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The Journal of Animal Behavior Technology (JABT) is a fully peer-reviewed journal of essays of interest to behaviorologists, behavior analysts, and animal behavior technologists. JABT publishes essays of all kinds, including review of topics, original research papers, short communications, critical reviews, persuasive essays, theoretical works, technical articles, and commentary.

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Audience: Behaviorologists, behavior analysts, animal behavior technologists, animal trainers.

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Editor's Introduction

Welcome to the sixth issue of the official journal of the Association of Animal Behavior Professionals. It has been quite some time since the last issue was published and some changes have occurred in that time. The name of the journal has changed from Journal of Applied Companion Animal Behavior (JACAB) to Journal of Animal Behavior Technology (JABT). JABT will also now be completely open access, meaning that it will be published on the AABP web site and be available to everyone for free. This will help ensure a wider readership and attract more submissions.

As before, the emphasis of the AABP and its journal will be behaviorological. Although this limits the likely submission possibilities, we will renew and maintain that emphasis. This means that the journal will publish articles within the disciplines of behaviorology and behavior analysis at both the basic science and the technology levels and will not publish articles from a psychology, ethology, or medical model orientation. Each submission will be subjected to critical peer review prior to being accepted or declined for publication.

In this issue, we have articles from Jesús Rosales-Ruize, Susan G. Friedman, and from myself, James O'Heare. The first two articles are variations on the important theme of errorless conditioning procedures and generally, the constructional (aka graded) approach to changing behavior that emphasizes added reinforcement (also acceptably known as positive reinforcement). The third paper will present the most recent version of a strategy for emphasizing constructional added reinforcement in contingency management planning, which will become the new official policy of the AABP as well.

Enjoy!

James O'Heare, DLBC

Managing Editor, JABT

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Teaching Dogs the Clicker Way

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Clicker training has become synonymous with shaping. Thanks to the attention Karen Pryor brought to clicker training through the publication of her book *Don't Shoot the Dog*, many people use shaping to teach their dogs and other animals. Shaping is, of course, a unique feature of Skinner's operant conditioning that sets it apart from other behavioral learning theories that assume we learn by trial-and-error. Theories of "trial-and-error, and accidental success" (Thorndike, 1898) portray learning as a slow process that begins with many errors that are eliminated over time. The desired behavior occurs the first time largely by chance, and across trials, unwanted behaviors gradually drop until only the correct act is performed. According to Hull (1952), trial-and-error learning requires numerous repetitions to diminish the initial dominant reactions, especially if the desired response is not initially offered/successful. The animals are supposed to try and try, until they get it correct. Correct behavior is rewarded and incorrect extinguished (or punished e.g., the methods of reward-and-punishment, sticks and carrots, etc.). The picture of learning is shown as a descending curve of trying time or errors.

Behavior brought about in the trial-and-error way can be said that it was shaped by the consequences. But this is not what Skinner meant by shaping. In Skinner's view, trial-and-error learning obscured the possible contribution that differential reinforcement (paying a different quality of reward) could make, and he offered operant conditioning as its replacement.

> "Operant conditioning shapes behavior as a sculptor shapes a lump of clay. Although at some point the sculptor seems to have produced an entirely novel object, we can always follow the process back to the original undifferentiated lump, and we can make the successive stages by which we return to this condition as small as we wish." (Skinner, 1953, p. 91)

The proposal is more than a refinement of the trial-and-error contingencies, it also carries with it a unique view of learning and an attitude towards teaching (Skinner, 1968), and later refined in Goldiamond's (1974) constructional approach. In an effort to differentiate Skinner's behaviorism from others' behaviorisms (or trial-and-error learning theorists), the field is now called behavior analysis and it members are called behavior analysts instead of behaviorists. The approach is implicit in clicker training and in this sense, these practitioners are also behavior analysts (which is why they are also sometimes called operant conditioners and Skinnerians). In what follows you will recognize some of your clicker methods and perhaps be made aware of other methods that you were not aware you were using.

The Shaper

In Skinner's system the shaper (experimenter, teacher, trainer, coach, etc.) takes a more active role. The shaper does more than set up the problem and watch how errors disappear or how long learners take to learn, if they learn. Rather than relying on accidents, behavior is systematically changed towards the correct behavior by changing the contingencies

of reinforcement. A contingency of reinforcement is the relation between the cue (S^D), the behavior and its consequence. In Skinner's words "Teaching is simply the arrangement of contingencies of reinforcement." (1968, p. 5). Although Skinner's idea of the shaper is sprinkled throughout his writings perhaps it was most incisive in his books *Walden II* and *The Technology of Teaching*. At the most practical level the shaper should approximate the characteristics of Skinner's teaching machine. The shaper then would:

1. Induce sustained activity.
2. Ask the student to take that step which he is at the moment best equipped and most likely to take.
3. Help the student to come up with the right answer, accomplished in part through the orderly construction of the program, and in part with techniques of hinting, prompting, suggesting, and so on, all derived from an analysis of behavior.
4. Reinforce every correct response immediately. This is why the clicker is so important.

Learning

For Skinner, the term "learning" did not have any useful reference and got in the way of the direct description of behavior environment relations. Saying that a learner learned how to swim says very little about the swimming. The term is also dangerous in that is biased towards the learner. Learning readily implies that it is something that happens to learners; and naturally the failure and success in turn is blamed on the characteristics of the learner, which gives rise to presumptions, such as intelligence and retardation. This is not to say that genes, brains and other physical and historical characteristics of the learner are not important. They are, and like any other variable related to behavior, the relation needs proof, and failure to teach and presumptions hardly constitute proof.

As Sidman (1985) points out, instead of thinking about learning curves, it is more productive to think of them as teaching curves involving the interaction of the learner, the teacher and the teaching program. Thus, learners that do not learn, or learn slowly with a given program, might learn quickly with another program, or a different teacher in the same program. In fact, if all the relevant variables are right, learning only requires one reinforcement.

In Skinner's experiments, learning did not need to be a continuous and slow gradual process, learning could be made to happen in an abrupt all-or-none fashion or without errors. In contrast to the learning curves of other behaviorists and cognitivists, Skinner's (1938) learning graphs showed a straight line of correct responding (i.e., lever pressing) and it often took one reinforcer to learn or at most a few of them. The rats learned from their success. There was no trial-and-error!

Because of this Skinner sometimes is called a one-trial learning theorist to contrast him with the trial-and-error theorists. One trial learning was possible because Skinner did not let the rats learn by themselves, he helped them by systematically controlling the relevant variables. In his words, "Prompted by Pavlov's emphasis on the control of conditions. I made sure that all Thorndike's "errors" were eliminated before a successful response could be made." (1987). Teaching rats to press the lever proceeded as follows:

First, the rats were introduced to the Skinner box until the rats were moving about the box with no signs of emotional behavior that may be produced by an unfamiliar environment. (They looked comfortable in the box). Skinner made sure that the food pellets were familiar to the rats by mixing the pellets with the rats' regular food (familiarity). He then introduced the food by delivering a food pellet into the tray in the Skinner box. This was repeated until the sound of the dispenser (which clicked) became discriminative for approaching the tray. He said:

> "In order to obtain maximal reinforcement of the first response to the lever, the discriminative response to the sound of the magazine (dispenser) must be well established." (1938, p. 66)
>
> "If reinforcing power is not first given to the sound of the magazine through the establishment of a discrimination, a certain

> interval of time will elapse between the response and the stimulation from the food, and the effectiveness of the reinforcement will be severely reduced." (p. 72)

Once the magazine/sound-approach/feeder behavior was established, the lever was introduced and lever pressing was captured by reinforcement.

Clicker teachers are familiar with one-trial learning and capturing, and might be wondering why Skinner did not shape lever pressing by reinforcing movements (approximations) relevant to lever pressing. In 1938, he was perhaps constrained by being able only to operate the feeder by the action of the lever or other parts of the apparatus and thus shaping was mainly done by gradually changing the apparatus and capturing. Although fully aware of the importance of the sound for shaping and the notion of approximations, it was not until later that he could reinforce freely occurring approximations when he was able to operate the feeder with a hand switch. Skinner recollects:

> "It was only later, on Project Pigeon, that we [Skinner & the Brelands] discovered how much more expeditiously we could shape complex behavior by operating a food dispenser with a hand switch." (Skinner, 1989).

Nonetheless in 1938 Skinner was also able to teach a dark-light discrimination without errors.

These ideas were later on pursued by Terrace (1961), who among other things, trained pigeons a vertical-horizontal line discrimination with very few errors. This approach was called "errorless learning" or "errorless training," which influenced the field of Programmed Instruction, Keller's Personalized System of Instruction, Mathetics (the science of learning) in the early '60s. The ideas were further refined and conceptually advanced by Goldiamond in what is known as the Constructional Approach (Goldiamond, 1974).

Error vs Correct

Skinner was concerned with constructing, or building repertoires, not with eliminating errors. It is not an accident that the cumulative records of Skinner emphasized the desired (i.e., target) behavior and early learning curves emphasized the errors. Although he recognized that we might learn something from our errors, he pointed out that "correct behavior is not simply what remains when erroneous behavior has been chipped away." For Skinner, the term "error" (and "correct" for that matter) says very little about behavior, and discourages the direct description of behavior-environment relations (i.e., what the organism is doing instead of the correct behavior). In his system, errors are not necessary for learning to occur. Errors are not a function of learning or vice-versa, nor are they blamed on the learner. Errors are a function of poor analysis of behavior, a poorly designed shaping program, moving too fast from step to step in the program, and the lack of the prerequisite behavior necessary for success in the program (Skinner, 1968).

The choice of whether a behavior is correct or an error, is not trivial or just a matter of perspective, it may also dictate the type of procedures used in practice. In shaping, there are no errors to correct, only behavior to shape. In trial-and-error there are errors to be reduced and reduction techniques are likely to be used to this aim.

Examples of this proliferate in "traditional" obedience training:

A: To teach a dog to walk closely to heel, all errors are rigourously punished. The dog may be too far forward, too wide, or lagging behind, if the dog is not in the correct heel position, the lead is jerked. The dog is left with overwhelming anxiety, during which it must try to puzzle out what the solution is—what I am supposed to do to avoid punishment?

B: Teaching a dog a sit and stay is exactly the same program: the dog is punished for all errors, movement, changing position, barking, etc., and left to puzzle the correct behavior.

C: Spray water at the dog, hit the dog with a projectile, or produce a loud sound when the dog approaches something (e.g., food, livestock, etc.). Again all errors are punished.

Alternatively, you can use a shaping program to teach alternative behavior:

A: Teach the dog how to move close and maintain the position.

B: Teach the dog how to sit quite still.

C: Teach the dog to turn away and follow, a "come this way."

In traditional obedience training, the emphasis on the erroneous, inappropriate, undesirable, and maladaptive behavior is characteristic of PATHOLOGICAL approaches and the emphasis on the desired target behavior is characteristic of CONSTRUCTIONAL approaches.

Goldiamond (1974) describes the distinctions between the constructional and pathological approaches as follows:

> "The orientation to be proposed is a constructional one. This is defined as an orientation whose solution to problems is the construction of repertoires (or their reinstatement or transfer to new situations) rather than the elimination of repertoires.
>
> Help is often sought because of the distress or suffering that certain repertoires, or their absence, entail. The prevalent approach at present focuses on the alleviation or the elimination of the distress through a variety of means which can include chemotherapy, psychotherapy, or behavior therapy. I shall designate these approaches as pathologically oriented (pathos, Greek, suffering, feeling).
>
> Such approaches often consider the problem in terms of a pathology which—regardless of how it was established, or developed, or is maintained—is to be eliminated. Presented with the same problem of distress and suffering, one can orient in a different direction. The focus here is on the production of desirables through means which directly increase available options or extend social repertoires, rather than indirectly doing so as a by-product of an eliminative procedure. Such approaches are constructionally oriented; they build repertoires."

As you can see, shaping and the constructional approach go hand in hand because their main purpose is to build desired behavior-environment relations and, like a shaping program, the constructional approach is guided by the answers to the following four questions (Goldiamond, 1974; Skinner, 1968):

- Where do you want to go?
- Where are you now?
- What steps are going to take you to your destination?
- What is going to keep you going?

Goldiamond pointed out that the answers to these questions further distinguished pathological vs constructional approaches. I will consider his arguments in the context of teaching dogs.

1. Outcomes or targets

Although similar outcomes may be produced by the two orientations, when viewed in terms of distress alleviated, the outcomes of the two approaches are not necessarily similar when viewed in terms of repertoires established.

Where do you want to go?

Shaping programs have an explicit target. Imagine that your dog jumps on people at the door and that makes it a problem to answer the door. If shaping, you will teach the dog to go to its mat when you answer the door. You could also teach the dog to remain sitting by your side until you release him. These behaviors are unlikely to happen by trying to decrease the jumping.

Similarly, with leash walking, the issue is not about reducing leash pulling, it is about teaching the dog to maintain self control whilst level at your side.

2. Current usable (relevant) repertoires

One can focus on (and try to describe) what is wrong, or is lacking, in order to make correction(s). In the other case, since one is trying to construct new repertoires, one must focus on what repertoires are available, are present, and are effective. Accordingly, different databases are required.

Where are you now?

What does your dog already do that can be used to begin shaping and during shaping?

It might be the case that the dog that jumps on people, already goes to its mat on cue, or responds to other commands relevant to the behavior you want to shape. You can begin your shaping program there. Or, it might be the case that you begin with the fact that your dog really likes a certain kind of treats and you have to first establish the click-food relation, before you proceed to shape the desired behavior. All of these are good places to begin, as long as they provide a means to immediately begin shaping with frequent clicks and treats.

3. Sequence of change procedures

Given different target outcomes and different starting points selected for their relevance to the outcome, the mediating procedures which convert entry repertoire to target repertoire must also differ. The data which are considered as designating progress will differ, as must assessment of therapeutic effectiveness.

What steps are going to take you to where you want to go?

This is what it is usually called the "shaping program." The final behavior is broken down into teachable units or shaping steps necessary for the correct performance. Like Chinese nesting boxes, each shaping step is a mini-program and is also guided by the four questions. For example, staying on the mat and getting up on command can also be further divided in shaping steps and those steps further subdivided and so on. Only one thing at a time is taught. The shaper either maintains the stimulus and setting constant and changes the response, or maintains the response constant and changes the stimuli or the setting, or maintains the behavior–environment relation and change the schedule of reinforcement.

Usually the response is trained first, then the cue and lastly the settings. At each step of the program, the learner has a reasonable chance of success. Periods of extinction are invitations for analysis of the program steps, the sequence, and the environmental arrangements. Good shaping is characterized by high rates of reinforcement and low use of extinction (or minimal frustration).

4. Maintaining consequences

The consequences in one case may be progressive relief, diminution of aversive control, or gradual progression to such relief. Alternatively, they may be explicit reinforcement of units in a progression, or gradual progression toward the repertoire to be established. In the latter case, assessment concentrates on reinforcers in the natural environment.

What is going to keep you going?

What reinforcers are going to be used during training? Are these the same reinforcers that are going to maintain the behavior outside of training? In the case of the dog jumping on people, the reinforcer could be a treat during training and praise and a pleasant physical interaction after training or the opportunity to greet the visitor or eating a treat.

The constructional approach is directly derived from Skinner's experimental analysis of behavior and does not only apply to the teaching of dogs but also to other organisms such as rats, pigeons, horses and humans. Unfortunately, it is not the dominant approach. Trial-and-error learning, the attention-to-erroneous-behavior strategy and the derived teaching technology are still very much alive. One such approach in dog training is what is called "reward" training (loosely, the use of food to lure and reward correct behavior). Unfortunately, this approach can also claim the use of positive reinforcement (i.e., food). But, the very word "reward" should give us a hint that they shape more like Thorndike than like Skinner. No wonder it is often said that reward training does not work all the time, it is not for all dogs, and works best when combined with leash/collar training. It can be said that these methods involve the elicitation of behavior with food or aversive stimulation, and food and "correction" as consequences. Such an elicitation is not necessary in Skinner's system. In fact, he argued against it with Miller and Kornosky in 1937. You do not have to make the organisms do

anything or put them through anything, as was done by Miller and Kornosky (e.g., elicit the dog's foot withdrawal with electric shock and offer food). Operant conditioning only requires an active organism and an environment that favors the occurrence of the desired behavior or some other relevant behavior to the terminal behavior. Fortunately, these trainers recognize that reward training is an old technique predating Skinner. Unfortunately, they cannot tell the difference between these methods and Skinner's. But, there is still hope, and clicker training offers a strong alternative. It is also nice to see that the targets for clicker training have been evolving from teaching dogs tricks to obedience and competition to every day life skills. This is certainly well beyond typical "dog training" and falls within the constructional approach, in that the concern is switched to teach dogs behavior necessary to make the most of the dogs' quality of life and the dog-human-world interactions.

Like clicker training, the constructional approach has been criticized as being unrealistic in its almost exclusive use of positive reinforcement. But, the constructional approach, like clicker training, is more than blind faith in positive reinforcement. Clearly, the goal is to teach with positive reinforcement only and minimize extinction. We know very well that this consistently produces happy learners and better learning. We also know that what makes possible the exclusive use of positive reinforcement is the program. Every time that we find ourselves correcting or waiting too long for the response, it is time to reconsider the shaping program. Take loose leash walking, for example. Some training procedures that might be considered "positive" still produce a fair amount of pulling during extinction and the reinforcement for loose leash walking. This extinction, of course, can be minimized by systematically introducing the leash and teaching prerequisite behavior such as the heel position, walking by the teacher's side in a straight line, at the teacher's pace, turning, stopping, etc. Thus, instead of a blind faith and political or ideological alliance to positive reinforcement, shapers should be characterized as constructional trainers, as they are always looking for what to reinforce, which inevitably leads to the almost exclusive use of positive reinforcement.

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Tsk, No, Eh-eh: Clearing the Path to Reinforcement with an Errorless Learning Mindset

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Abstract

Abstract: We all know the saying, "If at first you don't succeed, try, try again." Unfortunately, trial and error approaches typically result in low rates of reinforcement that generate unwanted fallout. Learners practice errors, making correct responding less likely, and they become frustrated, setting the occasion for aggressive behavior and giving up. This fallout led researchers and practitioners to ask whether errors really necessary for learning to occur? "Errorless learning" is a term used to describe a teaching approach that limits incorrect responses through careful arrangement of the teaching conditions. In this article, the basic elements of designing an error-reduced learning environment are discussed in order to design more effective, efficient and humane training plans.

Many of our most effective training strategies weren't as well known in the past as they are today. Take Thorndike for example, who in 1898, sorely needed shaping to teach a dog to go to the corner of a large pen. Thorndike wrote:

> I would pound with a stick and say, "Go over to the corner." After an interval (10 seconds for 35 trials, 5 seconds for 60 trials) I would go over to the corner (12 feet off) and drop a piece of meat there. He, of course, followed and secured it. On the 6th, 7th, 16th 17th 18th and 19th trials he did perform the act before the 10 seconds were up, then for several times went during the two-minute intervals without regarding the signal, and finally abandoned the habit altogether (p.77).

While Thorndike's apparent devotion to data is impressive, his trial and error approach to dog training got in the way of success. I looked up trial and error in the Urban Dictionary – admittedly not exactly an academic resource but this "satirical crowdsourced online dictionary of slang words and phrases" ("Urban Dictionary, 2016), is right on target. The "crowd" contributed the following descriptions of trial and error learning:

- Trying something until you get it right.
- The next best thing to guessing.
- When you mess up repeatedly until you do something right.
- A person will try something, get it wrong, learn from the mistakes, try again, and hopefully eventually get it right.
- A systematic means of determining a solution to a problem, often involving a large amount of time; often involves eliminating possibilities.
- The story of my life.

Tradition

Trial and error (T&E) is the standard approach to teaching exemplified by the well worn proverb, "If at first you don't succeed, try, try again." While both operant training and

T&E procedures rely on selection of behavior by consequences, success with the T&E approach is accidental, a chance occurrence. Although the feedback provided by incorrect responses (i.e., punishment or extinction) may eventually guide the learner to the correct behavior, it can take a lot of "Tsk, No, Eh-eh" consequences to prune the many incorrect choices off the possibilities tree. This makes T&E a slow process, which often leads to negative fallout. Learners practice errors and effort is punished (Chance, 2009, p. 312). Further, research indicates extinction is an aversive procedure that generates undesirable emotional reactions described as frustration, aggression and giving up. Pierce and Cheney (2013) report the following fallout (information in brackets and italics added):

Pigeons flap their wings in an aggressive manner and will even work for an opportunity to attack another bird during the presentation of the S^{Δ} [*S-delta, the extinction stimulus, i.e., the no-response signal*] on a multiple schedule. Birds will peck a different key if such pecking turns off the extinction stimulus, implying that the stimulus is aversive … Because emotional behavior is generated, discriminative responding [*correctly responding to the the discriminative stimulus, S^{D}, and correctly not responding to the extinction stimulus, S^{Δ}*] takes a long time to develop. In addition, spontaneous recovery of S^{Δ} responding from session to session interferes with the acquisition of discrimination. Finally, even after extensive training, birds and other organisms continue to make errors by responding in the presence of the signal for extinction [S^{Δ}] (p. 238).

The pervasive use of T&E represents, at least in part, the cultural fog about how behavior works. High rates of errors are not necessary for learning to occur and can actually work against mastery. To reduce the fog, it's important to be clear: Prompts are information, not bribes; operating on the environment to gain reinforcers is our biology; and learning success resides in the environment not the learner. With less clarity, we may miss the power of changing conditions to change behavior.

In an excellent article in which operant training and T&E are discussed, Rosales-Ruiz (2007) shared B.F. Skinner's perspective from his book, *The Technology of Teaching*, published in 1968:

Errors are not a function of learning or vice-versa nor are they blamed on the learner. Errors are a function of poor analysis of behavior, a poorly designed shaping program, moving too fast from step to step in the program and the lack of the prerequisite behavior necessary for success in the program.

Errorless learning

"Errorless learning" is a term used to describe a teaching approach that limits incorrect responses by means of carefully arranged teaching conditions. Terrace (1963) researched errorless learning with a successive discrimination task. In the traditional successive discrimination procedure (different than Terrace's procedure), a pigeon, for example, is reinforced with food for pecking a disk on the wall of an operant chamber (called a key light or key) when it's illuminated red. After many repetitions, when the pecking behavior in the presence of the red key is well established, the color of the key changes to green and pecking is no longer reinforced. With the standard protocol then, the red light is the discriminative stimulus (S^{D}) that cues pecking for food reinforcement, and the green light is the stimulus delta (S^{Δ}) that signals the extinction condition (i.e., pecking will not produce food reinforcement). The red and green keys are then alternately presented with the corresponding reinforcement and extinction conditions in effect. After initially making many errors (due to response generalization), the correct differential response to key color gradually occurs (Pierce & Cheney, 2013).

Alternatively, Terrace used two procedures in his errorless discrimination training not typical of standard discrimination training. First, the S^{Δ} condition, the green key, was introduced very early in the program before pecking in the red light condition was well established. Second, Terrace used a fading (i.e., fading in) procedure to present the green key at different values, gradually increasing brightness, wavelength and duration over the repetitions. These two procedures resulted in faster learning of the discrimination and very few errors. The pigeons

trained with the errorless discrimination procedures made about 25 errors (i.e., pecking the green key light) compared to 2000 to 5000 errors made by the pigeons taught with standard procedures. Only those birds trained with T&E exhibited emotional responses in the presence of the S^{Δ}. The pigeons trained with the errorless approach remained calm until the red disk, S^{D}, appeared.

These findings have been widely replicated across species. Powers, Cheney, & Agostino (1970) found that preschool children taught a color discrimination with errorless learning procedures learned faster and with fewer errors, and they enjoyed learning more than the children taught with standard procedures. Roth reported similar results with dolphins (as cited in Pierce & Cheney, 2013).

More than a protocol: A mindset

Terrace's errorless discrimination protocol, which includes early presentation of the S^{Δ} and fading in the discriminative features of the S^{Δ}, is one important way in which we can improve learning outcomes. But, there is a bigger picture to be considered by having an error-reduced mindset. As eloquently stated by Rosales-Ruiz (2007):

We also know that what makes possible the exclusive use of positive reinforcement is the program. Every time that we find ourselves correcting or waiting too long for the response it is time to reconsider the shaping program (p. 6).

In other words, the rat is never wrong, it's the program. The mindset is one of taking responsibility for reducing errors and our power to do so is good news. By improving learning environments and our procedural skills, we can reduce errors, increase learning speed and rate of reinforcement, and reduce frustration and aggression. Behavior is always conditional; behavior never occurs in a vacuum. Creative use of antecedents and consequences is key to reducing errors and increasing efficient, effective learners. Below are some examples of using antecedents, consequences and several procedures with an errorless learning mindset.

Antecedent influences

Antecedent influences are those stimuli, conditions and events that set the occasion for behavior to occur. The overlapping categories of antecedent influences are briefly discussed below.

Setting events. Not all antecedent arrangements are learning solutions. Changing physical setting features in the training environment can make the right behavior easier. Sometimes, it is as simple as removing the cue for the error and adding a cue for the correct response. For example, in 2015, Pella Shades launched a media campaign demonstrating the value of setting events. By lowering his Pella window shade, the caregiver reduced his dog's incessant barking as people passed by (LoveThatRebecca, 2015). Arranging substrates for ease of movement, expanding entry and exit doors, and keeping food reinforcers tucked into pouches instead of visible in hands are all examples of arranging the setting for success.

Motivating Operations. The strength of reinforcers isn't fixed, it's conditional (i.e., reinforcer strength waxes and wanes depending on circumstances). Motivating operations are anything that establishes conditions that change the strength of a reinforcer. When the daily diet is freely available it may be less motiving to work for, so we train with special treats; when a behavior is cued by an unfamiliar trainer, responding may be less motivating, so we encourage relationship building by means of depositing reinforcers in the reinforcement bank account first. In another example, at Cheyenne Mountain Zoo, the trainers increased the value of going home by putting sticks on the beaver's path.

Discriminative stimuli and prompts. Pairing S^{D}s with strong reinforcers results in clear cues. We can't reinforce a behavior that never happens, so prompts can be used initially and then faded out in order to transfer stimulus control to the S^{D} alone. Prompts can be verbal, visual, or gestural and include food lures and modeling. Prompts can be used in a least-to-most approach or a most-to-least approach, depending on the situation. The least-to-most approach is useful for assessing current skills (i.e.,

what the learner can do independently or with minimal prompting). Fading too fast or too slow can be problematic (MacDuff, Krantz, & McClannahan, 2001). Target sticks are common prompts that can be be quickly faded after a few reinforced repetitions of the desired response. Reinforcer placement can prompt the correct response. For example, Peta Clark, a talented trainer from Australia, prompts the bow position by delivering the food reinforcer slightly under the dog's chest and then fades the prompt.

Consequence influences and cool procedures

There are many important characteristics to consider to maximize reinforcement. The fundamental characteristics of effective reinforcement include clear contingency (i.e., the dependency between behavior and outcomes) is best achieved with consistent reinforcement. Contiguity (i.e., immediate delivery) often best achieved with auditory or visual markers like clickers, whistles and short utterances. Reinforcer type, quantity, novelty and variety can also influence motivation and outcomes.

The training procedures we use and the expertise in using them are an important source of reducing errors, frustration and aggression. Shaping, differential outcome effect, differential reinforcement of alternative behaviors, and behavioral momentum are some of the sharpest tools in the operant tool box, with which to replace problem behavior and teach new skills.

Shaping. Shaping is the process of reinforcing successive approximations of a desired behavior. Shaping allows us to train behaviors that may never occur otherwise. Chance (2009) describes 5 tips for successful shaping: First, reinforce small steps. Trainers who get poor results often require too much at once. Second, provide immediate reinforcement the instant the desired approximation occurs. Third, deliver small reinforcers, just enough to be effective without slowing pace. Fourth, reinforce the best approximation available, rather than sticking to some pre-set plan. Fifth, back up when necessary to progress more rapidly to the final goal (p. 141). For example, the trainers at Zoo Knoxville used shaping to teach their elephants the component parts of a voluntary blood draw behavior. Dog behavior consultant Lori Stevens uses shaping to teach walking-then-jumping through cavaletti rails to build body awareness and strength in dogs. Lori adds difficulty by shaping the number, height, and distance between the rails.

Differential outcome effect. With the differential outcome effect, the reinforcer varies systematically with the behavior. For example, browse (vegetation eaten by animals such as leaves and bark) reinforces shifting into the yard, and carrots reinforce returning to the barn. The differential outcome effect has been shown to be a robust phenomenon that can speed learning with a wide variety of species, learning objectives, and reinforcers (See e.g., Miyashita, Nakajima, & Imada, 2000, for horse training). Trainers at the Oakland Zoo explored the differential outcome effect to teach a giraffe to place her foot in the center of a radiograph plate. Foot placement anywhere on the edges of plywood mock-up produced hay cubes and foot placement directly in the center of the mock-up produced banana chips.

Differential reinforcement of alternative behaviors. Differential reinforcement of alternative behaviors answers the question, "What do you want the animal to do instead of incorrect or inappropriate behavior?" Trainers at the Columbus Zoo reinforced an Asian small clawed otter for holding a block, an incompatible alternative to grabbing the target they were using to prompt an open mouth behavior. Trainers at San Diego Zoo reinforced a male lion for laying down, an incompatible alternative to aggressive behavior at the shift door.

Behavioral momentum. Based on Nevin's work, Mace et al. (1988) described behavioral momentum as "the tendency for behavior to persist following a change in environmental conditions" (p. 123). Mace developed a corresponding intervention for non-compliance that consisted of delivering a sequence of cues with which the subject was very likely to comply (high probability requests) prior to delivering the low-probability request. Momentum-like effects were shown. The antecedent high-probability cue sequence increased compliance and decreased

compliance-latency and task duration. Ken Ramirez from the Shedd Aquarium and Karen Pryor Clicker Training, use behavioral momentum as a key feature in response to missed cues following a short withholding of reinforcement with sea lions and other animals.

Get real

On this planet it is neither realistic nor necessary to experience no errors whatsoever (which is another way of saying we don't need *every* outcome to lead positive reinforcement). We are resilient and can bounce back after mistakes, even learning from them and being enriched by them, given an empowered learning history that is rich with successes. After all, even the pigeons taught with Terrace's carefully orchestrated errorless discrimination technique made 25 errors. But the T&E group made between 80 to 200 times more errors and were the only pigeons to show frustration and aggression. Clearly, reducing errors is a worthy goal, which leads us to the question—How many errors is too many? If only there was a simple, single answer. Perhaps the question is better framed as—How would we know what is too many errors for any given individual? The answer lies in reading and heeding an animal's body language. Latency responding to cues, too much or too little focus and intensity also provide strong clues as to the aversive impact of errors. Further, problem behaviors, including repetitive and self-injurious behaviors, may have an escape function. That is, problem behaviors may function to remove aversive conditions like the demands of largely unsuccessful training sessions.

Also, it is interesting to note that some research suggests Terrace's errorless discrimination procedures may be most useful in situations where the contingencies are fixed (as is the case with many trained behaviors) rather than changing. With problem solving situations with frequently changing contingencies that depend on eliminating incorrect responses (e.g., search and rescue dogs), traditional T&E procedures may result in more flexible responding and allow better remembering and recall (Pierce & Cheney, 2013, p. 239). More research is needed to discover the interaction between training procedures and different operant classes of behavior.

Conclusion

Trial and error training approaches typically result in high rates of errors and low rates of reinforcement – the perfect recipe for unwanted fallout. Learners practice errors, making correct responses less likely in the long run. These learners often show frustration, aggression or just give up. Trainers can be similarly demoralized by their animal's slow learning curve and the frequent withholding of reinforcers that results from incorrect responses. The operant training toolbox is full of alternatives that differ from trial and error learning, by providing ways to guide learners to reinforcement. One alternative to traditional trial and error training is Terrace's successive discrimination procedure, which has come to be known as errorless learning. However, errorless learning is more than a set of procedures. It is a mindset that encourages trainers to take responsibility for their learner's outcomes, resulting in more carefully and creatively arranged environments and training plans. With the errorless learning mindset, animals in human care will experience higher levels of success, greatly improving their welfare.

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Minimally Aversive Contingency Management Planning

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This paper provides guidance to behaviorologists, behavior analysts, and animal behavior technologists on utilizing the least aversive methods possible when constructing and implementing contingency management plans for clients and their companion animals. The strategy presented here emphasizes diligence in finding added reinforcement-emphasized approaches to resolving problematic behavior. You can find the most current version of this strategy online through the Association of Animal Behavior Professionals, linked to throughout the Professional Practices Guidelines at www.associationofanimalbehaviorprofessionals.com/guidelines.html.

Avoiding extremism and dogmatism

It is important to avoid exaggeration or excessive simplicity in this analysis. Accepting extreme arguments, such as that "all forms of aversive stimulation are always sure to cause irreparable harm" or that "aversive stimulation is necessary to succeed in training," leads to dogmatic positions, which are best avoided in favor of careful consideration of the circumstances and dedication to utilize the least aversive methods possible.

An aversive stimulus is any event that functions (a) to evoke behavior that has reduced or terminated it in the past, (b) as a punisher if presented immediately following a behavior, or (c) as a reinforcer when withdrawn immediately after a behavior (Cooper et al., 2007). Added punishment, subtracted punishment, subtracted reinforcement, and extinction, even in their mildest forms, all involve aversive stimulation to some degree. Only added reinforcement involves no aversive stimulation at all. If a stimulus meets the criteria listed above, then the stimulus *is* classified as aversive. It is usually easy to predict which stimuli will function as aversive stimuli. Indeed, predicting which stimuli will be aversive is generally just as reliable as predicting which stimuli will function effectively as reinforcers. These predictions can be confirmed once you have implemented the chosen procedure with the stimulus in question.

It should also be noted that aversive stimulation is ubiquitous. We face hundreds, if not thousands, of aversive contingencies on a daily basis. Aversive stimulation plays a major role in controlling our daily social and nonsocial behavior. We put on seat belts to escape the buzzing sound (and tickets, and injuries). We put the back foot forward when walking to escape falling forward. We answer a question asked of us to avoid the aversive reaction that would result from ignoring the question. We do the dishes or take out garbage to avoid spousal nagging or a lack of clean dishes. We cross the street to avoid walking past a scary looking person. We turn the wheel when driving through a curve to avoid driving into a ditch. We "nudge" a vending machine that does not quite release our product. We escape unconditioned aversive stimuli in daily life on a minute-by-minute basis and come to escape conditioned aversive stimuli as well (what we call "avoidance" of the unconditioned stimulus). Most of these do not elicit strong emotional arousal or pain and the fact that a stimulus is aversive, per se, does not mean it is necessarily problematic.

Some forms of aversive stimuli can, however, generate strong emotional arousal and even pain. We might fail to pay attention waiting at a red light and evoke a beeping behavior from impatient drivers behind us. This might elicit emotional behavior that we might experience and label embarrassment, which results in our resolving to pay closer attention next time. Depending on our conditioning history, this could be a particularly aversive experience that results in not only the adaptive paying-more-attention behaviors but also rather unpleasant emotional behaviors, which may then generalize to driving in general or even to interacting with other people in general—fallout! One might stick a fork into a toaster to dislodge a stuck piece of toast only to be shocked, resulting in injury and a general aversion to toasters or even all electrical appliances. One might contradict a spouse, only to have them lash out at us vocally or even physically, resulting in numerous side effects. Although challenging to operationalize and measure quantitatively, predicting *how* intensely aversive a stimulus will be, is more or less reliable as well. Failing to reinforce non-criterion responses or withdrawing ongoing reinforcement is aversive, but it is generally not as problematically aversive as harsh punitive stimulation. Noncontingent aversive stimulation is much more problematic than contingently applied aversive stimulation, and readily escapable and eventually avoidable aversive stimulation is much less problematic than inescapable and unavoidable aversive stimulation.

Furthermore, some forms of aversive stimulation are productive, causing the expansion of adaptive repertoires of behavior, whereas other forms are not productive and only result in the expansion of maladaptive behaviors. Two forms of aversive stimulation might be equally aversive, with the only difference being that one is productive while the other is not. Extinction of a problematic behavior may result in momentary emotional arousal, but it may then also result in a decline in the ineffective behavior and perhaps an increase in some more effective (and acceptable) behavior. The relief from stepping forward, and not falling on our faces when walking, results in proper (and effective) walking behaviors. Alternatively, rubbing a dog's nose in feces as a supposed "punishment" for voiding in the house is unlikely to result in the expansion of adaptive behaviors and *is* likely to result in secretive voiding and numerous other problematic side effects, both operant and respondent. Growling at a stranger might result in an owner screaming at the dog and yanking their leash, which might result in a decrease in growling but also an establishing operation for escaping strangers in the future, resulting in an increase in alternative behaviors such as lunging and snapping as a first reaction.

It is worth making the distinction between socially mediated and direct aversive stimulation that we could not have reasonably foreseen and/or prevented. The seat-belt buzzer might be aversive but it might also be deemed useful to "remind" us to put on our seat belt. Some forms of aversive stimulation we deem useful and necessary because we cannot easily identify a less aversive solution. In other instances, a particular socially mediated form of aversive stimulation simply may not be the most reasonable and least aversive solution. Rubbing a dog's nose in feces is not only unlikely to result in a decrease in voiding in the house but it is also highly likely to result in numerous problematic side effects.

To summarize and conclude, in some cases, the aversive stimulation is a direct outcome of the behavior, and in others, the stimulation is mediated socially. For the stimulation that is contacted directly, some forms are useful and minimally aversive/problematic and others particularly aversive and problematic. In this latter case, if we can reasonably foresee and prevent the aversive stimulation in favor of a less aversive solution, this is preferable (i.e., avoidance). In cases where we mediate the stimulation, some forms may be minimally aversive, productive and necessary, while others are particularly aversive and problematic, unproductive and unnecessary. For instance, extinguishing a problem behavior is usually necessary, productive, and minimally aversive, particularly when a graded approach (i.e., the procedural application of errorless conditioning strategies) is used and a replacement behavior is installed that serves the same function. Rubbing a dog's nose in feces, on the other hand, is a different matter. That would be intensely

aversive, problematic in terms of side effects, unproductive in terms of solving the problem, and unnecessary in that other, better solutions, exist. This is why the topic of aversive stimulation is not as simple as whether the stimulus is aversive per se or not. Aversive stimulation per se is not the primary problem; the problem is aversive stimulation that is unnecessarily intense and/or unproductive.

In the examples of putting your back foot forward to walk and avoid falling, turning the steering wheel when reaching a curve in the road to avoid crashing the car, or putting on a seatbelt to escape the aversive buzzing sound, the reader might have been thinking, "these are not the kinds of things I am opposed to" and that is exactly the point being made here. Railing against "aversive stimulation" is not exactly the most productive solution, as it misidentifies the problem. The problem is aversive stimulation that is intense or harsh where it does not need to be and/or is unproductive where more productive solutions exist. For example, pinching a dog's ear to generate a sit that can then be subtractively reinforced with release of the ear is completely unnecessary. It is harshly aversive and highly likely to generate serious and intractable side effects. There are much more productive and less aversive ("best practice") methods available. Even if there were no less aversive "solutions" to generating a sitting behavior, it is unlikely that such methods could be justified simply on the basis of training a dog to sit on cue. The solution is more of a threat to the dog's behavioral well-being than the problem of not sitting on cue. As we explore the topic of aversive stimulation that we participate in mediating or allow to happen directly where we could have prevented it, continue to think about the (a) necessity, (b) intensity, and (c) productivity of the stimulation. If such stimulation is not necessary in the sense that a less aversive solution exists or the risks outweigh the benefits, then the stimulation is *not* justified. If such stimulation is not productive, then it too is *not* justified. Rarely is intensely aversive stimulation, the kind that is likely to cause problematic side effects, justified—this would represent an extreme scenario that is usually avoidable with added reinforcement-emphasized methods.

Aversiveness-ratcheting strategies

There are several algorithms, flow charts, and models available that provide guidance to trainers on how and/or when to implement more intensely aversive methods in their training plans.[1] These resources commonly recommend minimally aversive added reinforcement-emphasized methods to start, and when the changes in behavior are inadequate, the algorithm justifies an incremental increase in the intensity of aversive stimulation in the contingency management plan, followed again by the solution of greater levels of aversiveness if the technologist fails again. The solution justifies a ratcheting up of levels of aversiveness.

Although it is appropriate to limit increases in aversiveness, and indeed, at some point, a slight increase in aversiveness may be required in some cases, this aversiveness-ratcheting strategy ignores the actual variables resulting in the inadequate training, thus leaving ratcheting as the only solution. In most cases, this aversiveness-ratcheting strategy makes the false assumption that increasing the aversiveness of a contingency management plan is the best solution when an intervention fails to generate adequate results. Indeed, the authors of such models may only be aware that they limit aversiveness and be unaware of the implication that the best solution is to ratchet up aversiveness.

[1] This includes models I have previously published (O'Heare, 2013). These aversion-ratcheting models often have the phrase "minimally aversive" or "minimally intrusive" in their title, alluding to aversion-ratcheting as a solution to failure. That is also why I am referring to the strategy provided here as "added reinforcement-emphasized"—to clearly put the focus on added reinforcers. Aversion-ratcheting models are the paradigm at present and have been for quite some time. The insidious implication they perpetuate is unstated and it rarely occurs to the authors that these implications exist. Indeed, the authors' "intent" is to help ensure that fellow behavior technologists use as little aversive stimulation as possible, a laudable goal to be sure and a primary reason why the paradigm persists. I humbly hope that stating these assumptions and implications clearly and proposing a strategy based on a different kind of solution will help contribute to a paradigm shift in this regard.

Where the actual problematic variables are ignored in such models, if one fails to achieve their objectives with an added reinforcement-emphasized plan, the aversiveness-ratcheting strategy provides the choice between failure on the one hand and increased aversiveness on the other. This leads to the implication that a lack of aversiveness is actually the problem. Of course, the best solution to a lack of aversiveness is *not* an incremental increase in aversiveness.

The actual problem is some misstep with the assessment, contingency management plan, or its implementation, and the actual solution is to identify and resolve the misstep. The failure of an intervention to generate adequate changes is not necessarily due to a lack of more intensely aversive stimulation, nor is an increase in the aversiveness of the intervention the best solution.

This is not to say that aversive stimulation is never justified. However, if an intervention is not generating adequate changes, the best, most productive solution is to identify exactly why and change *that*. An intervention may fail because i) the results of a functional assessment have an inaccurate or incomplete contingency analysis, or ii) of an unsuitable procedure or set of procedures, iii) the implementation suffers from problems, iv) the progress is being sabotaged by out-of-session training to the contrary, or v) any number of other problems.

Therefore, again, the best, most productive, solution is to identify the actual source of the problem and make the necessary adjustments. For example, if a training project is not going well, one might recognize that the dog is hyperactive and distracted and this is disrupting the training efforts. The most productive solution is not to increase aversiveness but rather to reduce the ambient distraction and generally ensure more exercise for the dog, changing the motivating operations.

Recognizing the problem is a skill, as is finding a suitable solution. Expanding one's repertoire of such problem-solving behaviors is more productive than increasing aversiveness. As mentioned, this too is not to say that a small increase in the aversiveness of a plan is never justified. One should always try to find a less aversive solution before resorting to a more aversive solution. However, this is quite different from an aversiveness ratcheting approach, which tends to ignore the real problems with the relevant contingencies. In an aversiveness-ratcheting approach, the solution to ineffective training is an increase in aversive stimulation. In the approach advocated here, the solution to ineffective training is identifying and resolving the variables causing the actual problem.

Emphasizing added reinforcement-based methods

Success with added reinforcement-emphasized methods requires proficiency in their application and a dedication to find solutions to problems when they arise. Most technologists that resort to aversive methods are simply not adequately proficient in the application of added reinforcement-emphasized methods, including identifying what variables are causing problems and resolving them. Some technologists exhibit a *belief* that they must "resort to" punitive methods when they fail to achieve quick initial success without them. Failure to achieve training objectives with graded added reinforcement-emphasized methods (i.e., errorless conditioning strategies) should prompt trainers to identify the inefficient and/or ineffective practices or assumptions causing the difficulty. This allows trainers to make the necessary adjustments to the program, in order to resolve them, rather than "resorting to" more aversive methods that may hide, and often compound, the difficulties. Therefore, if one wishes to utilize an errorless added reinforcement-based approach and minimize aversive stimulation, one ought to first acknowledge that the failure of an intervention is likely the result of problems with the assessment, plan, or their implementation. One ought to work to increase one's general proficiency with regard to finding added reinforcement-emphasized solutions, and when such failures occur, emphasize identifying and fixing the problem, as opposed to ratcheting up the aversiveness. This general strategy is sure to be more productive.

Why implement the added reinforcement-emphasized contingency management strategy?

The strategy proposed in this paper is presented because of its careful attention to long-term effectiveness, including the effects on the target behavior, as well as the well-being of the subject in general. What reinforcers are available to maintain behaviors that comport with the strategy presented here? After all, it clearly requires a higher response effort and may indeed limit access to certain short-term, impulsive reinforcers. While intensely aversive methods and the eliminative approach in general may impulsively provide a suppression of the problem behavior, thus allowing escape from the aversive condition it establishes for the trainer, these procedures cause a number of problems that may not be immediately apparent, but will ultimately cause more problems than are resolved. Knowledge of added reinforcement-emphasized methods and troubleshooting methods to resolve progress issues, and a dedication to use the least aversive methods possible, helps avoid progress problems and insidious problem side effects. This expanded repertoire of problem solving and emphasis on avoiding intensely aversive methods brings about a more productive state of affairs in the long run, which is why it is the wiser approach and worth the added effort. The point here is that it may not be evident to all, but the most productive course of action when faced with progress problems is to identify the problem variables and find solutions for those problems rather than mask failure with aversive stimulation that may momentarily make it seem as though the problem is resolved, but will end up causing even greater problems.

When professional behavior comports with a strategy that emphasizes increased skill in identifying and modifying inefficient or ineffective contingency management planning and training practices, benefits accrue to the all involved parties (e.g., subject, client, and the individual trainer), as well as the behavior technology field as a whole. The subject benefits from the standard by experiencing a higher degree of comfort and behavioral well-being that comes with being conditioned to react to stimulation in a way that ultimately promotes an expansion of their repertoire of adaptive social behaviors within the family and contacts a greater number of added reinforcers. The client benefits from the standard by avoiding the necessity of dealing with the well-known side effects that commonly occur with the use of highly aversive methods and their objectives will be achieved in an orderly manner. By providing effective, minimally aversive training, the individual technologist benefits from stronger success rates, reduced risk of injury and liability exposure, increased business due to a good reputation, and the respect and trust of clients, colleagues, and allied professionals. The field benefits from the standard with market growth and increased respect from the public and allied professionals. Notice that these are the same reinforcers available for the adoption of all best practices and high-standard guidelines. In the long term, adopting a high standard of ethical behavior, including dedication to implementing this or similar strategies provides greater benefits to society than the failure to adopt such a strategy.

Bringing behavior under the control of practices described in this strategy tends to generate pride-related feelings and thoughts as well. Increased knowledge and skill makes for a much more reinforcing endeavor.

Strategy for avoiding versus banning aversive methods and tools

This paper does not present a list of banned, disallowed, or outlawed specific tools or methods. The strategy described here is simply not the place for this kind of prohibition for the following reasons.

First, this strategy is intended to be comprehensive and all-encompassing and to provide guidelines through *all* possible situations all the way from simply preempting a problem behavior without even interacting with the subject, all the way to the worst-case emergency scenarios that are extremely rare and even to the consideration of euthanasia. If the strategy is going to be comprehensive in this manner, then it cannot simply stop short and ban intensely aversive methods—that would simply leave people unarmed in terms of *how* to avoid getting

to that point and leave them helpless, when and if such a rate and extreme case does present itself. Although worst-case scenarios will be *extremely* rare, they are theoretically possible, and the strategy accounts for all possible scenarios. Therefore, it would present a discontinuity to then say that this or that specific tool or method is never ever to be utilized no matter what, period. If the model is going to proceed all the way to the worst-case scenarios, then it must not then prohibit outright, the tools and methods utilized in these extremely rare circumstances. Rather than stop the strategy short of the worst-case scenario and providing an incomplete strategy, it provides the guidance required to minimize aversiveness. The entire strategy is built on the idea of helping the user focus on the real problem and *avoid* increasing aversiveness. The reason that the contingency management plan is failing is *not* because it fails to include intensely aversive methods. Behavior is driven by reinforcement and added reinforcers can be harnessed via an errorless and constructional approach to generate effective changes in behavior. Furthermore, the solution to whatever the impediment is, involves resolving the impediment or finding a solution that allows the problem to become irrelevant. Helping avoid something by training *how* to avoid it is preferable to legislating the avoidance precisely because it trains in what "*to do*" rather than what "*not to do*," as some like to put it, something we always emphasize with our clients, because it is more productive. The focus is on arming the technologist with a set of guidelines that will prevent the unjustified use of any harsh aversive tool or method, as opposed to providing a specific list of tools/methods that may never be considered. Followed diligently, I dare say no technologist would *ever* get to the stage where intensely aversive methods are considered. The entire model is heavily focused on finding a more productive solution. Make no mistake about it, the strategy outlined here presents a strong stand for utilizing the least intrusive interventions possible, but it does so in a more productive way than specifically outlawing specific things.

Before I proceed to the strategy itself, some trainers have been outraged that I would even include a Box 6, the box that includes intensely aversive methods. To that criticism, I will make two points. First, the entire process here is about *how to avoid* utilizing intensely aversive methods. I believe this to be more realistic and productive than a blanket ban on Box 6 interventions. Second, exactly what will these technologists do when and if they ever do face reaching a Box 6 case? We are talking about when they have *diligently tried everything* to avoid it and the problem is *extremely dangerous and cannot be managed*. What do these trainers do then? Simply walk away? Euthanize? Is that really the most ethical solution?

I am told these technologists simply would never reach Box 6 and not banning Box 6 outright will legitimize people moving forward to Box 6. To the first claim, I say great and indeed a competent technologist proceeding diligently through this model will *not* likely reach Box 6. However, it remains a possibility, and what then, which brings us to the second point. To that second point, guidance is more important than my taking responsibility for incompetent professionals reaching Box 6 without appropriate diligence. Indeed, just about the only way that one would likely reach Box 6 is *not* to follow the strategy, and of course that is not the fault of the strategy, author of the strategy, or any organization that elects to make the strategy a policy. One can be strongly dedicated to added reinforcement-emphasized methods and allow for the possibility that the use of some aversive methods might potentially become necessary and indeed the least harmful solution left to consider.

The strategy

The strategy presented here emphasizes three primary systems:

- Objectivity and accountability through proper measurement;
- Emphasis on constructional approach; and
- Reaction to failure of identification and resolution of problematic variable(s).

First, the strategy emphasizes objectivity and accountability through establishing precise quantitative behavior objectives and careful

quantitative tracking of the behavior throughout the process.

Second, the strategy emphasizes the use of a constructional rather than eliminative approach achieving as close to errorless conditioning through a graded approach as possible. A constructional approach involves increasing the subject's repertoire of adaptive behaviors, placing the subject in an environment that supports the occurrence of replacement behaviors and contact with highly effective reinforcers. The eliminative approach involves placing the subject into a trial-and-error environment and the elimination of problem behaviors with punishment and extinction (Goldiamond, 1974/2002; Delprato, 1981). A graded approach is the procedural application of the constructional approach and is used to achieve as close to errorless conditioning as possible (See, Terrace (1963) for discussion of errorless conditioning procedures).

Third, failure to achieve the objectives prompts careful reevaluation of the behavior objective, the contingency analysis, the choice of procedures, and implementation-related variables.

Failure to identify and resolve the problem may prompt an evaluation of the constructional approach and finding a more successful way to put the subject in a position to exhibit the replacement behavior rather than the problem behavior. It may also prompt a change in the motivating operations and other antecedent conditions. This reaction to failure does not involve the application of particularly harsh aversive stimulation, but rather reevaluation and problem solving measures.

A proficient animal behavior technologist should be able to plan and implement constructional added reinforcement-emphasized behavior change plans and completely avoid harsh aversive stimulation. Where a trainer is frequently faced with difficulties in achieving training objectives with added reinforcement-emphasized methods, the best solution is, again, not to resort to more aversive methods but rather to increase their own repertoire of effective planning and implementation of added reinforcement-emphasized training, and more effectively identifying and resolving problems when they face them. The solution is education, not coercion.

The flow chart in Figure 1 depicts this process

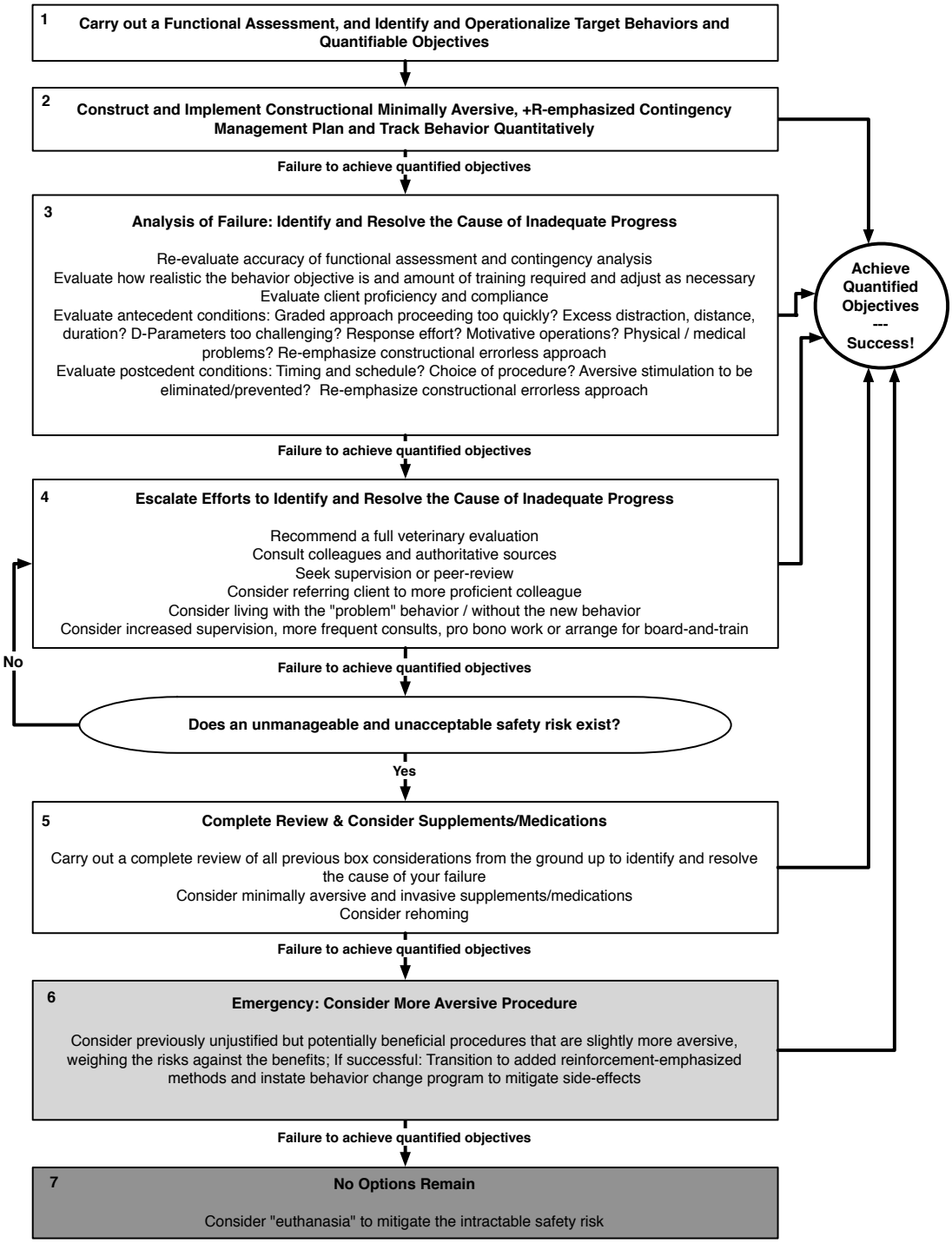

Figure 1. This algorithm provides guidance on how to identify problems in training plans and make adjustments to help achieve success in achieving behavior objectives.

Box 1. Functional assessment and behavior objectives

The first step in the strategy is to carry out a formal functional assessment of the problem behavior and any potential replacement behaviors, and to identify and operationalize specific target behaviors and quantifiable behavior objectives with respect to the problem behavior and replacement behaviors. Without clarity, specificity, and objective accountability, success will be less likely.

The behaviors involved in the contingency management plan are defined operationally and functionally. Operationalizing the target behavior involves describing it in a manner that is directly observable and quantifiable/measurable, not vague or speculative. Defining a target behavior functionally involves defining the behavior by its function—the reinforcer that maintains it. The contingency analysis is not a broad, generalized structurally oriented diagnostic label, but rather an accurate, reliable set of contingency diagrams or contingency statements describing the specific target behavior and the independent variables influencing it. The functional assessment leads scientifically to identification of these variables, and the contingency analysis sums them up concisely.

Once the evocative stimulus and any function-altering stimuli and the consequences (i.e., specific reinforcers) that are maintaining the target behavior are known, the technologist is in a position to develop a constructional strategy and plan that will manipulate the evocative stimuli, function-altering stimuli, and the consequences so that the behavior will change. Where problem behaviors are involved, the goal is to make that problem behavior irrelevant, ineffective, and inefficient (O'Neill et al., 1997).

Box 2. Construct and implement constructional minimally aversive +R-emphasized contingency management plan

In this phase of the project, the contingency management plan is constructed. The plan includes the objectives for the program, the constructional strategy and specific procedures that will be implemented, and any implementation related details or instructions that may be required. The contingency management plan is not a hodge-podge of anecdotally supported intuitions or "hit or miss" "tricks of the trade," or the result of trying just another "tool" from a "tool box" of such tricks. The contingency management plan is an evidence-based application of strategies and procedures well supported in the natural science literature. Utilizing a natural science-based approach makes it far less likely that one will meet with difficulties and hence a supposed need to formulate a more aversive approach. Once the systematically constructed training plan is implemented, the target behavior will be tracked quantitatively throughout the case to ensure objective accountability.

First, consider whether antecedent control alone could provide a resolution to the problem. Preempt/prevent problem behavior by manipulating evocative stimuli, presenting stimuli that prompt replacement behaviors and preventing ones that evoke problem behavior (i.e., management). Manipulate motivating operations, perhaps utilizing noncontingent functional reinforcement (i.e., presenting the reinforcer that maintains the behavior on a random time-based schedule, but not after the target behavior) to eliminate the establishing operation for the target behavior. Manipulate other function-altering stimulation, to promote occurrence of replacement behaviors instead of problem behaviors, addressing variables such as medical conditions, nutrition, physical stimulation, stress-inducing environmental stimulation, and so on, such that problem behaviors are less likely to occur. Whereas this kind of "management" solution, is not necessarily a conditioning solution, it does indeed provide an appropriate solution to the problem in some cases. This is preferable to more involved interventions. This is, however, not always viable.

Where a more invasive contingency management plan is required, utilize all of the above antecedent control measures and complement them with added reinforcement-emphasized postcedent control measures as well. This usually involves a graded differential added reinforcement procedure. Gradually replace the problem behavior with an acceptable alternative

behavior by prompting and additively reinforcing it in the appropriate environment and manipulate that environment to ensure success. Utilize a graded approach by breaking the project into smaller manageable steps, and incrementally and gradually increasing the level of intensity of exposure to problem stimuli such that the subject does not sensitize or exhibit the problem behavior. In addition, it is best to train different components separately, in order to make success more likely. This might involve training replacement behaviors completely outside of the problematic setting to fluency, and then gradually introducing the subject to the problematic setting while manipulating such variables as distance, duration, and distraction. The graded approach should minimize occurrence of the target behavior, allowing for the installment of the replacement behavior in as close to an errorless manner as possible.

The graded approach ensures that as few instances of the target (i.e., problem) behavior occur as possible and in some cases, this can mean that these "errors" never occur. In many cases, the replacement behavior can be completely installed without any such mistakes. However, if the target behavior occurs, it must be extinguished, that is, it must not contact reinforcement if it is to be effectively displaced. These "mistakes" should also, of course, prompt evaluation of what went wrong with the errorless conditioning approach. Extinction is an aversive contingency, but by using a graded approach, manipulating the motivating operations, and installing an acceptable replacement behavior that accesses the same reinforcer early on, the aversiveness is minimized dramatically. Furthermore, while extinction is aversive, it is at least productive, and indeed necessary, should the target behavior be evoked. Extinction involves preventing the target behavior from generating the reinforcer maintaining it (i.e., the functional reinforcer). In some cases, other ongoing stimuli may also contribute to reinforce the behavior. In these cases, while the functional reinforcer is withheld, these other ongoing reinforcers can potentially maintain the behavior through a longer, more protracted, extinction curve. For example, continued social contact may function as a reinforcer in some cases, even if it is not the functional reinforcer in the contingency. This is an ongoing reinforcer, present throughout the session. Where necessary, it can become important to avoid *any* potential reinforcement of the problem behavior, not just the functional reinforcer. In these cases, the ongoing reinforcement is subtracted for a brief period of time contingent on occurrence of the problem behavior as well.

To reiterate, while any and all instances of the target behavior must be extinguished, occurrence of the target behavior should be minimized with a graded (errorless) approach.

Box 3. Analysis of failure: Identify and resolve the cause of inadequate progress

A well-constructed and well-implemented training plan designed to achieve realistic goals will usually be successful. Minor problems and their causes may become obvious, and simple adjustments necessary, as you proceed, but there are many variables involved in replacing problematic behaviors, some of which occur outside of the presence of the technologist. Problems can occur and it is not always easy to identify and rectify them. If the problem behavior occurs, this means it was evoked. Have you misidentified the antecedent–behavior contingency involved and hence the behavior was evoked by a stimulus condition that you did not appreciate was evocative, or did you merely allow contact with the known evocative stimulus? Was a function-altering stimulus or a motivating operation the problem? Do you need to review and adjust the contingency analysis? Do you need to carry out functional analyses to isolate and test potentially functional relations? Do you need to find a solution for ensuring the subject does not contact the evocative stimulus? Is the failure due to unrealistic expectations? Are you requiring too much of a change in behavior too quickly? Are you jumping to new criteria levels before you have conditioned the previous levels to steady-state? Are you failing to maintain minimal distraction, duration, and distance to start or combining these variables too quickly? Is the problem just a matter of needing more time to ensure that you are moving at the subject's pace? Make the necessary adjustments to the plan, including controlling the variables that are causing difficulties. Set the subject up for success!

Exhibiting the behavior means that the subject has to experience an extinction trial, which is best avoided. More important than whether the behavior occurred is whether it accessed reinforcement or not. If the behavior occurred but extinction was in place, at least this will contribute to eliminating the problem behavior. If the behavior accessed reinforcement, this is a much more serious problem. It is vital that if the behavior accesses reinforcement directly or the behavior is dangerous, that the behavior be effectively precluded. If the reinforcer is accessed extrinsically, can be controlled, and it is not dangerous, then it must be extinguished every single time. Failing to prevent contact with the functional reinforcer every single time the behavior occurs essentially puts the behavior on a sparse variable ratio schedule, which may make it much more resistant to extinction. Furthermore, extinction generates topographic variability and usually an increase in the intensity of the behavior. In this way, failed extinction can shape a much worse problem than the original behavior. The situation must be carefully evaluated and specific plans made to ensure extinction for *every single* occurrence of the target behavior. That is, of course, only if the errorless approach breaks down.

Make sure that the client fully comprehends how to manage the environment in such a way that the target behavior is unlikely and where appropriate, that replacement behaviors are likely. Also make sure that the client reacts appropriately to breakdowns in the errorless approach and occurrence of the target behavior. Make sure they are not reinforcing the problem behavior at all! Explain the risks associated with sparsely scheduled reinforcement of problem behaviors and help them find ways to prevent reinforcement of the behavior. If they have been instructed merely to avoid all instances of the subject contacting problem evocative stimuli, ensure that they have been doing so effectively. If the contingency analysis generated through the functional assessment is incomplete or inaccurate, go back and resolve that deficiency, so that the problem stimulation is clearly identified. Question clients about other aspects the subject's daily routine to ensure that the subject is not training under stress or emotional arousal (i.e., under motivating conditions that make problem behaviors more likely than replacement behaviors). Have the client demonstrate the training they have been implementing and remediate where necessary. Reconsider what they are capable and incapable of working on between consultations. Ensure that they are not engaging in appropriate training procedures during "training sessions" but then inadvertently counter-conditioning that training in "everyday life." Take whatever actions are necessary to ensure that the client is implementing the proper training at all times.

Finally, evaluate other implementation related practices and variables. This evaluation process is not a cursory "technicality" in which you recognize only obvious mistakes. If everything is being done right, then you *should* be achieving success. If problem behaviors are being exhibited regularly or the target replacement behavior is not coming along smoothly, then something is wrong. This is your opportunity to identify that problem and resolve it, rather than resort to more aversive methods and tools. Aversive methods will not identify and resolve the problem for you—they may only hide it temporarily.

Consider either the possibility that you may have misidentified the actual functional reinforcer involved or the motivating operations establishing the value of the reinforcer. It is a common mistake to fail to recognize function-altering stimulation that sets the context in which the behavior occurs, including motivating operations. Is being "hungry" a necessary part of the problem? If so, feed the dog more regularly and eliminate that motivating operation.

There are many moving parts in a contingency management plan and many of them can derail smooth progress. Are there unrecognized sources of distraction? Are there concurrent contingencies operating on the contingency of concern? Are motivating operations being managed effectively for the target and replacement behavior? Is the intensity of exposure to the evocative stimulus being managed carefully enough? Are the reinforcers being delivered contingently and contiguously? Is the response effort for the replacement behavior lower than that of the target behavior?

Consider all of these and other components of the plan and its implementation to find and resolve any deficiencies that may be standing in the way of progress. Contingency management can be complex in the real world, largely because of the dynamic nature of the environment and the variables that influence conditioning. When a well-constructed plan falls short, this is largely where it does so. It can be a challenge to identify the implementation-related problems. If you have achieved some success, analyze to what this success is attributable. What differs in that situation as opposed to when the problem behavior occurs? Often, video recording the sessions can help you analyze the problem and your approach. Consulting a colleague can also be helpful, as well as provide a fresh perspective on the training plan and its implementation.

Box 4. Escalate efforts to identify and resolve the cause of inadequate progress

If your progress continues to fall short of what should be a reasonable expectation for change, despite your efforts to clearly define the problem evocative stimuli and arrange the environment to prevent contact with them, it is time to take more arduous steps in identifying and resolving the problems. Notice that what this stage justifies is not an increase in aversiveness but rather an increase in response effort associated with identifying and resolving the impediments to training.

Start by recommending a full veterinary examination, including blood work that might identify a medical problem (i.e., a disease process or injury) that might contribute to the problems with training. Various medical problems, ranging from simple localized pain due to a minor injury all the way to serious systematic disease processes, can interfere with training. Proceed with the contingency management plan once the veterinarian has identified and resolved the problem or states that they can find no problem. If you need to work around any particular medical issues, consult with the veterinarian on what to avoid when working with the subject.

Refer to authoritative sources such as articles, books, or videos describing the proper application of the procedures in question. Consult a colleague with relevant proficiencies. A fresh perspective, particularly if the colleague can observe you work with the procedure, either in person or on video, can reveal problems that would have continued to stymie the project and they can provide suggestions to get your plan back on track. Another option is to seek supervision for the case. This option has the added benefit of helping you develop your own formal proficiencies. It is also an excellent way to meet your training objectives, promote your professional development, and broaden your skill sets. It might even qualify for continuing education credits.

If these options are unavailable and you are otherwise still unable to identify the problem, you should consider referring the case to a behaviorologist or technologist with specific proficiencies related to the issues involved in the case. The Association of Animal Behavior Professionals[2] is a useful resource, particularly as certified members are behaviorologically oriented and specifically dedicated to using added reinforcement-emphasized methods. Referring the case to a certified member of the International Association of Animal Behavior Consultants[3] is another option. It is not a "moral failing" to lack proficiency in certain skill sets; recognizing and acknowledging a lacking in specific proficiencies is laudable when it is followed up with a referral to a professional with the required skills.

If you have diligently reevaluated the case and researched authoritative sources; if consultation, supervision, or referral are ineffective or not viable options; and the plan is still not sufficiently effective, you should consider finding a different kind of solution. You can consider selecting different procedures or a different combination of procedures or you may choose a different replacement behavior. Consider just how important the objective is to the subject and client. Perhaps it is worth simply living with this "problem."

If a replacement behavior is vital to the subject's quality of life, it is time to consider escalation. However, the escalation is not in the

[2] www.associationofanimalbehaviorprofessionals.com
[3] www.iaabc.org

aversiveness of the stimulation used in contingency management but an escalation in the effort, time, and resources expended to achieve success. Consider supervising the client's training behaviors more closely, perhaps being present for *all* training sessions and increasing the frequency of supervised training. This will help ensure that the client is well coached, more proficient, and not sabotaging the training plan with their lack of experience. You might consider offering a discount, making this option more affordable in general, or providing extra training time on a *pro bono* basis. You might also consider arranging for a board-and-train service so that a professional can train the subject, and once you or a colleague has trained the subject, you or your colleague can coach the client on how to maintain the training. These options are more arduous for various reasons, but are worth considering if you have legitimately reached Box 4. It is extremely rare for a professional technologist to reach Box 4, let alone have to move to Box 5.

Does failure constitute an unmanageable and unacceptable safety risk?

Is the problem behavior an unmanageable and unacceptable safety risk? If you have reached the stage where you cannot achieve your goals after careful reevaluation of every component of the case, colleagues and authoritative sources have not been able to help sufficiently, you cannot refer the client to a competent professional with specific skill sets that would make success more likely, and you are simply stymied, you need to consider just how important the goal is before proceeding to construct a more invasive contingency management plan.

Any time you consider implementing any aversive methods, be they mild, such as simple extinction for behaviors maintained by added reinforcement, or intense, such as shocking a dog for exhibiting the target problem behavior, you need to weigh the likely benefits against the likely risks. The question at this stage is, "Does the problem behavior impose an unmanageable and unacceptable safety risk?" By "unacceptable safety risk," we mean, "Is the behavior likely to cause significant harm to anyone at all, including the subject?" The more likely the harm and the greater the degree of harm that is likely, the more likely the question ought to evoke a "yes" answer. If the behavior is not particularly risky in this regard, the technologist and client should continue to attempt to find a solution in Box 4, but if this is not possible, they can make other environmental adjustments to mitigate the effects of the problem behavior and "live with it." If the unacceptable safety risk is also unmanageable, then the problem is dire. "Unmanageable" refers to the inability to find an acceptable means of preventing the problem behavior itself or the resulting harm. Usually, one can adjust routines, practices, or physical elements of the environment that will prevent or mitigate the behavior or resulting harm.

Problems raised in the literature as examples of supremely important and justifying aversive stimulation are car chasing or digging under fences out of the yard to chase deer. Indeed, these are both high-risk behaviors. However, neither is unmanageable as has been suggested. Keeping the dog indoors, or on leash when outdoors, or putting patio pavers along the fence perimeter to prevent digging out are reasonable solutions that cause minimal harm. Such problems as these require revisiting Box 4 and continued attempts to find the problem and a solution. Box 5 is not for such problems; it is for dangerous problems that cannot be adequately prevented.

The best solutions are not always conditioning solutions. Sometimes, the least invasive approach is antecedent control measures, what has been referred to as "management." People often make restrictive assumptions about what can and cannot be manipulated to prevent or mitigate the behavior. It may indeed be less expensive for someone to buy an invisible fence shock collar system than to have a physical fence erected, but this is likely to cause significant and intractable problematic side effects (see Polsky, 2000). It is important to weigh the alternatives. The riskier the behavior, the more invasive may be the restrictions or management of the environment. Some dogs simply may not be allowed off leash in public or it may be necessary to not even walk the dog in close proximity to others. The dog may have to wear a muzzle. Is the solution more or less likely

to be more harmful than the problem behavior and is there a less restrictive solution? These are important questions, which illustrate the idea of balancing likely risks and benefits rather than simply invoking simplistic all-or-none solutions. The technologist must consider the impact of management on the subject and the risk involved. Some restrictions or management solutions may be so invasive and create such a negative impact on the subject's life that the behavior must be considered as unmanageable, but this must be a carefully made decision.

Box 5. Complete review and consider supplements/medications

If you have legitimately reached Box 5, you have failed to diligently implement a successful contingency management plan to resolve an unmanageable problem behavior that poses an unacceptable safety risk and you have failed all other diligent attempts to identify the cause for your difficulties through all of the means discussed in the previous boxes. Your available options are narrowing dramatically. It is time for a complete review from the ground up. This is your last chance to find and resolve the problem or to find an acceptable workaround management solution to mitigate the potential harm that could result from the problem behavior. Once you have completed a full review of the case, implement any adjustments that this review generated.

If your full review and reevaluation has not generated results that will assure everyone's safety, it is time to consider some solutions that are more invasive but may provide a productive solution.

Consider consulting with a veterinarian about the possibility of using nutritional supplements (e.g., 5-HTP), medications, or even *minor* surgical interventions that might make the unmanageable and unacceptable safety risk more manageable and/or acceptable, if not ideal. The extent of intrusiveness must be weighed against the necessity of achieving the goal in the case at hand. A more intrusive solution may be justified for cases where the behavior is unmanageably and unacceptably risky, and less intrusive interventions have been exhausted. For instance, perhaps a 5-HTP supplement or a selective serotonin reuptake inhibitor medication can allow you to get a "foot in the door" with your contingency management plan that was just not possible before. These are not sedative options and usually result in few if any problematic side effects. More invasive medications exist of course; the client and their veterinarian should consider the potential risks. Again, these options are not to be considered made lightly.

In some cases, rehoming the subject is a safe alternative to proceeding to a highly intrusive contingency management plan. Often the antecedent stimulus is simply not present outside of the current arrangement or otherwise can be avoided in another home. A common example involves dogs who exhibit aggressive behaviors toward children. A safe alternative may be to move the dog to a home where they will have no contact with children. Rehoming can be stressful in itself, so it must be weighed against other alternatives. This is not a decision to be taken lightly, but it should be retained as an option worth discussing in some dire cases. In reality, this option is rarely realistic because of the risks involved and paucity of homes available for companion animals who exhibit serious problem behaviors.

These solutions are indeed less desirable than arranging the contingencies in a constructional manner in order to install an acceptable replacement behavior where once there was a problem behavior. But, where there is a significant safety risk involved and you cannot find a less invasive solution then the more invasive solution becomes justifiable, as unfortunate as it may be. Just be sure that you have diligently exhausted less intrusive options first!

Box 6. Emergency: Consider more aversive procedures

If you have legitimately reached Box 6, you have failed to diligently implement a successful contingency management plan to resolve an unmanageable problem behavior that poses an unacceptable safety risk and you have failed in all other diligent attempts to identify the cause of the problem through all of the means discussed in the previous boxes, and supplementation/medication or rehoming are not viable. Your available options are narrowed

even further. It should be extremely rare for a technologist to legitimately reach a Box 6 dilemma. Assuming you have been diligent and still reached Box 6, the problem is extremely dangerous and intractable. This is a highly unusual emergency! The only remaining potential solution is a contingency management plan that involves procedures that are likely to be productive but are also more aversive. This is not to say that these methods are generally more effective or that they will be effective in any given case. However, they remain the only potential solution. For example, in an escape related case, if a differential reinforcement-like procedure (+R for replacement behaviors) has failed, perhaps because of the weaker and contrived added reinforcer being used, then a differential subtracted reinforcement procedure, using the more powerful intrinsic functional reinforcer will be more successful.[4]

Intensely aversive procedures should only be constructed by professionals who are proficient in doing so and should be performed and supervised or reviewed by professionals proficient in their application, as well. Proficiency does not mean a cursory familiarity or self-study, under most circumstances, but a true proficiency—one developed through appropriate consultation, formal education, and/or supervision by proficient instructors and supervisors. The thing about proficiency is that one does not always know the full scope of what one does not know; a professional lacking proficiency is sometimes not aware of the extent of their lacking in a particular skill set, which is why formal instruction is important. Again, although "lack of proficiency" may have a negative connotation in common usage of the phrase, professionally speaking, we all have various levels of proficiency in various knowledge and skill sets. Quite frankly, there is rarely (if ever any) use for proficiencies in implementing intensely aversive procedures where there *are* proficiencies in implementing added reinforcement-emphasized procedures. We cannot all be maximally proficient in all areas. Recognizing and addressing our lack of proficiency in a particular skill set is best reinforced; it is not a "moral failing." If the technologist is not adequately proficient to construct and implement a more aversive intervention, they should refer the case to a colleague who is. Nevertheless, whether a referral is possible or not, a professional who lacks these specific proficiencies must *not* undertake the task. Supervision or peer review can help you evaluate your proficiency level.

Even where the professional is proficient in constructing and implementing a highly intrusive intervention, they should seek either formal supervision or peer review in the case. Supervision involves having a professional who is more proficient in that particular skill set take responsibility for the decisions of the case and approve your actions in implementing it. Typically, you consult with your supervisor between sessions to review the data, your actions, and what you want to do next. Your supervisor helps ensure you provide the best possible service. This may be done via video conferencing, phone, or even email, where feasible, as long as it allows for effective supervision. This also helps you develop your proficiencies for future cases. Peer review (i.e., "consultation") involves having a competent colleague review your plans and the results on an ongoing basis with you, throughout the process as required. They will provide a "reality check" and a critical eye to help ensure that you are doing the right thing. In this relationship, you remain responsible for the case, although you take the peer review seriously. No highly intrusive intervention should proceed without supervision or peer review/consultation, or, where appropriate, ethics committee review and oversight. This may seem restrictive, but these checks and balances help ensure the subject is receiving the best possible service, which is good for them, the client, the professional, and the profession as a whole.

[4] Note that while a graded subtracted reinforcement procedure is aversive and certainly not the least aversive procedure available for escape cases, if carefully planned and executed in a constructional and graded manner, it is not generally *extremely* aversive either. It is raised here as an option not because subtracted reinforcement is only justified in Box 6 cases but to highlight it as an incremental up-step in aversiveness from a differential reinforcement-like procedure that makes use of added reinforcement for replacement behaviors.

The criteria for effective punishment of a problem behavior including contingency, contiguity, intensity, sufficient introductory level of intensity, control of reinforcers, and manipulation of reinforcer deprivation (Chance, 2009, pp. 210-217), or subtracted reinforcement of a replacement behavior must be carefully observed. I will not elaborate here on the criteria, as professionals proficient in their application should be fluent with them and it would require far more space than is available to address the topic properly here. Meeting these criteria is not always possible, and mistakes are common. Furthermore, it is important to remember that side effects are an intrinsic component of utilizing intensely aversive stimulation, common even in highly controlled laboratory settings and they cannot be completely mitigated.

If one has been truly diligent and still arrives at Box 6 (highly unlikely), then this is a dangerous emergency. Even though intensely aversive procedures are not expected to be more effective than added reinforcement-emphasized methods, they are some of the few options left. If they happen to be effective in resolving the problem behavior in any particular case, then they have literally saved the subject's life. Side effects can then be assessed and a separate contingency management plan constructed to help resolve them and improve the subject's quality of life. Always select and implement the *least* aversive procedure possible, even once you feel justified in introducing aversive methods. For example, consider a graded and constructional differential subtracted reinforcement of a replacement behavior before considering an added punishment-based procedure.

Once the highly intrusive intervention is carefully designed, review or supervision is in place, and all agree the intervention is necessary, considering the behavior and goals in question, it can be implemented. Only professionals proficient in designing and implementing intensely aversive contingency management plans should carry out the program. This is not something you can generally expect a client to perform, except in certain situations (e.g., where they are carrying out only a small and relatively risk-free component of the program and they demonstrate that they can carry it out properly). The behavior must, as always, be tracked quantitatively throughout the process, so that the effects of the intervention on the level and trend of the behavior can be known and success objectively judged. If the plan is designed and implemented well, the strength of the problem behavior should quickly decline to an acceptable level. Once an intensely aversive plan is implemented and it is determined to be initially successful, the technologist should transition to a less invasive and more added reinforcement-emphasized set of controls, in order to fill the suppression void left by some aversive methods.

Plans must then be made to rehabilitate the harm caused by the intensely aversive methods. This must not be neglected. A full evaluation should take place post-intervention to determine the behavioral side effects that have been generated by the invasive procedures and plans should be made to rehabilitate them.

If the goal is not quickly achieved, move to Box 7.

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