

# Contingency Horizon: on Private Events and the Analysis of Behavior

Sam Leigland

Published online: 20 February 2014

© Association for Behavior Analysis International 2014

**Abstract** Skinner’s radical behaviorism incorporates private events as biologically based phenomena that may play a functional role with respect to other (overt) behavioral phenomena. Skinner proposed four types of contingencies, here collectively termed the *contingency horizon*, which enable certain functional relations between private events and verbal behavior. The adequacy and necessity of this position has met renewed challenges from Rachlin’s teleological behaviorism and Baum’s molar behaviorism, both of which argue that all “mental” phenomena and terminology may be explained by overt behavior and environment–behavior contingencies extended in time. A number of lines of evidence are presented in making a case for the functional characteristics of private events, including published research from behavior analysis and general experimental psychology, as well as verbal behavior from a participant in the debate. An integrated perspective is offered that involves a multiscaled analysis of interacting public behaviors and private events.

**Keywords** Private events · Radical behaviorism · Teleological behaviorism · Molar behaviorism

---

This article is based on a paper presented at the 2011 meeting of the Association for Behavior Analysis, International, Denver, CO.

---

S. Leigland (✉)  
Department of Psychology, Gonzaga University,  
Spokane, WA 99258, USA  
e-mail: leigland@gonzaga.edu

One of the conspicuous characteristics of Skinner’s *radical behaviorism* has been its treatment of private events in a natural science (e.g., Day 1983/1992; Skinner 1945, 1953, 1969, 1974). In recent behavior analytic writings, however, a controversy has arisen concerning the adequacy and necessity of Skinner’s analysis of private events (e.g., Baum 2011b, d; Moore 2011). The controversy involves the contention that Skinner’s inclusion of private events in his analysis of behavior is irrelevant at best and misleading at worst, as all behavioral phenomena, including the language of the “mental,” may be analyzed exclusively in terms of overt behavior–environment interactions over extended periods of time (e.g., Baum 2011a, c).

The controversy may be traced, in part, to two recent books on contemporary behaviorism: Baum’s (2005), *Understanding Behaviorism: Behavior, Culture, and Evolution* (2nd ed.), and Moore’s (2008), *Conceptual Foundations of Radical Behaviorism* (for reviews, see, e.g., Leigland 2006, 2009). Although the books cover a number of common themes of importance to contemporary behavioral science, certain differences may be seen in the treatment of specific issues, one of which is the role of private events in a natural science (e.g., Leigland 2010). The differences became acute in a recent review by Baum (2011d) of Moore’s (2008) book on radical behaviorism, which was followed in turn by a reply by Moore (2011) and then by Baum (2011b; see also Schlinger 2011).

The origins of the controversy may be traced further back to a variation in behaviorism that had been presented as an alternative to Skinner’s radical behaviorism. In 1994, Rachlin’s book *Behavior and Mind* described a scientific system, called *teleological behaviorism*, which

would account for all “mental” phenomena without recourse to private events. On this view, “mental” phenomena, such as when a person says that she “believes” that a friend will be arriving soon, the overt statement is not under the influence of a private event, but rather is controlled by a history of overt context-related environment–behavior interactions involving the friend in the past. Such a history involving an extended period of time and contingencies is sufficient to account for all of the overt verbal and nonverbal behavior involved, and the analysis makes all of the interactions accessible to standard (third-person) scientific practices. Further, it dispenses with fruitless and misleading (third-person) speculation about the private events of others. Baum’s *molar behaviorism* (e.g., 2005, 2011b, d) has supported Rachlin’s (1994) position as an alternative to Skinner’s (e.g., 1953) analysis of private events.

Given the appearance of a more recent series of papers that have addressed the issues raised by Baum (2011b, d) and Moore (2011; Schlinger 2011), the present space would not allow for an adequate discussion of all points raised in the course of the recent debates (see Baum 2011a, c; Dougher 2013; Catania 2011; Hinline 2011; Marr 2011; Palmer 2011; Rachlin 2011). Accordingly, this paper will be organized around the following three themes: (a) an overview of the scientific systems involved and some examples of specific issues of controversy, (b) an examination of empirical research and observation that are relevant to the controversy, and (c) some specific recommendations for an integrative approach to the issues of private events in a scientific analysis that includes characteristics of both scientific perspectives.

The issues involved in this controversy are complex and subtle but are important in the continuing development of a comprehensive science of behavior. The scientific conception of the role of private experience, or private events, in the analysis of the behavior of the organism as a whole has relevance to all systematic scientific issues, including the consistency of the account, measurement and methodology, and explanatory practices.

## Overview of Radical Behaviorism and Teleological/Molar Behaviorism

### Radical Behaviorism

From the perspective of radical behaviorism (e.g., Skinner 1945, 1953, 1969, 1974), private events are

regarded as occurrent and discriminable conditions of the body that may participate in the functional control of the ongoing behavior of the individual organism and which have special relevance to human verbal behavior. Such conditions of the body constitute stimulus conditions to which the individual may respond discriminatively, either non-verbally or verbally, given certain histories of reinforcement. Private events may be functional with respect to behavior, but the controlling relations are complex given the types of variables involved and the complexity of the contingencies necessary to establish functional relations (see also Chiesa 1994; Leigland 1992, 2010; Moore 2008; Todd and Morris 1995).

Virtually all people agree that private events are phenomena; that they are events that are apparent or observed in the first-person sense. Skinner’s radical behaviorist interpretation of private events connects the phenomena to the nervous system of the individual, allowing for certain types of reactions to be made by the person to certain internal conditions of the body. This pragmatic view of science allows the scientist to view private events as biologically based phenomena available to the observing individual, whose history in a verbal community has established a discriminative verbal repertoire which can function under the partial control of private stimuli (e.g., Skinner 1953, 1957).

The functionally defined and pragmatic technical vocabulary of behavior analysis suggests that private events may be described in terms of “response” or “stimulus” properties. As “behavior” and “environment” are assumed to be interacting constantly and inextricably, an interactive context may provide for a given private event to be described using either term. For example, long hours of working in front of a computer screen may be correlated the onset of a headache, and the presence of the headache itself may be correlated with the behavior of getting up and finding an aspirin. In the former observed (first-person) relation, the headache may be interpreted in terms of “response” properties with respect to the extended context of computer work (in the sense of an elicited response), and the latter relation may be interpreted in terms of “stimulus” or contextual properties with respect to the behavior of finding an aspirin (in the sense of a motivating operation).

As “behavioral phenomena,” private events would have a place in a comprehensive science of behavior and would be of special scientific interest to that science

to the extent that such phenomena enter into functional interactions with other (overt) behavior. Whether described in terms of “response classes” (radical behaviorism; e.g., Skinner 1953) or “activities” (teleological or molar behaviorism; e.g., Baum 2002), behavior–environment interactions may themselves interact in complex ways, including controlling relations with other behavior or producing larger behavioral functional units (or nested activities; e.g., Baum 2002). Examples include “say-do” correspondence research (e.g., Lloyd 2002) and equivalence research and derived relational phenomena (e.g., Garcia and Benjumea 2006; Hayes et al. 2001; Sidman 1994).

On the radical behaviorist view, private events do not have a “causal” role with respect to other behavior (such as verbal behavior; e.g., Skinner 1953, 1957; see also Hayes and Brownstein 1986; Leigland 1997). Skinner consistently described the term “cause” as verbal behavior under the control of observed correlations between events. Skinner substituted the term “function” for “cause,” where the former was to be a descriptive term, devoid of implications of metaphysical forces or action (e.g., Leigland 1998). Private events, as with public environmental events, may enter into contingencies of reinforcement and have certain functional effects with respect to the behavior of the individual.

### Teleological Behaviorism and Molar Behaviorism

Rachlin’s systematic perspective was described in *Mind and Behavior* (1994; see also Baum 2005). As noted previously, teleological behaviorism excludes private events from the analysis of behavior. However, if private events are to be regarded as non-existent (or at least non-functional), then the question is how to provide a scientific account of the occurrence of the vocabulary of “mental life,” as when someone describes a “belief,” an “expectation,” or a “pain.”

From the perspective of teleological behaviorism, all of the verbal phenomena associated with “mental” life may be analyzed entirely through overt behavior in interaction with reinforcement contingencies over extended time scales. The phenomena called “mental” may only be described and explained effectively in the third-person perspective. Private events, if they occur, do not enter into contingencies of reinforcement that change and maintain (overt) behavior and are thus unreliable and unnecessary to a scientific analysis and may impede scientific progress through the promotion of

explanatory fictions. The nature of Rachlin’s argument is illustrated in the following passage:

Rachlin identified mental events like believe, want, intend, know, hear, see, be in pain, and so forth with extended patterns of public behavior. For Jane to believe that the death penalty is wrong, for example, means Jane speaks out against it whenever the subject comes up, gives money to organizations that work to oppose it, joins in demonstrations against it, and so on. If enough of these activities occur, over a period of time, people around Jane will assert that she believes the death penalty is wrong. Jane herself will assert her belief on the same grounds. No private or mental event need come into the account. (Baum 2011a, p.195)

A very similar position regarding private events is described in Baum’s (e.g., 2011a, c) molar behaviorism. The only significant difference between the two systems may involve the description of mentalistic verbal behavior occasioned by behavior patterns extended in time. Baum summarized the issue as follows:

Rachlin and I differ in the way we express the relation between mental terms and extended behavioral patterns. Rachlin says that Tom’s belief that the bus will take him home *is* his getting on the bus day after day. I prefer to say that Tom’s getting on the bus day after day occasions an observer’s (possibly Tom himself) saying that Tom believes the bus will take him home. This approach emphasizes the role of verbal behavior and the culturally received nature of categories like belief and desire. The words belief and desire are helpful shortcuts in our verbal exchanges about behavior, but no belief, believing, desire, or desiring exists apart from the labeling, the verbal behavior. (Baum 2011c, pp. 243–244, emphasis in original)

The present discussion will compare radical behaviorism with the combined systematic perspective of teleological/molar behaviorism (cf. Hinelin’s multiscaled analyses; e.g., 2001, 2011).

### Private Events and the Contingency Horizon

A central question for a behavior analytic account of private events is how such events might acquire

behavioral functions. Certain cases might be easier to interpret than others. For example, when the condition we call an “itch” arises in the first-person case, the act of scratching may bring it to an end, and the person may subsequently be able to observe the effect as an example of negative reinforcement. In the third-person case, when we observe a person, or a cat, stop whatever he/she is doing and suddenly engage in vigorous scratching in a specific location on his/her body, we are likely to interpret the motivating operation, the aversive stimulus, as having similar stimulus properties and functions that have been observed in the first-person case (in the absence of evidence of the effects of alternative contingencies).

The question of the possible functional properties of private events is most important in the case of verbal behavior. First described by Skinner (1945), the problem concerns the means by which a verbal community can bring a verbal response class under the discriminative control of a stimulus class to which it has no access, namely the private event of another person. Without access to the (private) stimulus, the verbal community has no opportunity to apply differential reinforcement to establish discriminative stimulus control of the private event with respect to a verbal response class.

In several well-known sources, Skinner (e.g., 1945, 1953, 1957, 1964, 1974) described four ways in which verbal behavior may be brought under the discriminative control of private events. To describe the controlling relation technically as *discriminative* is to describe the function of an observed (first-person) private event as participating in a four-term operant relation, including the verbal operant response class, reinforcement, and motivating operation. Skinner (1945, 1957) outlined the four types of contingencies that might enable discrimination training of verbal behavior with respect to private events: (a) differential reinforcement based on classes of public stimuli that are correlated with classes of private events (e.g., external tissue damage and private events under the vocabulary of “pain”); (b) differential reinforcement based on classes of public behaviors that are correlated with classes of private events (e.g., holding one’s head and groaning and private events under the vocabulary of “pain”); (c) an overt, verbally based discriminated operant that transfers to private events via common stimulus properties, as in metaphor (e.g., a pain can be described as “sharp” or “dull”; such transfer might be interpreted via contemporary research as derived stimulus relations; e.g., Hayes

et al. 2001); and (d) contingencies supplied by the verbal community that reduce the magnitude of overt verbal behavior to private verbal behavior (e.g., when children are taught to speak or read “silently”). The latter contingency enables the functional properties of verbal behavior to include private as well as overt verbal behavior.

A boundary or region for functional contact between private events and verbal behavior was given a more technical definition by Skinner (1969) in the following footnote: “Although the private world is defined anatomically as ‘within the skin,’ the boundaries are the limits beyond which the reinforcing community cannot maintain effective contingencies.” (p. 230). I propose that this definition be termed the *contingency horizon*. This term (a) brings Skinner’s (e.g., 1957) “four contingencies” under a single concept that emphasizes their status as a contingency class, (b) identifies in a single term the distinctive interpretive/theoretical move in Skinner’s functional analysis of private events, and (c) identifies in its current usage the four contingencies as possible areas of research in the functional analysis of verbal behavior.

If private events are to play a role in the analysis and explanation of behavior, then research is needed to clarify a variety of issues regarding behavioral functions of such events and the development of such functions. Several lines of empirical research and observation will now be considered which demonstrate the functions of such events, as well as research relevant to the concept of contingency horizon.

### Functional Characteristics of Private Events: Research and Observation

#### Private Phenomena: Introductory Examples

*Relations Between Classes of Overt Behavior* In addressing the question of whether private behavioral events can participate in the functional control of overt behavior, we may begin by asking whether overt behavioral events may be observed to be a functional variable in the control of a given (overt) operant response class. Again, behavior, whether public or private, is not regarded as having a “causal” role regarding other behavior. Rather, the question is whether occurrent response classes may contribute stimulus function to the contingencies of reinforcement that may be observed to

affect other response classes (or activities; e.g., Baum 2002) occurring with the same individual.

Such relations are the subjects of basic and applied human research on “say-do” correspondence training (e.g., Lloyd 2002). In these studies, contingencies of reinforcement are arranged for a functional relation between the occurrence of one response class (e.g., verbal statements predicting future behavior) and another (the occurrence of the predicted behavior). Similar studies have been conducted with pigeons, where reinforcement contingencies were arranged such that pigeons’ choice behavior itself served a conditional stimulus function in conditional discrimination tasks (e.g., (DaSilva and Lattal 2010; Garcia and Benjumea 2006; Lattal and Doepke 2001; Shimp 1982, 1983). Further evidence of the functional stimulus properties of behavior in interaction with other behaviors may be seen in everyday examples of tacts of one’s own behavior, as when one is asked, “What are you doing?” and the answer, “I’m looking for my car keys” is under the joint control of the question and the speaker’s own behavior (see also autoclitic behavior; Skinner 1957).

*Public–Private Recitation* Another observation-based example of possible behavioral functions of private events involves private self-talk. Virtually everyone is familiar with the experience of private self-talk (e.g., Baum 2011b), as when one engages in private verbal rehearsal of a grocery list before entering the store.

From a teleological/molar behaviorist perspective, it should be possible to view *private* behaviors or bodily conditions (to which we have acquired the ability to respond verbally, as we can with overt actions/activities) as *extended in time* as we would with any other overt activities. For example, I can recite the Gettysburg Address out loud, or privately, or can switch between the two over time. If such a recitation involves real-time switching between public and private verbal behavior, there would normally be little doubt that the silent segments are (a) occurring privately and (b) are serving an ongoing function with respect to the successive overt segment and vice versa.

A criticism of this interpretation might be that from the third-person/listener’s perspective, the recitation could be “faked” in the sense that the speaker could have memorized only the publicly spoken segments and separated those segments with silent pauses. However, in order to be convincing to a listener familiar with the Gettysburg Address, the speaker would have had to be

trained to time the respective silent pauses to correspond to length of time needed for the private speaking of the relevant passage from the Address. Even in this case, however, the timing of the “faked” silent recitation passages would involve mediating private verbal behavior of some sort (e.g., the private counting of seconds) in order for the correspondence to the length of the omitted passage to be credible.

Further, if the listener asked the “faking” speaker to repeat the recitation such that different segments of the Address were spoken aloud and privately, the speaker would likely be unable to do so in a credible fashion. For a speaker who had learned the Address well, such changes would not be difficult. Again, the point of this exercise is that (a) in accordance with teleological/molar behaviorism, private verbal behavior, like public verbal behavior, may be viewed as behaviors/activities extended in time, and (b) in accordance with radical behaviorism, verbal behavior may be functional with respect to other behavior whether public or private.

#### Functional Private Events: Basic Research Examples

*The Role of Private Rehearsal* In the classic memory experiment by Peterson and Peterson (1959), participants were given a memory task of the following sort: e.g., “KVBMQ, 327”—where the task was to listen to and remember the five letters in order and when the random number was then presented, immediately begin counting backward, out loud, from that number by threes. They found that the recall accuracy dropped off very rapidly over a period of about 15 s.

A key part of this procedure was the overt counting task, but what function did it serve? It may be safe to assume that virtually every verbally capable person could recognize (and to whom it could be demonstrated) that the task prevented the private verbal rehearsal of the letters and that without the task, the recall might be all but perfect over as long an interval as one might choose. Again, a teleological/molar behavioral account might only cite the overt behavioral contingencies over extended time periods, but the potential moment-to-moment functions of occurrent, private, verbal behavior in situations without interfering verbal tasks is a commonly observed (first-person) phenomenon. The challenge for the teleological/molar account is to offer a plausible interpretation of the observed effects without the participation of functional private events.

*“Talk-Aloud” Instructions in Problem-Solving Tasks* A large body of experimental evidence appears to show that both public and private self-talk have orderly relations to public or overt problem solving behavior (Ericsson and Simon 1993). In Hayes’ (1986) review of Ericsson and Simon’s (1984) *Protocol Analysis: Verbal Reports as Data*, a behavior analytic perspective was brought to bear upon a new strategic development in cognitive research. Participants in a problem-solving task were instructed to speak aloud while working toward a solution to the problem. Compared to task performance without such instructions, certain types of instructions produced overt verbal behavior that interfered with the ongoing task, while other types of instructions did not have systematic or conspicuous effects upon the task performance. For example, if participants were instructed to speak *aloud* what they were saying *privately* as they worked on the task, there were no systematic differences in task performance. Instructions to make overt evaluative statements regarding their performance, however, or to make statements about earlier task behaviors produced decrements in ongoing problem-solving behavior compared to no instructions (Hayes 1986).

Hayes (1986) interpreted such findings in terms of public and private verbal behavior interacting with rule-governed problem-solving behavior. Hayes et al. (1998) extended the interpretations toward the development of specific methodological proposals for the analysis of rule-governed behavior (see also Alvero and Austin 2006; Arntzen et al. 2009; Cabello et al. 2004; Wulfert et al. 1991). The challenge for teleological/molar behaviorism is how to account for such data-based effects without appealing to functional properties of private verbal behavior. The challenge might be met by specific proposals for how overt behaviors (only) and reinforcement contingencies extended in time might produce such phenomena.

#### Functional Private Events: Clinical/Applied Research Examples

The practical role of private events in a comprehensive analysis of human behavior might be seen most clearly in research and applications developed in clinical behavior analysis. One of the most prominent examples of such research is derived from acceptance and commitment therapy (ACT; e.g., Hayes et al. 1999). ACT is based on an analysis of verbal process, private events, and contingencies of avoidance behavior and proposes

an interaction between these that appears to be central to various forms of psychopathology, health problems, and perhaps certain forms of maladaptive social interactions (e.g., Hayes et al. 2014). This interaction, experiential avoidance, involves rule-governed strategies for the attempted control and avoidance of aversive private events (e.g., events falling under the ordinary-language categories of feelings, thoughts, or bodily states). Briefly, avoidance strategies may produce reductions in such private events over short time scales, but the longer-term effect is the differentiation and rule governance of the avoidance strategies, a magnification of the aversive private events over time, and an increasingly restricted and avoidant repertoire of nonsocial and social behaviors (Hayes et al. 2006).

As a behaviorally oriented therapy, ACT uses verbal and nonverbal methods for training a specific type of discriminative repertoire involving both (a) perceptual or discriminative distancing from aversive private events (e.g., a “deliteralizing” of private self-talk, reducing the functional effects of the verbal events) and (b) an acceptance of aversive private events as ongoing verbal or nonverbal behaviors to be simply observed but not evaluated or controlled. The trained disengagement of the private events from the avoidance strategies reduces the latter and enables the return and/or acquisition of more adaptive and appetitive behaviors.

Studies have shown ACT to be an effective treatment for a wide variety of psychological/behavioral and medical disorders (e.g., Hayes et al. 2006, 2014). Evidence also suggests that ACT training may have productive effects on social relations, such as social stigma and prejudice (e.g., Biglan 2009; Biglan et al. 2008; Hayes et al. 2004), and may suggest significant applications at the community level (e.g., Biglan and Hinds 2009).

The verbal and nonverbal processes involved with clinical phenomena of the sort addressed by ACT and related behavioral therapies are obviously very complex, but numerous studies indicate that such analyses are providing new directions in effective treatments. How the processes and dynamics of the analyses might be expressed in technical detail without appealing to the functional influence of verbal and nonverbal private events is a challenge for teleological/molar behaviorism.

#### Contingency Horizon: Nonhuman and Human Research

*Nonhuman Research* In a study by Lubinski and Thompson (1987), interacting contingencies were

programmed for two pigeons in which reinforcement for the discriminated behavior of one pigeon was conditional upon the other pigeons' correct "reporting" of the effects of one of three injected substances (a stimulant, a depressant, or saline). The latter pigeon had a history of discrimination training with respect to the three drug (including no drug) conditions in which it was trained. Specifically, the pigeon had to respond discriminatively to stimuli correlated with each of the three distinctly different substance effects. This training served as the basis for the "reports" of the substance conditions to the other pigeon, whose discriminative behavior to one of three keys (with stimuli correlated with the three injected substances) was reinforced if it corresponded to the substance currently in effect with the "reporting" pigeon.

The resulting interactions (replicated with a chemically different stimulant and depressant) were interpreted by the authors and others (e.g., Pierce and Cheney 2008) as an example of communicative behavior under the control of private events, in this case a particular drug state present at the time of the pigeons' "report" to the other pigeon. However, Baum (2011d) has recently argued against such interpretations:

Lubinski and Thompson. . . , having trained pigeons to peck at one key when given Drug A and another key when given Drug B, claimed that the pigeons were discriminating on the basis of private states produced by the drugs. The states, however, were inferred from the performance and were redundant with pecking the one key or the other. Nothing is gained from positing an inner cause about which you know nothing—neither what it is, where it is inside the pigeon, nor what it has to do with the pigeon's nervous system. (p. 122)

Yet Baum's (e.g., 2002) molar behaviorism might be brought to bear to support the inclusion of private states/events. That is, Baum's "given drug A" quoted above is a unitary event (injection of substance A), but the conditions of discrimination training occur at a later time and in a different context. We must assume (in accordance with a molar analysis of behavior) that drug A produces an *effect* of some sort, extended in time, that is *discriminable* from the *effect* of drug B and which serves as the *basis* of the discrimination.

In other words, the differential drug administration is the *operation* of the stimulus discrimination training, but the differential drug *effects* must serve as the *basis*

of the stimulus discrimination training and the discriminated behavior that results. We cannot say anything about the stimulus properties involved in this case, as we could if we were presenting a red versus green light, but we can say that there are differential effects of the drugs upon the pigeon's behavior and that these effects can be "communicated" to another pigeon with accuracy. To say that the three injected substances "have differential effects" is to say, in this case, the same thing as saying that the substances "produce different private states/events." The function of the latter statement is to acknowledge the temporally extended (molar) nature of the stimulus effects of the injected substances that arise when discrimination training occurs at the contingency horizon.

*Human Research* One of Skinner's (e.g., 1957) four ways in which the contingency horizon might enable verbal behavior under the control of private events is through differential reinforcement based on classes of public stimuli that are correlated with classes of private events. For example, adults might differentially reinforce a child's pain-related verbal repertoire, especially on occasions in which the child is likely to be experiencing pain (such as after falling down). The correlated public event and private event might allow for the private (pain) stimuli to enter into a controlling relation with the overt verbal (pain vocabulary) behavior under certain conditions of stimulus control.

Sonoda and Okouchi (2012) have recently explored an experimental method for the analysis of such contingencies. In an earlier study, Okouchi (2006) distinguished between two definitions of private events for the purposes of an experimental analysis. *Unconditional inaccessibility* is a context in which an event is private with respect to a single observer, while *conditional inaccessibility* is a context in which an event is observable to a single observer and one other observer, but not by others.

The latter definition was employed in a study by Sonoda and Okouchi (2012) in which participants designated as instructors were trained in an AC conditional discrimination task where A stimuli served as samples and C stimuli served as designated comparisons. Following training, the instructors were then to train the same conditional discrimination task to another participant designated as a learner. The instructor monitored the learner's performance on the task via computer communication, and consequences were delivered

(addition or removal of points) based on correct or incorrect responses on the task.

In the latter condition, however, the sample stimuli were different for the instructor and learner. During the training of the learners, the instructors were presented with the same sets of A and C stimuli used previously, although a different set of B stimuli were presented simultaneously with the A stimuli, with the B stimuli serving as the basis of the conditional discrimination training for the learners. That is, when the instructor presented stimulus A1 (for which a correct selection would be C1), the learner would see stimulus B1 (for which the correct selection would be C1). The B stimuli were unseen and unknown to the instructor and hence were private stimuli in the sense described above as conditional inaccessibility.

All 26 of the learners (each matched with a different instructor) acquired the conditional discrimination through discrimination training based on private stimuli that were correlated with stimuli assessable to the instructor. The accuracy of conditional discrimination training was affected by the degree of correlation between the public and private stimuli. These results provide support for the proposal by Skinner (1945, 1953, 1957) that private events can enter into the control of behavior through correlated public events and socially mediated stimulus discrimination training at the contingency horizon.

### Concluding Examples and Possible Directions

*First-Person Reports* Perhaps some evidence of the functional characteristics of private events might be found in first-person reports. Specifically, some statements made by critics of the radical behaviorist position on private events appear to indicate that such events contribute to the control of verbal behavior. For example, from Baum's (2011d) criticism of Skinner's analysis:

Skinner insisted that these private events were just like public events, except that they were private, saying, for example, that his toothache is just as physical as his typewriter. Following Skinner's lead, Moore asserts that public and private events differ only in the size of their audience, private events being confined to an audience of one. It is an enticing view, *because we all experience the ability to talk to ourselves and imagine to ourselves without other people being privy to these*

*events*. Problems arise, however, when private events are taken to affect public behavior. (p.121; emphasis added)

The emphasized segment seems to demonstrate what is being disputed. That is, the inclusive "we" indicates private events of the author that are part of the history controlling the quoted statement. Furthermore, the passage also seems to support Baum's (e.g., 2002) molar analysis of behavior as applied to private events, as it is only over substantial time scales that such contingencies are possible. In a later passage, Baum states:

To be sure, sciences often posit unobservable events—at the atomic level, for example—but these must have defined properties and understood relations to observable events, neither of which can be said of reported-on private events. Your inner speech or inner imaging are never measured (then they would no longer be private!), and have *no reliable relation* to public behavior. Asserting that private sensory and speech events are 'just like' public behavior cannot solve this problem. (Baum 2011d, p.122; emphasis added)

The question that arises from this passage is this: How is it possible to assess the reliability of the relation between public and private events without the controlling influence of one's own private events entering into the assessment? The statement seems to require such functional influence by private events. Furthermore, the passage implies that there may be *some* relations between public and private events (if perhaps not always reliable—certainly there are *some* reliable relations of this sort; e.g., the pain that results from hitting one's thumb with a hammer). Perhaps the statement also implicitly suggests an empirical analysis of the conditions under which such relations are more or less reliable (cf. Calkin 2002, 2009).

*Possible Research Directions: Methodological/Programmatic Approaches* While several lines of research reviewed here have provided evidence of the functional characteristics of private events, methodological and programmatic proposals have been offered in the behavior analytic literature for the explicit analysis of private events as part of the larger analysis of behavior. Several of these proposals will be described briefly.

Methodological analyses range from the early conceptual work in the 1970s of Day (1992a, b) to the large-



scale, multi-disciplinary programmatic proposals of Place (1993). Place has sketched a general research agenda to be addressed in social, personal, conceptual, developmental, experimental, and physiological domains. Place's recommendations were outlined in a very generic fashion, but the outline serves as a first step toward more extensive analyses of the functions of private events in the analysis of behavior.

Keenan (1997) described a different sort of proposal, and his interest in teaching radical behaviorism and behavior analysis led him to develop exercises for students that are designed to emphasize importance of private experiences as directly observable phenomena. In several exercises involving self-observation, the effects of instructions and context are used to emphasize the interactive and behavioral character of private experience. The goals of the exercises are (a) to place the observable, behavioral characteristics of private events into the context of radical behaviorism as a scientific system and (b) to provide new students with a type of scientific training that is contingency-shaped, to augment the more traditional rule-governed introductory material.

Issues of studying private events directly have also appeared in Neuringer's (e.g., 1984, 1991a, b) discussions of behavior analytic self-experimentation. Neuringer summarized the potential benefits of self-experimentation in general with the following:

Whether the focus of the research is applied or basic, self-experimentation brings scientific methods to our own lives. It is the quintessence of the  $N=1$  method and it increases the probability that the research will be relevant—and therefore potentially meliorative—to at least one  $N$ . (Neuringer 1984, p. 403)

Neuringer (1991a) also addressed the study of private events directly in the following:

This two-lab example is a model for self-experimental analyses of covert phenomena. Self-experimenter  $W$  observes a covert phenomenon as dependent or independent variable, publishes the findings, and self-experimenter  $Z$  attempts to replicate. The goal of self-experimental covert research is descriptions of intersubjectively reliable functional relationships. (p. 45)

This goal is also part of the research programs reported by Calkin (e.g., 2002, 2009). Calkin has reviewed a

substantial amount of research from individuals reporting first-person observations of private events. Observers recorded frequencies of different classes of private events over time and conditions, and the events were plotted on standard celeration charts. Results indicated, for example, the interaction of the frequencies of the private event classes with a variety of environmental variables and verbal processes and appeared to show similarities in the temporal dynamics of private events and public behaviors.

Although, as noted previously, private events are not “causal” in the traditional sense of the term, such events play a role in the interactive network of functional variables that affect behavior in interaction with contingencies over time. A further empirical understanding of such dynamics could lead to advances in applied and clinical behavior analysis and might be an important part of such basic research topics as the analysis of ordinary-language mentalistic terms and explanatory practices (Leigland 1996).

## Summary and Conclusions

The question of private events in a science of behavior may be summarized very briefly for the two scientific systems. Radical behaviorism regards private events as directly observable (first-person) phenomena that arise from conditions of the body and which can play a functional role in combination with other variables with respect to other overt and covert, verbal and nonverbal behavior, given a history in a verbal community that can establish such functions. Teleological/molar behaviorism excludes private events from the analysis of behavior and relies exclusively upon analyses of overt behavior and extended contingencies in time, as it is only through extended temporal relations between overt behavior and environmental conditions that the phenomena and terms of “mental” events (such as acting overtly in accordance with the vocabularies of “belief” and “pain,” for example) may be discriminated by third- and first-person observers.

A variety of experimental research studies agree with distinctive and commonly experienced first-person observations in supporting the functional characteristics of private events. Further, this functional perspective regarding private events has been put to use in the clinical and applied research domains. Skinner's (e.g., Skinner 1945, 1953, 1957) radical behaviorism provides a

plausible interpretation of how such functions may develop, and this interpretation has found some empirical support (e.g., Sonoda and Okouchi 2012).

What remains to be clarified is how teleological/molar behaviorism can provide alternative explanations to the research findings and observations described in this paper without recourse to private events. This is not to suggest that such alternative explanations are not possible, but interpretive proposals about how molar, temporally extended contingencies alone might produce some of the effects cited here would be a welcome addition to the ongoing discussion of private events in a science of behavior.

If private events can indeed be regarded as having behavioral functions, then they must play a role in behavior analytic research, interpretation, and theory, especially in the domain of human verbal behavior. There remain considerable challenges to such research, but a better understanding of the functions and contingencies involved might produce advances in the applied and clinical domains of behavior analysis.

An integrated account of private events that includes characteristics of Baum's (e.g., 2002) molar behaviorism and radical behaviorism is possible (Leigland 2006). The emphasis of molar behaviorism on extended time scales for the analysis of behavior in general, and verbal behavior in particular, does not by itself seem to necessitate a nonfunctional perspective of private events. Like overt behavior, private events may be observed (first person) to occur over very short timescales (such as a sudden, sharp, brief pain, a "flash of insight," a fleeting visual image) or over extended periods of time (such as chronic knee pain, privately "playing" the third movement to Rachmaninoff's Piano Concerto No. 2, thinking privately through a complex problem, privately rehearsing a conference paper on an airplane).

Further, there appear to be overlapping, continuously flowing dynamics between public and private behavioral events, each on multiple and interactive timescales and contingencies extended in time. All of this is compatible with a multiscaled (Hineline 2001, 2011) or molar (Baum 2011c) analysis of behavior. Thus, an analysis of behavior that emphasizes the importance of varying timescales, such as those described by Hineline and Baum, may be applied to both private and public behaviors.

The findings and phenomena described in this paper might be addressed through research and interpretation from the perspective of teleological/molar behaviorism.

Interpretations might be developed that illustrate how specific histories of temporally extended reinforcement contingencies involving overt behavior and stimulus conditions (i.e., without private events) might produce some of the phenomena described above (e.g., the public-private recitation example).

Research on private events from a radical behaviorist perspective has only begun, but the beginning is promising. One such area of research addresses the development of verbal behavior under the control of private events. The contingencies involved (e.g., Skinner 1945, 1957) may be described as the contingency horizon, below which the social/verbal contingencies that bring private events into the functional behavior stream are no longer effective. The contingency horizon is a complex and elusive boundary, but such boundaries are not uncommon in science, as can be seen in membrane dynamics in cell biology, and the event horizon of black holes in physics and cosmology. Teleological/molar behaviorists might gain in simplicity by steering clear of it, but radical behaviorists want to explore the horizon and to see how far down the rabbit hole goes for a science of behavior.

## References

- Alvero, A. M., & Austin, J. (2006). An implementation of protocol analysis and the silent dog method in the area of behavioral safety. *Analysis of Verbal Behavior*, 22, 61–79.
- Arntzen, E., Halstadro, L.-B., & Halstadro, M. (2009). The 'silent dog' method: Analyzing the impact of self-generated rules when teaching different computer chains to boys with autism. *The Analysis of Verbal Behavior*, 25, 51–66.
- Baum, W. M. (2002). From molecular to molar: A paradigm shift in behavior analysis. *Journal of the Experimental Analysis of Behavior*, 78, 95–116.
- Baum, W. M. (2005). *Understanding behaviorism: Behavior, culture, and evolution* (2nd ed.). Malden: Blackwell.
- Baum, W. M. (2011a). Behaviorism, private events, and the molar view of behavior. *The Behavior Analyst*, 34, 185–200.
- Baum, W. M. (2011b). Evasion, private events, and pragmatism: A reply to Moore's response to my review of *Conceptual Foundations of Radical Behaviorism*. *Journal of the Experimental Analysis of Behavior*, 95, 141–144.
- Baum, W. M. (2011c). No need for private events in a science of behavior: Response to commentaries. *The Behavior Analyst*, 34, 237–244.
- Baum, W. M. (2011d). What is radical behaviorism? A review of Jay Moore's conceptual foundations of radical behaviorism. *Journal of the Experimental Analysis of Behavior*, 95, 119–126.
- Biglan, A. (2009). Increasing psychological flexibility to influence cultural evolution. *Behavior and Social Issues*, 18, 15–24.

- Biglan, A., & Hinds, E. (2009). Evolving prosocial and sustainable neighborhoods and communities. *Annual Review of Clinical Psychology*, 5, 169–196. Retrieved May 11, 2011, from <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2663939/pdf/nihms84433.pdf>. doi:10.1146/annurev.clinpsy.032408.153526.
- Biglan, A., Hayes, S. C., & Pistorello, J. (2008). Acceptance and commitment: Implications for prevention science. *Prevention Science*, 9, 139–152.
- Cabello, F., Luciano, C., Gomez, I., & Barnes-Holmes, D. (2004). Human schedule performance, protocol analysis, and the “silent dog” methodology. *The Psychological Record*, 54, 405–422.
- Calkin, A. B. (2002). Inner behavior: Empirical investigations of private events. *The Behavior Analyst*, 25, 255–259.
- Calkin, A. B. (2009). An examination of inner (private) and outer (public) behaviors. *European Journal of Behavior Analysis*, 10, 61–75.
- Catania, A. C. (2011). On Baum’s public claim that he has no significant private events. *The Behavior Analyst*, 34, 227–236.
- Chiesa, M. (1994). *Radical behaviorism: The philosophy and the science*. Boston: Authors Cooperative.
- DaSilva, S. P., & Lattal, K. A. (2010). Why pigeons say what they do: Reinforcer magnitude and response requirement effects on say responding in say-do correspondence. *Journal of the Experimental Analysis of Behavior*, 93, 395–413.
- Day, W. F. (1983/1992). On the difference between radical and methodological behaviorism. *Behaviorism*, 11, 89–102. (Reprinted in S. Leigland (Ed.), (1992). *Radical behaviorism: Willard Day on psychology and philosophy* (pp. 61–71). Reno, NV: Context Press.)
- Day, W. F. (1992a). Analyzing verbal behavior under the control of private events. In S. Leigland (Ed.), *Radical behaviorism: Willard Day on psychology and philosophy* (pp. 171–175). Reno: Context.
- Day, W. F. (1992b). Methodological problems in the analysis verbal behavior controlled by private events: Some unusual recommendations. In S. Leigland (Ed.), *Radical behaviorism: Willard Day on psychology and philosophy* (pp. 165–170). Reno: Context.
- Dougher, M. J. (2013). Behaviorisms and private events. *The Behavior Analyst*, 36, 223–227.
- Ericsson, K. A., & Simon, H. A. (1984). *Protocol analysis: Verbal reports as data*. Cambridge: Bradford Books/MIT.
- Ericsson, K. A., & Simon, H. A. (1993). *Protocol analysis: Verbal reports as data (revised ed.)*. Cambridge: Bradford books/MIT.
- Garcia, A., & Benjumea, S. (2006). The emergence of symmetry in a conditional discrimination task using different responses as proprioceptive samples in pigeons. *Journal of the Experimental Analysis of Behavior*, 86, 65–80.
- Hayes, S. C. (1986). The case of the silent dog: A review of Ericsson and Simon’s protocol analysis: Verbal reports as data. *Journal of the Experimental Analysis of Behavior*, 45, 351–363.
- Hayes, S. C., & Brownstein, A. J. (1986). Mentalism, behavior-behavior relations, and a behavior-analytic view of the purposes of science. *The Behavior Analyst*, 9, 175–190.
- Hayes, S. C., White, D., & Bissett, R. T. (1998). Protocol analysis and the “silent dog” method of analyzing the impact of self-generated rules. *The Analysis of Verbal Behavior*, 15, 57–63.
- Hayes, S. C., Strosahl, K., & Wilson, K. G. (1999). *Acceptance and commitment therapy: An experiential approach to behavior change*. New York: Guilford.
- Hayes, S. C., Barnes-Holmes, D., & Roche, B. (Eds.). (2001). *Relational frame theory: A post-Skinnerian account of human language and cognition*. New York: Kluwer Academic/Plenum.
- Hayes, S. C., Bissett, R., Roget, N., Padilla, M., Kohlenberg, B. S., Fisher, G., Masuda, A., Pistorello, J., Rye, A. K., Berry, K., & Niccolls, R. (2004). The impact of acceptance and commitment training and multicultural training on the stigmatizing attitudes and professional burnout of substance abuse counselors. *Behavior Therapy*, 35, 821–835.
- Hayes, S. C., Luoma, J. B., Bond, F. W., Masuda, A., & Lillis, J. (2006). Acceptance and commitment therapy: Model, processes and outcomes. *Behaviour Research and Therapy*, 44, 1–25.
- Hayes, S. C., Strosahl, K., & Wilson, K. G. (2014). *Acceptance and commitment therapy: The process and practice of mindful change* (2nd ed.). New York: Guilford.
- Hineline, P. N. (2001). Beyond the molar-molecular distinction: We need multiscaled analyses. *Journal of the Experimental Analysis of Behavior*, 75, 342–347.
- Hineline, P. N. (2011). Private versus inner in multiscaled interpretation. *The Behavior Analyst*, 34, 221–226.
- Keenan, M. (1997). ‘W’-ing: Teaching exercises for radical behaviourists. In K. Dillenburg, M. F. O’Reilly, & M. Keenan (Eds.), *Advances in behaviour analysis* (pp. 236–272). Dublin: University College Dublin Press.
- Lattal, K. A., & Doepke, K. J. (2001). Correspondence as conditional stimulus control: Insights from experiments with pigeons. *Journal of Applied Behavior Analysis*, 34, 127–144.
- Leigland, S. (Ed.). (1992). *Radical behaviorism: Willard Day on psychology and philosophy*. Reno: Context.
- Leigland, S. (1996). The functional analysis of psychological terms: In defense of a research project. *The Analysis of Verbal Behavior*, 13, 105–122.
- Leigland, S. (1997). Systems and theories in behavior analytic science: An overview of alternatives. In L. J. Hayes & P. M. Ghezzi (Eds.), *Investigations in behavioral epistemology* (pp. 11–31). Reno: Context.
- Leigland, S. (1998). Radical behaviorism and the clarification of causality, constructs, and confusions: A reply to Hayes, Adams, and Dixon. *The Psychological Record*, 48, 423–437.
- Leigland, S. (2006). Science and human behavior: A review of William Baum’s understanding behaviorism: Behavior, culture, and evolution (2nd ed.). *The Behavior Analyst*, 29, 279–287.
- Leigland, S. (2009). A comprehensive science: A review of Moore’s conceptual foundations of radical behaviorism. *The Behavior Analyst*, 32, 243–253.
- Leigland, S. (2010). Functions of research in radical behaviorism for the further development of behavior analysis. *The Behavior Analyst*, 33, 207–222.
- Lloyd, K. E. (2002). A review of correspondence training: Suggestions for revival. *The Behavior Analyst*, 25, 57–73.
- Lubinski, D., & Thompson, T. (1987). An animal model of the interpersonal communication of interoceptive (private) states. *Journal of the Experimental Analysis of Behavior*, 48, 1–15.
- Marr, M. J. (2011). Has radical behaviorism lost its right to privacy? *The Behavior Analyst*, 34, 213–219.

- Moore, J. (2008). *Conceptual foundations of radical behaviorism*. Cornwall-on-Hudson: Sloan.
- Moore, J. (2011). A review of Baum's review of conceptual foundations of radical behaviorism. *Journal of the Experimental Analysis of Behavior*, *95*, 127–140.
- Neuringer, A. (1984). Melioration and self-experimentation. *Journal of the Experimental Analysis of Behavior*, *42*, 397–406.
- Neuringer, A. (1991a). Behaviorism: Methodological, radical, assertive, skeptical, ethological, modest, humble, and evolving. *The Behavior Analyst*, *14*, 43–47.
- Neuringer, A. (1991b). Humble behaviorism. *The Behavior Analyst*, *14*, 1–13.
- Okouchi, H. (2006). An experimental analysis of another privacy. *The Psychological Record*, *56*, 245–257.
- Palmer, D. C. (2011). Consideration of private events is required in a comprehensive science of behavior. *The Behavior Analyst*, *34*, 201–207.
- Peterson, L. R., & Peterson, M. J. (1959). Short term retention of individual verbal items. *Journal of Experimental Psychology*, *58*, 193–198.
- Pierce, W. D., & Cheney, C. D. (2008). *Behavior analysis and learning* (4th ed.). New York: Psychology.
- Place, U. T. (1993). A radical behaviorist methodology for the empirical investigation of private events. *Behavior and Philosophy*, *20*, 25–35.
- Rachlin, H. (1994). *Behavior and mind*. Oxford: Oxford University Press.
- Rachlin, H. (2011). Baum's private thoughts. *The Behavior Analyst*, *34*, 209–212.
- Schlinger, H. D. (2011). Introduction: Private events in a natural science of behavior. *The Behavior Analyst*, *34*, 181–184.
- Shimp, C. P. (1982). On metaknowledge in the pigeon: An organism's knowledge about its own behavior. *Animal Learning & Behavior*, *10*, 358–364.
- Shimp, C. P. (1983). The local organization of behavior: Dissociations between a pigeon's behavior and self-reports of that behavior. *Journal of the Experimental Analysis of Behavior*, *39*, 61–68.
- Sidman, M. (1994). *Equivalence relations and behavior: A research story*. Boston: Authors Cooperative.
- Skinner, B. F. (1945). The operational analysis of psychological terms. *Psychological Review*, *52*(270–277), 291–294.
- Skinner, B. F. (1953). *Science and human behavior*. New York: Macmillan.
- Skinner, B. F. (1957). *Verbal behavior*. New York: Appleton-Century-Crofts.
- Skinner, B. F. (1964). Behaviorism at fifty. In T. W. Wann (Ed.), *Behaviorism and phenomenology* (pp. 79–108). Chicago: University of Chicago Press.
- Skinner, B. F. (1969). *Contingencies of reinforcement: A theoretical analysis*. New York: Appleton-Century-Crofts.
- Skinner, B. F. (1974). *About behaviorism*. New York: Alfred A. Knopf.
- Sonoda, A., & Okouchi, H. (2012). A revised procedure for analyzing private events. *The Psychological Record*, *62*, 645–661.
- Todd, J. T., & Morris, E. K. (1995). *Modern perspectives on B. F. Skinner and contemporary behaviorism*. Westport: Greenwood.
- Wulfert, E., Dougher, M. J., & Greenway, D. E. (1991). Protocol analysis of the correspondence of verbal behavior and equivalence class formation. *Journal of the Experimental Analysis of Behavior*, *56*, 489–504.