are not without effect. We experience countless transitions of verbal stimulus to verbal response, and natural contingencies presumably establish weak intraverbal control in many such cases. Intraverbal control is the potentiating effect of a verbal stimulus on a verbal response, regardless whether that stimulus is sufficient, by itself, to evoke that response. When it is sufficient, the evoked response is an intraverbal in the narrow sense, but more commonly a verbal stimulus has a weak evocative effect on many mutually incompatible responses (i.e., *divergent multiple control*; Michael et al., 2011). Hearing, reading, or saying the word *dog*, for example, will slightly increase simultaneously the probability of saying *bark*, *collar*, *spaniel*, *beagle*, *Fido*, *race*, *kennel*, among many other responses. Such “priming” effects are usually too weak, under normal circumstances, to evoke any one intraverbal response directly, but they can be detected by special experimental procedures such as measuring the decreased latencies to emit those responses to corresponding textual stimuli (Neely, 1991), or by recording distinctive electroencephalographic responses (Ortu, 2012). For discussions of the relevance of such experiments to behavioral phenomena, see Donahoe and Palmer (2011) and Palmer (2009, 2014). To make the point a different way, if someone responded to the stimulus *dog* by saying *beagle*, we would call the response an intraverbal in the narrow sense, but we would presumably fail to observe that the stimulus *dog* had a simultaneous effect on the probability of emitting many incompatible responses as well. More commonly, a verbal stimulus does not evoke any intraverbal response at all, but we might see its effects indirectly in the multiple control of subsequent behavior. For example, a person who has just heard the word *dog* might be more likely to use the idiom *bark up the wrong tree* rather than the equivalent *go down a blind alley* (see Skinner, 1957, Chapters 9–12, for many anecdotal examples culled from his experience).

Of course, the distinction between the intraverbal, as a type of verbal operant, and intraverbal control, as one element among many in the multiple control of verbal behavior, has analogs in the other types of verbal operant. The response *chair*, under control of a chair as a stimulus, is a tact, but we seldom actually say *chair* when we enter a room with a chair in it, nor do we list the other objects in the room. Nevertheless, we must assume that the presence of a chair slightly increases the probability that we will say *chair* relative to a room with no chair. We thus distinguish

between the tact, as a verbal operant, and tact control, the potentiating effect of a stimulus on the corresponding response. We can make analogous distinctions for each of the other verbal operants. To analyze verbal behavior, we must commonly tease out the various sources of control; classifying responses as one type or another is seldom sufficient.

Given the dense schedule of reinforcement common in most verbal exchanges, stimulus control of verbal behavior is presumably modified nearly every time we speak, perhaps even when we covertly follow along the speech of another, for to listen is commonly to behave verbally (Schlinger, 2008). It follows that intraverbal control is modified accordingly. How could it be otherwise? But if so, the number of intraverbal relations must be incalculable, with most verbal responses exerting some measure of intraverbal control over a vast number of other responses, for the number of intraverbal transitions in anyone's history is immense. Since a speaker is usually also a listener, intraverbal control emerges most commonly from one's own speech. That is, the number of transitions from verbal stimulus to verbal response in one's own speech must be vastly greater than those between speakers. When we rehearse a bit of poetry, it is typically our own verbal behavior that serves as the controlling stimuli for intraverbal responses, not the speech of others.

Skinner has remarked that most verbal behavior is under multiple control (1957, p. 227); it appears inescapable that intraverbal control is commonly one or more of the multiple controlling elements. The intraverbal, as a class of rote responses to antecedent verbal stimuli, is conceptually simple, but intraverbal control is another matter. Its influence is pervasive and subtle, affecting not just our "choice of words" but phrases, clauses, and sentences, prosody, and grammar.

The Role of Intraverbals and Intraverbal Control in Grammar

A characteristic feature of intraverbals is that both antecedent stimulus and response are defined structurally as well as functionally. The antecedent *Mary had a...* evokes *little lamb*, and equivalent expressions—*small sheep*, *juvenile ovine*, *baby lamb*—will not do. The importance of this seemingly minor detail is that many of the structural properties of verbal behavior that so excite the linguist arise, at least in part, from the prevalence of intraverbals and intraverbal control. In particular, autoclitic frames and grammatical tags are largely intraverbal. In Skinner's taxonomy, an autoclitic frame is an interrupted or incomplete intraverbal chain that becomes functional for a listener only by the inclusion of one or more variable terms.

Call X up / look X over / X gave Y to Z / X put Y on the Z / in the X / under the X / the boy's X are all examples of autoclitic frames. An important class of autoclitic frames is the set of relational propositions at the heart of relational frame theory: *X is bigger than Y / X is the opposite of Y / X is the square root of Y / X is the same as Y*. The frames in such examples are intraverbal; that is, they form the lattice into which variable terms are inserted according to context. As I have discussed autoclitic frames at length elsewhere (e.g., Donahoe & Palmer 2011; Palmer, 1998; 2009, 2013; 2014), I will merely remind the reader that the frame comes to strength in characteristic contexts (e.g., calling someone, inspecting something, giving something, comparing sizes, computing square roots) because of a history in which intraverbal control was established over the fixed

elements of the frame. The variable terms come to strength according to the context. In *the woman gave the check to the clerk*, the variables terms are *woman*, *check*, and *clerk*. In a different context, other terms with similar functions would come to strength.

Thus, it seems likely that the formal properties of language (“grammar”) arise from the structure of autoclitic frames, which arises in turn from the structure of intraverbals. Moreover, because of their invariance, these structural properties of intraverbals can serve as controlling variables for paraphrase, deductive reasoning, and linguistic transformation. If *X gave the Y to Z* (active voice), then *Z was given Y by X*, and *the Y was given to Z by X* (two versions of the passive voice); if *X is bigger than Y*, then *Y is smaller than X*; If *X is the square root of Y*, then *Y is the square of X* (deductive inference). Thus, both the transformation of sentences that served such a prominent role in the foundation of Chomsky’s theories of linguistics (e.g., Chomsky, 1957) and the abundantly studied phenomena of derived responding in the behavioral laboratory in verbal subjects (e.g., Hayes, Barnes-Holmes, & Roche, 2001; Sidman, 1994) might be explained in part by the stimulus control of autoclitic frames and their intraverbal structure.¹

A second role that intraverbal control plays in linguistic structure is in establishing “agreement” between one unit of verbal behavior and another. Intraverbal agreement is particularly conspicuous in highly inflected languages, such as Latin and Old English, but traces remain in contemporary English.

The speaker responds to a common property of the situation and gives it a tag. This alters the status of, and the available grammatical practices with respect to the responses which remain. If the first response has been tagged as a noun, a fragmentary intraverbal pattern will supply the appropriate tag for, say, the verb to follow... The effect of one grammatical tag in setting up another with a sort of skeletal intraverbal response is clearly seen when the process miscarries to produce “bad grammar.” The classical example *The wages of sin is death* finds the intraverbal connection between *sin* and *is* overcoming the more remote relation between *wages* and *are*. In a hastily written sentence on an examination beginning *Paresis increase rapidly...* the final *s* of *paresis* has controlled a verb appropriate to a plural subject because *-s* is a common ending of plurals. (Skinner, 1957, p. 337–339, *passim*)

Grammatical tags illustrate just one form of agreement among many. To cite just a few, the direct article *the* calls for the gerund form of verbs (*the running of the bulls*); the adjective *many* calls for the plural form of a noun; verb forms, distinguished in part by their affixes, are typically modified by adverbs ending in *-ly*. (A woman began a sentence, *She arranged her outfit so beautifully, while I arranged mine so...* and then found herself forced to conclude with the ludicrous expression... *so uglily*—a neologism brought to strength by the combined intraverbal contrast between *beautiful* and *ugly* and that between the verb form *arranged* and the adverbial suffix *-ly*.) Thus, intraverbal control pervades our speech and exerts a subtle effect on our “choice of words,” their arrangement, and their form.

¹ The concept of joint control is required as well. See Lowenkron (1998) for an exposition of this point.

Conditional Discriminations

An important class of examples of intraverbal control is that of verbal conditional discriminations (Axe, 2008; Eikeseth & Smith, 2013; Sundberg & Sundberg, 2011). In a conditional discrimination, responses to a discriminative stimulus depend on the status of one or more other stimuli. When a traffic light turns green we step on the gas, but only if the road ahead of us is clear of pedestrians or other vehicles. In a verbal conditional discrimination, our response to one verbal stimulus varies according to the presence or absence of other verbal stimuli. For example, we would respond differently to *When is your mother's birthday?* and *When is your father's birthday?* (Axe). Moreover, the difference in responding is not simply the additive effects of responding to each element of the verbal stimulus separately; rather, the difference arises from a history of differential reinforcement (Eikeseth & Smith). That is, we have learned to respond one way to *mother's birthday* and another way to *father's birthday*. As a result of such differential experience, one verbal stimulus alters the evocative effect of a second verbal stimulus on an intraverbal response (Sundberg & Sundberg).

Some apparent examples of conditional discrimination require a more complex analysis. A prompt like *Name some animals that have antlers* might evoke responses such as *moose, reindeer, and elk*, but it is implausible that many participants would have heard that particular question before and even less likely that they would have had differential training with respect to possible answers. Therefore, the responses do not appear to be either simple intraverbals or conditionally discriminated responses. Rather, they appear to be multiply controlled responses, partly under intraverbal control of elements of the question but partly under control of mediating behavior of the participants (e.g., Kisamore, Carr, & LeBlanc, 2011). For example, one might generate possible answers by visualizing the trophies at a hunting lodge, or the exhibits at a zoo, or a trip to a national park. When one imagines a candidate with antlers, the onset of joint control would evoke an appropriate verbal response. In this hypothetical example and many others, intraverbal control is an important element, but to explain the behavior, it is not enough to call the responses intraverbals; the role of additional variables must be taken into account. If I want to know why you said... *the flag*, in response to *I pledge allegiance to...*, being told that it is an intraverbal is a complete explanation, because it invokes a plausible history of reinforcement for emitting the response in the presence of the stimulus. There is nothing mysterious about it. But if I say, *A frog was sitting in my cereal bowl*, in response to *Did anything interesting happen at breakfast?* it explains nothing to call it an intraverbal. Such novel examples of recall are instances of problem solving, and require a complex interpretation, usually invoking mediating behavior that introduces additional sources of stimulus control. See Donahoe and Palmer (2011) and Palmer (1991) for extensive discussions of the difference between recall as a stimulus control phenomenon and recall as a problem solving phenomenon.

Conclusion

If the term *intraverbal*, as an elementary verbal operant, is to serve an explanatory function, behavior analysts must restrict the use of the term to those instances in which reinforcement of contiguous or correlated usage with a verbal antecedent has been

observed or can plausibly be inferred. Responses of this sort include social formulae in idle conversation (*Fine thanks, and you?*), memorized speeches and poems, clichés, famous quotations, and common phrases. Among the most important examples are the innumerable “facts” we acquire in school (*1066* in response to a question about the date of the Norman Conquest; *24* in response to *What’s three times eight?*) Chemical formulae and the equations of physics are usually learned as intraverbals. When we first learn a new topic, or when we speak of complex subjects, or those that we understand poorly, such as quantum mechanics or relativity, our remarks are likely to be liberally sprinkled with intraverbals. That is, our verbal responses are under exclusive control of verbal stimuli as the result of what we have read or heard. In all such cases, careful scrutiny is likely to reveal multiple sources of control—none of the responses is likely to occur in the absence of an audience, for example—but to the extent to which it makes sense to classify any verbal response as one or another type of verbal operant, these are intraverbals. Calling them so both classifies them and goes a long way toward explaining them. Citing the additional sources of control would only rarely be of interest, because they do not contribute substantially to the specific form of the verbal response.

In cases in which there is no relevant history of reinforcement for a verbal response to a verbal stimulus (Q: *Where have you been?* A: *Hiking with Sarah and Tanner*), it is a mistake to call the response an intraverbal, for doing so offers no explanation at all.

Grammatical regularities are commonly intraverbal skeletons into which variable terms that differ from case to case are inserted, constructions Skinner called autoclitic frames (e.g., *Sing X again!*). In this example, *again* is multiply controlled by the verbal antecedent *sing* and the variable term *X*, which might be wholly novel to the speaker (Dick: *What was that song?* Jane: *Mozart’s Wiesenlied*. Dick: *Sing Wiesenlied again!*) In such a case there is surely a relevant history of reinforced responding for saying *again* following *sing*. But is it an intraverbal? This is one case among many in which I believe that the urge to classify verbal operants is misguided. *Sing* shares control of *again* with *Wiesenlied*, for which there is no history of reinforced responding at all. To call *again* an intraverbal is defensible but offers only a partial explanation when a much more complex one is required (see Palmer, 2007, for further discussion of the problem of transitions in stimulus control in autoclitic frames). In such cases, it is best simply to call the response multiply controlled and to identify the various sources of control.

The foregoing analysis offers some suggestions for future work: (1) To what extent can intraverbal relations be established by mere listening? One could plausibly argue, *None at all*, for by my proposed definition intraverbals require a history of reinforced responding. But if listening commonly entails covert echoic behavior (Palmer, 2005; Schlinger, 2008), the conditions for establishing intraverbals might be met. Indeed, we often learn novel facts about the world by listening to others, in the absence of overt verbal behavior. An analogous question can also be raised for reading. If, as seems likely, the answer is *To some extent*, what are the parameters of such acquisition? What is the role of response amplitude? If we hear or read a poem, how much will we be able to recite? A few words? A line? What is special about the bits that hang together intraverbally and those that do not? (2) If some measure of intraverbal control can be established by reading, is the effect cross-modal? That is, will intraverbal control be maintained if the verbal stimulus is spoken, not read? (3) With nonsense syllables as elements, how many trials of contiguous usage are required before measurable

intraverbal control is established? (4) Does the prosody (cadence) of a verbal stimulus play a role in evoking an intraverbal response? (5) In prolonged intraverbal chains, as in reciting a long poem, or in reciting of the places of pi, what is the typical size of the functional intraverbal units? No doubt there is much variability within and between people, but are there any generalizations to be drawn?

Because the antecedent exerts such dominant control over the form of the response, intraverbals are predictable and likely to be seen as conceptually uninteresting. But I have speculated here that intraverbal control is nearly ubiquitous. Some measure of intraverbal control is likely established upon every emission of a verbal response following a verbal stimulus, but such control is usually detected only in conjunction with other variables. As a consequence, it plays some role in almost all verbal behavior at all levels of complexity, including the most formidable interpretive problems facing the behavior analyst who would try to interpret grammatical regularities in verbal behavior. Far from being one of the more trivial of the various controlling variables in verbal behavior, it is one of the most important.

Compliance with Ethical Standards

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

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