Behavior Analysis in Practice (2023) 16:117–126
https://doi.org/10.1007/s40617-022-00689-6

DISCUSSION AND REVIEW PAPER

Gradual Change Procedures in Behavior Analysis

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Accepted: 20 February 2022 / Published online: 30 March 2022

Abstract
A wide variety of procedures within behavior analysis use gradual change in stimuli, response requirements, reinforcement, or some combination thereof, to effectively change behavior. Such procedures include shaping, thinning, fading, and chaining. Collectively, gradual change procedures represent a conceptually systematic technology of behavior change with wide-ranging empirical support across diverse settings and contexts. However, navigating the gradual change literature can be challenging. Similar terms are used to describe functionally distinct procedures (e.g., stimulus fading, delay fading, demand fading), and distinct terms are used to describe functionally similar procedures (e.g., leaning, demand fading). I propose a taxonomy in which gradual change procedures are categorized according to the functional component of the contingency on which they act. Three broad categories are proposed: Gradual Changes in Discriminative Stimuli, Response Requirement, and Reinforcement. I provide examples of research in each category, across basic and applied settings, including terminology used by the author(s) to describe each procedure. Finally, I discuss benefits of this framework for consumers of the literature.

Keywords Shaping · Fading · Schedule thinning · Chaining · Transitions

One of the earliest moments of epiphany in my education in behavior analysis was when my undergraduate behavior principles instructor described stimulus fading. The instructor showed a video of a child that no longer engaged in self-injurious behavior when wearing a helmet, and described that over a long period of time, the therapists transitioned from a large, bulky helmet to a lightweight baseball cap, then to just a headband, all the while maintaining low rates of self-injury. This seemed like magic to me (or at the very least, a superpower). As I continued my education, other examples emerged of remarkable behavior change that was accomplished with the power of many, tiny changes. Andy Lattal described how he shaped a pigeon to engage in all sorts of novel and amusing behavior, from raising a flag to playing ping pong, beginning with the tiniest successive approximation of a single step. Later, during my postdoctoral fellowship at the Marcus Autism Center, I worked with a client who initially could not tolerate mere seconds of restricted access to edible items without engaging in severe aggression. Upon discharge from the clinic, the client could wait 30 minutes or even longer without a single instance of aggression. These examples all have in common incredibly large behavior change that was accomplished by many small changes.

The power of gradual change is reflected in the large number of empirically supported procedures that involve a gradual change in stimuli, the response, reinforcement, or multiple aspects of the contingency. Such procedures include fading, thinning, shaping, leaning, and chaining. When discussing these procedures with my students, I inevitably receive questions about how gradual change procedures relate. Is demand fading a form of shaping, schedule thinning, or both? Is fading a synonym for schedule thinning (and is that the same thing as leaning)? Questions are raised about the delineation between procedures, as well as the hierarchical relations among procedures (is X a subcategory of Y?).

Such questions are understandable considering the terminological landscape of the literature. One reason this literature may be difficult to navigate is the use of the same, or similar, terms to describe procedures that are quite distinct (Agrachov, 2019). In published literature, the term "fading," for example, has been used in many combinations, describing a wide range of procedures (stimulus fading, prompt

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fading, instructional fading, demand fading, schedule fading, delay fading). Fading has been used refer to a decrease (e.g., "fading out prompts") and an increase (e.g., "fading in demands"). Another example is early use of the term "stimulus shaping" to describe procedures that might now be characterized as stimulus fading (e.g., Zygmont et al., 1992; see McIlvane & Dube, 1992, for a discussion).

In addition to the use of similar terms to describe different procedures, the gradual change literature is characterized by use of different terms to describe functionally similar procedures. For example, the word "leaning" was used by Kincaid and Lattal (2018) to describe procedures used to increase the ratio requirement when training pigeons to peck keys. Piazza et al. (1996) used "demand fading" to describe a procedure for increasing the number of demands required to be complied with to result in reinforcement presentation (i.e., ratio requirement) in the context of a differential reinforcement of alternative behavior (DRA) treatment for destructive behavior. There are obvious differences between these studies that are perhaps well served by distinct terminology. However, it also seems reasonable that similar behavioral processes would be involved in increasing the ratio requirement regardless of species and setting, and these similarities may not be apparent to the reader if such distinct terms are used. Furthermore, even within one research area different terms may be used from study to study. For example, Lalli et al. (1995) used "response chaining" to refer to a procedure in which the subject was required to emit several demands before a communication response for a break was reinforced, and the number of demands was gradually increased. Similarly, in Fisher et al. (1993), the number of demands was gradually increased in the context of functional communication training (FCT), but this procedure was referred to as "demand fading." It is perhaps unsurprising, then, why this research area may pose challenges to consumers of the literature.

As a guidebook for navigating this landscape, I offer the following taxonomy of gradual change procedures, in which procedures are categorized according to functional component of the contingency on which they act. This paper is not intended to be an exhaustive review of any or all procedures, or an etiology of existing terms. Such a review would likely be unreasonably broad in scope, and several very helpful reviews of individual procedures have already been conducted (see, for example, Hagopian et al.'s, 2011, review of schedule thinning in FCT). Instead, I propose three general categories of gradual change procedures, based on changes in discriminative stimuli, response requirement, and reinforcement. For each category, I describe procedures that I include in that categorization. Examples are cited of empirical studies or reviews describing each procedure, with the corresponding term used by the author(s) to describe the method. Examples were selected to be a representative sample and are therefore not exclusively seminal studies. To facilitate connections across the basic-applied continuum, I provide examples from both basic and applied literature. Rather than propose a definitive "correct" term for each category of procedures, I seek to provide sufficient exemplars to allow consumers of the literature to be prepared for the terminology they will encounter. After outlining the categories, I conclude by offering observations that emerged from this framework and brief suggestions for its application.

A Taxonomy of Gradual Change

Figure 1 shows a diagram illustrating the proposed framework, summarizing the terms used to describe gradual change procedures. Procedures are categorized according to the functional change(s) in the contingency employed in each procedure. Tables 1, 2 and 3 summarize studies employing the terminology and illustrating examples of each procedure within each category. In the following sections, I discuss key distinctions between categories.

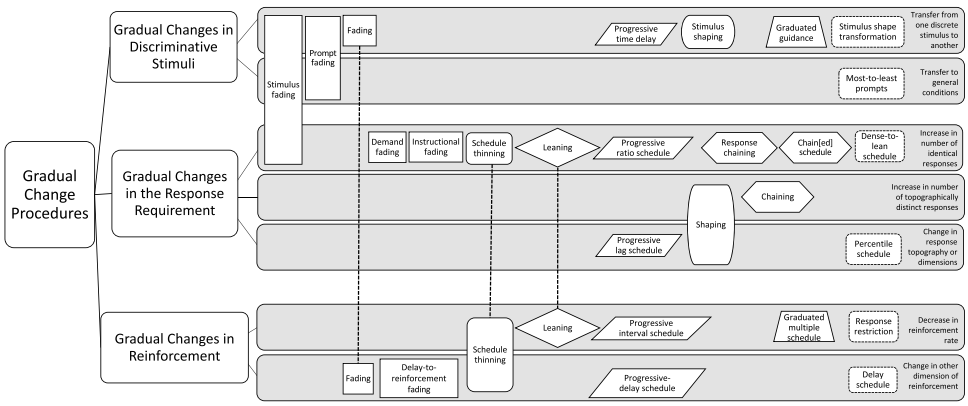

Fig. 1 A Taxonomy of Gradual Change. *Note.* Terms that are used in multiple categories span the categories or are connected with a dotted line. Groups of similar, but not identical, terms are identified with boxes of the same shape (e.g., variations of "fading" are in rectangles, procedures described as "progressive" are in parallelograms). Terms that did not neatly fit into these groups are on the far right and identified with dashed borders.

Table 1 Terms Describing Gradual Changes in Discriminative Stimuli

Subcategory	Example	Description
Transfer from one discrete stimulus to another		
Stimulus shape transformation	Johnson (1973), as discussed in Cooper et al. (2019, p. 407)	The initial stimulus gradually turns into another stimulus by changing its shape.
Fading	Terrace (1963)	Discriminative stimuli are introduced and/or removed by gradually changing in intensity (e.g., brightness of a light).
Stimulus shaping	McIlvane and Dube (1992)	A gradual change in discriminative stimuli results in a new stimulus–response relation.
Prompt fading	Gorgan and Kodak (2019)	Gradually removing a controlling prompt to transfer control to a natural S^D.
Stimulus fading	Pace et al. (1986), Experiment 1	Gradually decreasing the size of an arm restraint, eventually replacing it with a smaller item (wristband)
Progressive time delay	Dogoe and Banda (2009)	The time between the presentation of the natural S^D and the prompt gradually increases.
Graduated guidance	MacDuff et al. (1993)	Gradually increasing the distance between the therapists' hands and the participant.
Transfer to general conditions		
Stimulus fading	Pace et al. (1986), Experiment 2	Gradually decreasing the pressure of an inflated arm restraint until the restraint is removed.
Prompt fading	Bourret et al. (2004)	Removing a verbal prompt by gradually shortening it (e.g., "Nick," then "Ni," then no prompt).
Most-to-least prompts	Libby et al. (2008)	Removing a prompt by decreasing the amount of physical intervention (e.g., hand over hand to no prompt).
Graduated guidance	Lennox et al. (1987)	Gradually increasing the distance between the therapists' hands and the participant.

Gradual Changes in Discriminative Stimuli

The top branch of Fig. 1 identifies procedures that involve gradual change in discriminative stimuli. Such procedures are typically employed to evaluate or facilitate transfer of stimulus control. This transfer may consist of shifting control from one discrete stimulus to another. If this is the case, the gradual change consists of one stimulus "turning into" another stimulus. For example, Terrace (1963) transformed a black (i.e., unlit) key in a pigeon operant chamber into a lit key by gradually increasing the illumination of the key. Terrace described this procedure as "fading." In an applied context, Cooper et al. (2019, p. 407) illustrated an example of an image of a car turning into the written word "car." In a review of stimulus control terminology, McIlvane and Dube (1992) collectively termed Terrace's procedure and subsequent, similar procedures as "stimulus shaping," though anecdotally this term appears less frequently in recent published works.

In other cases, Gradual Changes in Discriminative Stimuli may be employed to transfer stimulus control from some existing discriminative stimulus (S^D) to the naturally occurring conditions (i.e., the "fading out" of a stimulus), without identifying specific stimuli that will subsequently control the response. In such procedures, the gradual change consists of reduction or elimination of a stimulus, usually, one that was initially added or imposed in some way (e.g., "prompt fading;" Gorgan & Kodak, 2019). Progressive time delay procedures also employ Gradual Changes in Discriminative Stimuli, in which the "fading out" involves gradual increases in the delay to discriminative stimulus presentation (e.g., Dogoe & Banda, 2009).

Though the term "fading" originated within the stimulus control literature, this term has subsequently been applied quite liberally, including as a descriptor of procedures manipulating the response requirement and reinforcement (see Fig. 1). It appears in early literature that the word "stimulus" in "stimulus fading" referred specifically to *discriminative* stimuli. Contemporary consumers of the literature, however, will find that fading does not exclusively refer to stimulus control manipulations. Thus, I encourage readers to exercise caution when encountering the terms "fading" and "stimulus fading," and to read further to determine the specific procedures to which the author refers when using such terms.

Gradual Changes in the Response Requirement

Procedures in this category (illustrated in the middle branch of Fig. 1) involve gradual change in the criterion for reinforcement, also known as the "response requirement." One simple method of altering the response requirement is to

Table 2 Terms Describing Gradual Changes in Response Requirement

Subcategory	Example	Description
Increase in number of identical responses		
Progressive ratio schedule	Hodos (1961)	Increasing the ratio requirement after each reinforcer delivery.
Leaning	Weiner (1982)	Gradually increasing the ratio requirement.
Dense-to-lean schedule	Hagopian et al. (2004)	Using a dense schedule that is then progressively thinned to the terminal schedule.
Demand fading	Fisher et al. (1993)	Increasing the number of instructional demands that must be complied with before a break is available.
Stimulus fading	Zarcone et al. (1994)	Increasing the number of instructional demands that must be complied with before a break is provided.
Instructional fading	Pace et al. (1993)	Gradually increasing the number of instructional demands by presenting more demands per session.
Response chaining	Lalli et al. (1995)	Requiring gradually more steps of a task be completed before a break is available.
Chained schedule	Zangrillo et al. (2016)	Gradually increasing the response requirement in the initial link.
Schedule thinning	Hagopian et al. (2011)	Decreasing the rate of reinforcement for an alternative response.
Increase in number of topographically distinct responses		
Chaining	Edwards et al. (2018)	Gradually increasing the number of toy play steps in a behavior chain required before reinforcement is provided.
Shaping	Ferguson and Rosales-Ruiz (2001)	Gradually increasing the number of required trailer-loading steps before reinforcement is provided.
Gradual change in topographical features or dimension(s) of the response		
Shaping	Eckerman et al. (1980)	Gradually changing the location of the required response to produce reinforcement.
Percentile schedule	Galbicka (1994)	Gradually changing a response by requiring it to differ from a certain percentile of prior responses.
Progressive lag schedule	Wiskow et al. (2018)	Gradually changing responding by requiring progressively more variability per response.

increase the number of responses that must be emitted to result in reinforcer presentation (e.g., progressive ratio schedules, leaning of ratio schedules, demand fading). Alternately, the response requirement may be increased by requiring multiple, topographically dissimilar responses (e.g., chaining, demand fading in which distinct demands are added), or changing the topography of a single response itself by requiring a change in some dimension(s) of the response. For example, shaping can be used to gradually change the formal features (i.e., topography) of the response. Percentile schedules, or "formalized shaping" (Galbicka, 1994) can be used to change dimensions of responding such as duration and interresponse time (IRT). Similarly, the parameter of a lag schedule may be progressively increased (e.g., lag 1, lag 2, lag 5) to gradually increase variability in the response (e.g., Wiskow et al., 2018).

Chaining and chain (or chained) schedules have been used to describe procedures in which (a) topographically distinct responses are linked to form new performances and (b) two or more schedules of reinforcement are linked are linked in a compound schedule of reinforcement, often in which the response requirement for identical responses is gradually increased in one component. It appears from an unsystematic review that "chaining" is more common within the former context, and "chained schedule" more common in the latter, though this is not a hard-and-fast rule (see Fig. 1 and Table 2). For example, Cooper et al. (2019) described chaining as a skill acquisition procedure "to add behaviors to an existing behavioral repertoire" (Cooper et al., 2019, p. 559; see Reynolds, 1975, for a description of a similar procedure in a basic research setting). In their review of schedule thinning procedures in the context of FCT, Hagopian et al. (2011) described chained schedules as a two-component schedule arrangement in which the number of required demands in the initial link is gradually increased, while the terminal link schedule for the communicative response (e.g., request for a break) remains an FR 1 (the term was used synonymously with demand fading in the review). Readers should additionally note that the term "chained schedule"

Table 3 Terms Describing Gradual Changes in Reinforcement

Subcategory	Example	Description
Decrease in overall reinforcement rate		
Progressive interval schedule	Findley (1958)	Increasing the interval that must elapse before reinforcement availability after each reinforcer delivery.
Graduated multiple schedule	Hanley et al. (2001)	Gradually increasing the duration of the SΔ period of a multiple schedule.
Leaning	Kuroda et al. (2018)	Gradually increasing the interval durations of a variable interval schedule.
Schedule thinning	Hagopian et al. (2005)*	Gradually increasing the duration of the SΔ period of a multiple schedule.
Response restriction	Roane et al. (2004)	Gradually increasing the amount of time the alternative response (i.e., response card) is unavailable.
Increase in delay to reinforcement		
Fading	Mazur and Logue (1978)	Gradually increasing the amount of time between a choice response and presentation of the chosen reinforcer.
Reinforcer delay fading	Fisher et al. (2000)	Increasing the amount of time that must elapse before a communication response is reinforced.
Delay-to-reinforcement fading	Hagopian et al. (1998)	Increasing the amount of time that must elapse before a communication response is reinforced.
Schedule thinning	Hagopian et al. (2005)*	Increasing the amount of time that must elapse before a communication response is reinforced.
Delay schedule	Hagopian et al. (2011)	Increasing the amount of time that must elapse before a communication response is reinforced.
Progressive-delay schedule	Dixon and Cummings (2001)	Gradually increasing the amount of time between a choice response and presentation of the chosen reinforcer.

*Identifies distinct procedures across participants; decrease in reinforcement rate was implemented for Matt, increase in delay to reinforcement was implemented for Stephen and James.

also refers broadly to a method of arranging compound schedules of reinforcement in which two or more schedules, each associated with a discriminative stimulus, are in effect sequentially (Cooper et al., 2019, p. 317; cf. tandem schedules). Not all applications of such schedules involve gradual change. For example, concurrent chains procedures are used in a variety of applications in which the schedule parameters are fixed, rather than gradually changing (e.g., investigations of conditioned reinforcement in basic research, assessment of client choice in an applied context).

While several of the procedures in this category have been discussed as "schedule thinning" procedures (e.g., Hagopian et al., 2011), a decrease in reinforcement rate is not a necessary characteristic of all procedures in this category. For example, while schedule thinning is generally discussed as a method of transitioning to a thinner/leaner (i.e., lower rate) schedule of reinforcement, the objective of procedures that gradually increase the response requirement might be more precisely be described as an increase in responding per unit reinforcement (i.e., the "ratio"). For example, depending on the topography of the response(s), the goal of demand fading might not be a lower rate of reinforcement per se, but rather, behavior that persists under more demanding response requirements.

Grouping procedures that manipulate response requirement together highlights the similarity between demand fading, chaining, and shaping. Anecdotally, I have heard several students and practitioners describe demand fading procedures as a method for "shaping up" persistent responding, which seems to point to a perceived similarly between schedule thinning procedures and shaping. The early shaping literature was not born out of a desire to decrease reinforcement, however. The percentile schedule as a method of shaping was designed specifically to maintain a constant probability of reinforcement *despite* changes in the response requirement (Galbicka, 1994). Additionally, schedule thinning and shaping may often be distinguished by the objectives of their implementation. Whereas change in the target response is the goal (in and of itself) for shaping procedures, schedule thinning procedures are primarily evaluated based on the effects of the procedure with respect to concurrent behavior (i.e., maintenance of low levels of problem behavior), rather than with respect to effects on the response for which the schedule requirements are changed (i.e., the alternative response). As noted in the introduction, the goal of

the present analysis was to categorize procedures based on function rather than the objectives of the behavior change agent. Thus, it is important to distinguish between schedule thinning procedures that involve gradual increases in the response requirement, thereby indirectly decreasing reinforcement rate, and schedule thinning procedures which decrease reinforcement rate directly. The latter category of procedures will be discussed in the following section.

Gradual Changes in Reinforcement

Procedures that involve gradual changes in reinforcement are summarized in the lowest branch of Fig. 1. This category involves gradual changes to interval and time-based schedules of reinforcement (progressive interval schedules, leaning of interval schedules, differential reinforcement of other behavior (DRO) schedule thinning, fixed-interval [FI] schedule thinning), as well as procedures designed to devalue or alter reinforcement by changing some dimension of the reinforcer (e.g., delay-to-reinforcement fading). Procedures involving increases in interval- or time-based schedules directly "cap" (i.e., limit), the amount of reinforcement that can be earned per unit time, and therefore may be considered a relatively more direct method of thinning than procedures that change the response requirement, discussed in the prior section, in which changes in reinforcement rate may be incidental. For the purposes of this taxonomy, I do not distinguish between procedures in which there is a contingency between responding and reinforcement and procedures in which putative or functional reinforcers are delivered response independently (i.e., noncontingent reinforcement, NCR). Rather, all procedures that involve direct changes to reinforcement parameters (contingent or noncontingent) are included in this category.

As seen in Fig. 1 and Tables 2 and 3, researchers in both basic and applied contexts have used the same terms (leaning and thinning) to refer to increasing the schedule parameter of interval-based or time-based schedules and increasing the response requirement of ratio schedules. Because different schedules have different effects on behavior (Ferster & Skinner, 1957), readers similarly should not assume, however, that both kinds of gradual change procedures have the same effects. For example, early basic research in schedules of reinforcement (see Baum, 1993, for a discussion) demonstrated the breakdown of responding under progressively leaner ratio schedules (i.e., ratio strain), but observed no such strain under interval schedules.

The term "fading" is used to describe procedures in this category as well, often specifically within the context of procedures in which the delay to reinforcement presentation is gradually increased (delay-to-reinforcement fading, delay fading), also known as delay schedules. Delay fading procedures have been investigated in basic research within the context of the delay discounting literature (e.g., Mazur & Logue, 1978). In a treatment setting, such procedures are used to increase the amount of time before reinforcement is delivered to a more naturalistic, and potentially sustainable, level relative to immediate reinforcement (e.g., to help teach a client to "wait"). Because increasing the delay to reinforcement will necessarily decrease the overall rate of reinforcement, these procedures have been discussed as a kind of schedule thinning procedure (Hagopian et al., 2011). It is important to note that the procedures in this category are functionally distinct from procedures in which the delay to discriminative stimulus presentation is faded (e.g., progressive time delay, prompt fading), which would be categorized as Gradual Changes in Discriminative Stimuli according to this taxonomy. Given the similarity between terms ("progressive delay schedule" vs. "progressive time delay"), readers should read the descriptions of procedures carefully when these terms are used.

One group of procedures included in this category are schedule thinning procedures using multiple schedules, also known as graduated multiple schedules (Hanley et al., 2001; see also Hagopian et al.'s, 2011, discussion of multiple schedules as a thinning technique). In multiple schedule thinning procedures, an S^D (typically correlated with continuous reinforcement for alternative behavior) and S^Δ (typically correlated with extinction for problem behavior and alternative behavior) are introduced, and the S^Δ period is gradually lengthened. Students and practitioners may be familiar with a "red/green board" arrangement in FCT which mands are reinforced when the reinforcer is "on green" (i.e., the S^D component) and not reinforced when the reinforcer is "on red" (i.e., the S^Δ component; extinction for problem behavior typically remains in effect across both multiple schedule components). The discriminative stimuli are what define this arrangement as a multiple schedule, as opposed to a "mixed schedule" in which alternations between different reinforcement schedules are not correlated with discriminative stimuli (Cooper et al., 2019, p. 318). Given the importance of discriminative stimuli in these procedures, readers may be surprised to see that multiple schedule thinning procedures are included in this category, rather than the Gradual Changes in Discriminative Stimuli category. This is because the gradual change in these procedures is not a change in the discriminative stimuli themselves (e.g., the shade or intensity of the color red on the red/green board would not change), but rather a change in reinforcement schedule components those stimuli are correlated with (e.g., the item stays "on red" for progressively longer periods). You might think of multiple schedule thinning procedures as a kind of signaled interval schedule (see Hanley et al., 2001, for a description), and therefore functionally similar to progressive interval schedules (also included in this category). Additionally, readers should note that multiple

schedules, like chained schedules, are a method of arranging compound schedules of reinforcement that are used in a variety of applications, not all of which include schedule thinning and/or gradual change.

One other note regarding multiple schedules in the context of schedule thinning. On its face, the multiple schedule thinning procedure bears resemblance to Terrace's (1963) study, in which an S^{Δ} (illuminated key correlated with extinction) was gradually introduced. However, that study did not include an analogous response to problem behavior (i.e., there was no "problem behavior key" for the pigeons to peck). Thus, stimulus fading effects (à la Terrace) can only account for how multiple schedule-thinning procedures establish discriminative control over the alternative response (e.g., mands), not effects on problem behavior. Specifically, the gradual introduction of the S^{Δ} *stimulus* in multiple schedule thinning likely functions to reduce mands when the reinforcer is unavailable (recall that an "error" in Terrace's study was a response on the extinction key). To understand the principles involved in multiple schedule-thinning's effects on problem behavior, we need to examine basic research investigations of thinning that include a response that is analogous to problem behavior, such as Sweeney and Shahan (2013).

By examining multiple schedule thinning in such detail, it is apparent that the gradual change literature expanded from early investigations of stimulus control to diverse procedures manipulating different aspects of the contingency, sometimes simultaneously. Furthermore, this example illustrates how understanding the functional distinctions between procedures is an important step in identifying connections between research bases, particularly when looking across basic and applied literature.

Some Observations

In constructing this framework, I erred on side of duplicating terms rather than selecting a single term (e.g., by including both fading and stimulus fading, chaining and chained schedule) and resisted the tendency to definitively establish hierarchical relations among terms (e.g., by defining prompt fading as a type of stimulus fading). The former consideration was based on the thrust behind this paper, specifically, to help consumers of the literature navigate the terminological landscape. This motivation is better served by including more exemplars of variation in terms, not fewer. Furthermore, while it can be helpful to place terms in a hierarchy, this is difficult to do with the gradual change literature because there is so much generalization of terms across functional categories (see Fig. 1). Some authors have grouped several of the terms I include here under a unifying umbrella such as errorless learning (e.g., Mueller et al., 2007), schedule thinning (e.g., Hagopian et al., 2011), or simply used "fading" as a general term to describe gradual changes, with more detailed descriptions specifying the kind of gradual change employed (e.g., "fading along the dimension of reinforcer delay"; Mazur & Logue, 1978). The present taxonomy provides an alternative framework that spans different domains of the literature and can incorporate new procedures and terms as they are developed.

Notably, grouping procedures functionally creates some alignment between distinct areas of the literature. Demand fading, for example, is commonly implemented as a treatment for escape-maintained problem behavior (Geiger et al., 2010), whereas chaining is used to teach new skills (e.g., Cooper et al., 2019, p. 559). Demand fading is commonly discussed as a schedule thinning procedure (Hagopian et al., 2011), but in this framework it appears in a different category from most other schedule-thinning procedures. It is important to not assume that all procedures within a category operate using identical principles, and accordingly we should be careful to avoid minimizing the nuanced distinctions between procedures. Interesting empirical questions arise, however, by questioning to what extent functionally similar gradual change procedures result in similar effects and are subject to the same behavioral laws. Moreover, we are more likely to have more success in answering such questions if we have a firm understanding of the functional features of the procedures under investigation. As discussed in this paper, our current organizing frameworks differentiate between the terms discussed here on the basis of such characteristics of the setting in which the procedure is investigated (laboratory or applied), what the procedure "looks like" (i.e., topographical features), or why we might choose to do it (e.g., skill acquisition or behavior reduction). The proposed framework is only one way of sorting these procedures, and a consideration of other organizational structures may facilitate a different analysis.

In Conclusion

In his seminal textbook, Sidman (1960, p. 284) called for the evaluation of transition states as phenomena of interest in their own right. It seems clear that the tendency to view transitions as simply the intervening state between periods of steady state responding is still, to some degree, prevalent in behavior analysis research and practice. In their application across both basic and applied settings, procedures such as schedule thinning, fading, and shaping are all in their own way examples of transitions. Gradual change procedures are often a means to an end, a way to reach a terminal schedule of reinforcement, the growing pains we endure to get to a successfully generalized treatment effect. Encouragingly, as illustrated by this paper, the breadth of effective procedures that employ gradual change illustrates that these

transitions have not, in fact, been neglected. The variety of effective procedures, using a similar set of functional tools (albeit with nuanced distinctions) exemplifies the creativity and pragmatism of the inductive research process employed in single subject research. On the other hand, this organic growth makes for a tangled garden.

I propose this taxonomy with the hope that it will have utility for students and practitioners of behavior analysis, as they cope with a sophisticated and expansive literature of gradual change. First and foremost, I hope that illustrating the intricacy of our collective use of gradual change terminology fosters patience in our communication with one another, and compassion for our students and supervisees as they grapple with this complex stimulus class. While it may be tempting to state rules for "correct" use of gradual change terms such as "fading refers to antecedent stimuli, thinning refers to reinforcement," as demonstrated here, such statements are an oversimplification of how these terms have been, and continue to be, used in the published literature. Thus, establishing stimulus control over the use of gradual change terminology is a challenge indeed. To help meet this challenge head on, I will now propose some suggestions for how a functional view of gradual change procedures may be applied in various settings.

In the classroom, instructors of behavior analysis courses may apply this framework by asking students to categorize examples of gradual change from their lives or practical experience according to functional components of the contingency (e.g., does the progressive overload method your personal trainer uses gradually change the response requirement or reinforcement? Which use of the term "fading" aligns with the procedure we use with Client A?). Alternately, for advanced students, the instructor could provide a list of gradual change procedures and ask students to create a concept map, which could be compared with the present framework. Such activities may serve as a helpful jumping-off point for a discussion of the role of technical terminology in behavior analysis, generally (e.g., Foxx, 1996; Hayes, 1991). In clinical contexts, I hope this framework encourages practitioners to examine their use of these terms, and consider the "lab lore" of their practice setting's verbal community (e.g., "In our clinic, do we call this demand fading or shaping? What is our rationale?"). Practitioners may also refer to this framework to identify additional search terms when searching for relevant literature to inform their practice.

Though I propose this organizing framework chiefly as an aid in teaching and practice, it may also be useful to researchers if it illuminates areas of conceptual connection across different domains of inquiry (e.g., skill acquisition and behavior reduction, basic and applied settings) resulting in novel research questions. For example, basic research investigations of progressive ratio schedules generally find that ratio strain occurs at the same response requirement, no matter how gradually the ratio is increased (e.g., Stafford & Branch, 1998), which seems to conflict with the numerous schedule thinning effects demonstrated in the applied literature. This is just one example of an area of the gradual change literature that invites further inquiry, in the classroom, laboratory, and clinic. To aid in this exploration, I propose the present organizing framework as a terminological roadmap that encourages us to think excitedly about how we may identify more areas of connection and, subsequently, expansion.

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