The least intrusive effective behavior intervention (LIEBI) algorithm and levels of intrusiveness table: a proposed best-practices model. Version 5.0

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Introduction

There is very little published in the animal behavior consulting literature that directly addresses the topic of how professional trainers and technologists should decide whether or not to use aversive stimulation, and under what circumstances any particular level of aversiveness is justified. This is surprising, considering how important the topic is and how much it is discussed and debated among professionals. Here, I will propose a best-practices model, including a decision-making algorithm and a levels of intrusiveness table, regarding the use of aversive stimulation. I will discuss in detail how to work through the decision-making process. This process will be referred to as the Least Intrusive Effective Behavior Intervention (LIEBI) model. There are widely differing opinions on the topic. While recognizing that there may be instances when aversive stimulation is called for, this particular algorithm will emphasize how to implement the least intrusive but still effective intervention possible and, when a more intrusive intervention is required, how to ensure that the decision and implementation are carried out with due professional diligence. It also establishes what I will call a red zone that identifies practices that indicate an extremely high degree of invasiveness and which ought to be avoided except under the most dire and extreme of circumstances—so extreme that most technologists should likely never have a case justifying it. The whole point of this model is to help professionals avoid getting to the red zone.

The LIEBI Model can be found online through the Association of Animal Behavior Professionals, linked to throughout the Professional Practices Guidelines:

http://www.associationofanimalbehaviorprofessionals.com/guidelines.html

Preliminary Concepts

It is important to avoid dogmatic positions when discussing what level of intrusiveness in behavior change programming is justified under what circumstances. An argument regarding whether to use aversive stimuli should recognize some initial assumptions, which I will discuss here in order to help us avoid an excessively simplistic treatment of the topic, something all too common. Questions such as whether to use aversive stimulation, under what conditions, and how to choose what form it will take in a behavior change program are always about weighing the likely benefits and the likely risks of the intervention in question, in the context which it resides. This decision requires recognizing that intrusiveness can be thought of as occupying positions on a continuum from mildly intense and unlikely to result in harm to highly intense and much more likely to result in harm. In the weighing process, it is important to remember that, because we are committed to "do no harm," we are ethically obliged to ensure we choose the options that are the least intrusive possible.

An aversive stimulus is any event that functions (a) antecedently to evoke behavior that has reduced or terminated it in the past, (b) consequentially as a punisher if presented immediately following a behavior, or (c) consequentially as a reinforcer when withdrawn immediately after a behavior (Cooper, Heron & Heward, 2007). The term is sometimes used synonymously with punisher (Miltenberger, 2008) or with negative reinforcer (Vargas, 2013; Chance 2009) but these are just more narrow uses of the comprehensive, verifiable and unambiguous definition above. We cannot be sure ahead of time what will function as an aversive stimulus because it has not yet occurred but it can usually be predicted fairly well, just as well as what we predict to be a punisher or reinforcer in fact and of course it can then be verified. As Vargas (2013, p. 341) puts it, "The only way to be sure about the effect of a stimulus in a particular situation is to make it contingent on behavior. If behavior is strengthened when it is removed, you have an aversive stimulus." And, this goes for other basic principles of behavior as well. So in summery, if a stimulus evokes escape behavior, its withdrawal reinforces a behavior or its presentation punishes a behavior, then it is an aversive stimulus. Whether stimulation is aversive or not is an all-or-none phenomenon and can be readily verified.

Whereas aversiveness refers to the subject's response to stimulation, intrusiveness is simply another perspective on this same functional relation emphasizing the technologist's intervention process and how aversive it is expected to be or turns out to be. Intrusiveness of an intervention corresponds to the intensity or magnitude of the procedure. We are often compelled by contingencies to refer to the *level* of aversiv*eness* of a stimulus. The magnitude of an averser can usually quite simply be determined by the measurement of the magnitude of the stimulation. For instance, the shock may be measured by the volts and the leash check or striking by the force applied. Alternatively, just as we can determine whether a stimulus is aversive or not experimentally, we can also determine whether one stimulus is more or less aversive than another experimentally by how the rates of behavior are changed in their presence. For example, simple titration design experiments can determine the relative evocative strength of two antecedent stimuli and in this context aversive contingencies can be compared and ranked. Predicting how aversive a procedure will be ahead of time without such experimentation is not always precise because the aversiveness of the procedure relies not only on the procedure itself but also the subject's response to it at any given time. This challenge will not stop us from recognizing the obvious fact that some procedures are clearly more aversive than others. For instance, turning your car's steering wheel on a curve in the highway, you are barely aware of the aversive stimulation that evokes your wheel turning behavior and in some cases you are completely unaware of it. On the other hand, if someone puts a shock collar around your neck and activates it, eliciting various extremely unpleasant emotional responses and evoking escape behavior and problem respondent associations with the collar and the person activating it etc. then you are quite aware of that event. Aversiveness could be measured physiologically by determining levels of certain chemicals in the bloodstream (i.e., emotional behaviors) or more accessibly by identifying how strongly the functional relations are and the relative changes in responding. These will all be estimates or approximations of aversiveness. Intrusiveness might also be defined for our use by the degree to which a procedure impacts a subject negatively in one way or another. Generally, the more problematic the side effects an intervention is likely to generate (e.g., injury, generalized problematic emotional behavior, increased aggressive behaviors, apathy or generalized behavioral suppression, countercontrol etc.), the more intrusive the intervention would be considered. The LIEBI model is open to any of several measures of harm or intrusiveness. I will leave further exploration of this topic for elsewhere. But again, for now, it is plainly obvious that some interventions are more or less intrusive than others and how we objectively measure just how aversive something is ought not stand in our way of providing ethical guidance on the use of various strategies that are putatively clearly of varying degrees of intrusiveness.

The term Least Intrusive Effective Behavior Intervention may be new, but the principle is not. It has been known for 40 years (Bailey & Burch, 2005) by a few names, including the "Least Intrusive Behavior Intervention" (LIBI), or "Least Restrictive Environment" (LRE) in behavior analysis. The term is not as important as the principle involved.

The Ethics of Effectiveness and Minimal Intrusion: Why We Consider This Issue

Interventions are judged not only by how effective they are narrowly in terms of the impact of the intervention on the target behavior, but also in a broader ethical context of the impact on the individual as a whole and, to a lesser extent, even on the guardian, the professional and the field as a whole. Obviously, effectiveness is an important feature of an intervention, but if we make effectiveness the only criterion by which we determine the appropriateness of an intervention, we risk failing to consider some other ethical objectives.

Friedman (2009) makes the very important observation that effectiveness of an intervention is insufficient as a criterion for the use of aversive stimulation. It is widely agreed upon among those from a wide variety of philosophical orientations that treating others in an invasive or highly intrusive manner, where it is unnecessary to do so, is morally problematic. We recognize ethically that the autonomy and dignity of others deserves respect. It is a cornerstone ethical principle in the helping professions that we implement the least intrusive intervention available. We are ethically obliged to construct interventions that are not only effective but also minimally intrusive. It is better to explicitly acknowledge and ground our discussion in ethics rather than ignore the reason we explore this topic to begin with.

The companion animals we deal with in our profession are vulnerable parties in the professional relationship we establish with them and their guardian, much like young children are in counseling relationships between a psychologist, a child and their parents. Companion animals cannot provide informed consent regarding the interventions that we choose to implement for them. Therefore, the responsible technologist ought to be dedicated to ensuring that the interests of the companion animal are carefully considered and that the animal is accorded respect for their dignity by intervening in a minimally intrusive manner (Association of Animal Behavior Professionals, 2008, principle 2.02; Behavior Analyst Certification Board, 2004, guideline 4.07). An effective behavior change program that helps the companion animal build their repertoire of adaptive behaviors is in the animal's interest, but effectiveness is not enough.

Aversive stimulation produces well-known side effects (see Sidman, 2000, for a general overview) that may influence the target behavior but can also cause serious secondary problems that may not be considered if one looks at the level and trend of the target behavior alone. Any question about the effectiveness of aversive stimulation must also look at the broader effects on the individual. In this regard, I (O'Heare, 2007, pp. 261–265) have argued that harsh punitive interventions do not "work" in this broader context.

Why Implement the LIEBI Model?

Why should we conduct ourselves in accordance with the LIEBI model? After all, it clearly requires a higher response effort than not using such a process. As with all behaviors, we look for the reinforcement made available for it. The LIEBI model is proposed as a "best practice" because of its careful attention to ethical responsibility. Delaying an immediate impulsive payoff in favor of a much higher long-term payoff is sometimes called wisdom (Chance, 2009). Considerately working through the process of finding the least intrusive effective intervention is a wise choice, partly because it avoids excess side effects associated with highly intrusive methods, which influence both the target behavior and the general behavioral wellbeing of the subject as a whole. If you avoid the side effects associated with aversive stimulation, these side effects will not be able to interfere with your goals. You also access a sense of professional ethical pride because you are treating others with respect for their autonomy, dignity and moral rights. Choosing to adopt a professional policy of working through the LIEBI model outlined here, rather than using a less stringent process, is beneficial for the companion animal, the client, the individual professional and the profession as a whole. The companion animal benefits from the standard by experiencing a higher degree of comfort and behavioral wellbeing, learning acceptable adaptive behaviors that ultimately promote a more adaptive social relationship within the family. The guardian benefits from the standard by avoiding having to deal with the well-known side effects that commonly occur with the use of highly intrusive methods, and they will achieve their goals in an orderly manner. The individual professional benefits with stronger success rates, reduced risk of injury and liability exposure, and the respect and trust of colleagues and allied professionals. The profession as a whole 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

adopting all best practices and high-standard ethical guidelines. Adopting a high standard of ethical conduct, including a dedication to implementing the LIEBI or similar model, benefits us more in the long run than failure to adopt such a practice.

Key Features of the LIEBI Model

The most prominent discussion of this topic I am familiar with outside of my own (O'Heare, 2007, pp. 307–311) is in the Delta Society's (2001) booklet, Professional Standards for Dog Trainers: Effective, Humane Principles, which outlines an algorithm to help dog trainers decide when to use aversive training methods. The model presented here has some similarities with the Delta Society algorithm but it is also unique. It is unique in that its focus is behaviorological. As well, it more strongly emphasizes avoiding implementation of highly intrusive interventions by diligently attempting to find less intrusive solutions and, when needed, ensuring that the decision-making process is carried out responsibly. It emphasizes tracking the target behavior quantifiably, and "success" will emphasize meeting objective, quantified goals with minimal side effect harm. Failure to achieve the goals leads first to careful reevaluation of the goals, the contingency analysis, application-related variables, the procedure choice and the objectives. Only upon careful reevaluation and consideration of other, less intrusive options is consideration of a more intrusive approach justified. Furthermore, rather than treating intrusiveness as just an all-or-none phenomenon, the LIEBI model recognizes a continuum of intrusiveness, even if we can only present this as a general approximation. A proficient technologist should be able to work their way through cases in this manner, avoiding almost all use of highly intrusive interventions in their behavior change programs.

The basic process is similar whether you are training a new behavior or attempting to reduce the strength of a problem behavior. Strengthening a behavior deficiency refers most commonly to increasing the rate of the behavior, bringing it under stimulus control (Chance, 2009, p. 130). In most cases, eliminating a problem behavior involves replacing it with a more acceptable behavior, by making the discriminative stimulus that sets the occasion for the problem behavior come to set the occasion for the new, desirable behavior. In either case, you are changing the strength of certain specific behaviors in certain environments. The flow chart in Figure 1 depicts this process.

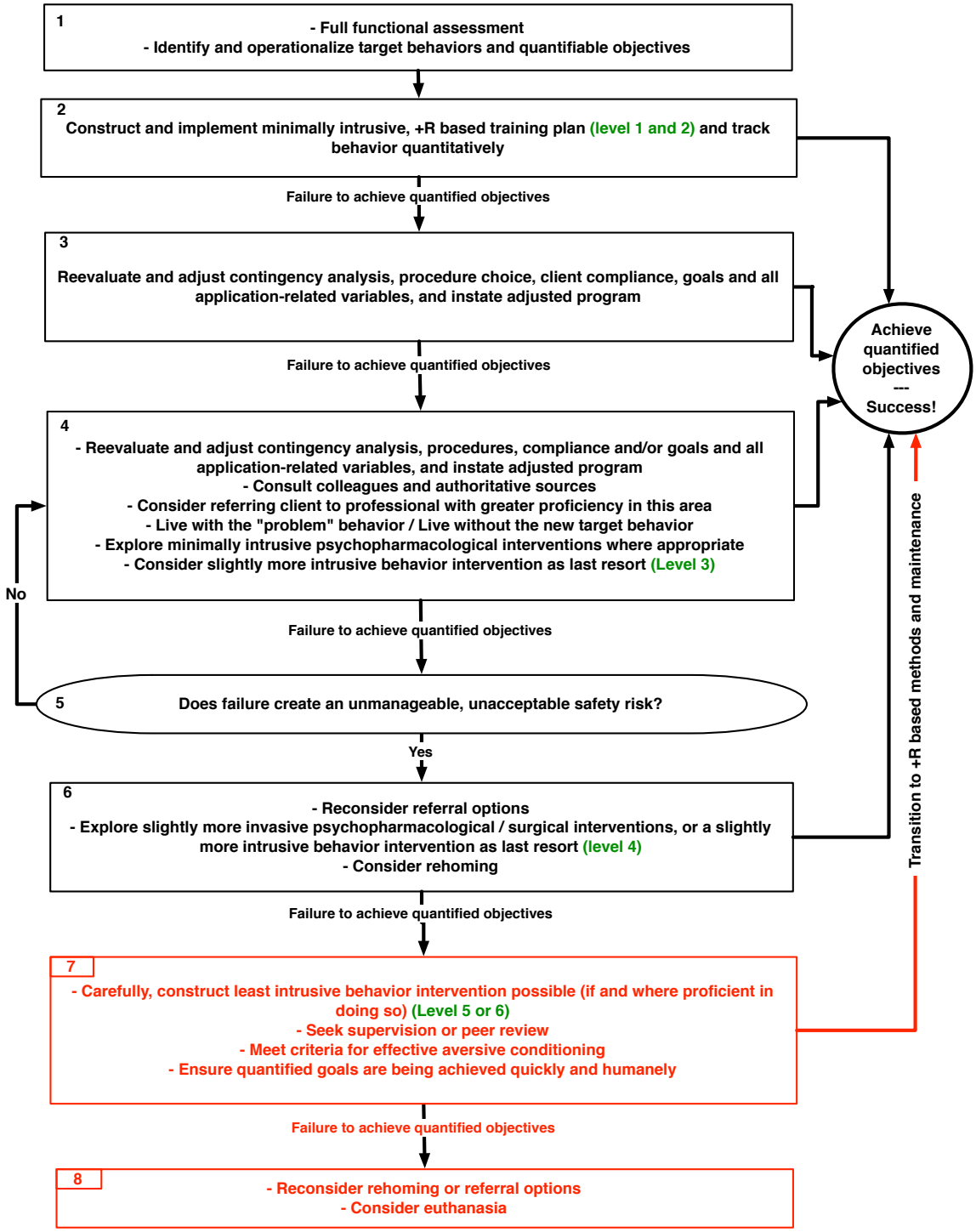

Figure 1. Algorithm for protocols in determining when to implement intrusive behavior interventions with a behavior reduction component.

Box 1 Any behavior change project should begin with a full functional assessment including identification of all relevant contingencies involved. This may include simply a contingency for a target behavior and a contingency for what other behavior might be performed otherwise in that situation, or it may include several competing multiple-term contingencies ranked by their influence over the subject's behavior as well as the contingency analysis for replacement behaviors. The functional assessment should include full

interviewing, direct observation and where appropriate, functional analysis trials. Do not proceed with a behavior change program until you have developed a high level of confidence in your contingency analysis developed through your functional assessment. When formulating a behavior change plan, identify and operationalize target behaviors and quantifiable objectives. Whether you are simply training a new behavior or resolving a problem behavior, the first step after your functional assessment is to identify and operationalize specific target behaviors and quantifiable behavior objectives. Without clarity, specificity and objective accountability, success will be less likely. The target behavior must be operationalized (i.e., described in a manner that is directly observable and quantifiable/measurable), not vague or speculative. Reference to supposed traits (e.g., "dominance") or general patterns of behavior (e.g., "separation anxiety" or "aggression") are unacceptable. Behavior change programming is an evidence-based endeavor, where scientific research methods are applied to describing and changing specific behaviors. As in all scientific approaches, reliable quantification of the dependent and independent variables is necessary.

Box 2. Design a constructive behavior change program. In this phase of the project, the behavior change program is constructed, including the basic strategy and the procedures to be implemented, and the objectives for the program are established. The behavior change program is based on the contingency analysis that was generated through a proper functional assessment. The contingency analysis is not a broad, generalized diagnostic label, but rather an accurate, reliable set of contingency diagrams 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 we know the discriminative stimulus and any function-altering stimuli contributing to motivation and the consequences (i.e., specific reinforcers) that are maintaining the target behavior, we are in a position to develop a strategy and plan that will manipulate the discriminative stimuli, function-altering stimuli and the consequences so that the behavior will change. Where problem behaviors are involved, our goal is to make that problem behavior irrelevant, ineffective and inefficient (O'Neill et al., 1997). The behavior change program is not a hodge-podge of anecdotally supported intuitions and "hit or miss" "tricks of the trade" but rather an evidence-based application of strategies and procedures well supported in the behaviorological literature. Utilizing a science-based approach makes it far less likely that one will meet with failure and hence a supposed need to formulate a more intrusive approach. A high degree of proficiency is our best defense against increasing intrusiveness. For instance, if we hypothesize that, in a particular instance, a dog barks (or parrot screams, or cat scratches) when his or her guardian is on the phone and this behavior has historically and reliably resulted in social attention, then we can employ a constructive strategy rather than an eliminative strategy (increasing the animal's repertoire rather than decreasing it; see Delprato, 1981; Goldiamond, 2002) and design a positive reinforcement procedure that gradually reinforces approximations of sitting quietly as a reasonable, minimally intrusive alternative contingency. Where an emotional response motivates problem operants, the problem emotional response can be changed via respondent conditioning procedures such as systematic desensitization. Plans should also be made for how to generalize the new behaviors in various environments. Once the systematically constructed behavior change program is implemented, the target behavior that was being tracked quantitatively through the functional assessment process continues to be tracked. Consider implementation of the behavior change program as a further test of the hypothesized contingency statement. At this stage, interventions are positive reinforcement based corresponding to level 1 and 2 in Table 1.

Box 3. Reevaluate. A well-constructed and well-implemented behavior change program meant to achieve realistic goals will usually be successful, but even well designed programs can sometimes fail to achieve success. If the quantified goal is not achieved, it is time to critically examine all of the components of the functional assessment, behavior change program or training plan and its application. Much behavior-environment interaction is complex, and there are many variables involved in effectively changing problem behaviors. This reevaluation process is not to be a cursory "technicality" in which you recognize only obvious mistakes. If everything is accurate and reasonable, then you should be achieving success (perhaps not at an acceptable rate). If you are not meeting your goals, there is a problem with what has been done so far. This is your opportunity to identify that problem and fix it rather than resort to more aversive methods and tools.

You should have proceeded with the functional assessment to the point of being confident in the accuracy of the contingency analysis it generates. Sometimes this can be achieved with interviewing and direct

observation. But sometimes our confidence turns out to be misplaced. Consider the possibility that the contingency analysis is inaccurate or incomplete. Most real world situations involve multiple contributing contingencies prevailing over the organism. You may have failed to identify some sources of reinforcement for instance or you may have ranked the concurrent contingencies incorrectly. If you did not proceed as far as you could have in the assessment, you should now go back and carry out these tasks. Ideally, you should proceed far enough in your functional assessment to avoid such inaccuracies. For instance, if you did not perform a functional analysis (i.e., experimental testing of the causal relationship between a behavior and its antecedent stimuli and/or consequences) and relied only on the interview and direct observation data (i.e., tracking target behavior to identify a correlation between it and its antecedents and consequences), you will likely want to complete the functional analysis to confirm or refute the accuracy of the contingency analyses experimentally (O'Neill et al., 1997, pp. 54–64). Sometimes, we use the intervention as a functional analysis test. If the tentative hypothesis is demonstrated to be incorrect, it is time to adjust and retest it. The following are some further ideas for reevaluation (but this is not an exhaustive list).

- Are the objectives realistic?
- Are the procedures chosen to address the target behavior appropriate in the situation?
- Have you addressed antecedent conditions adequately? Many professionals focus on consequences and fail to appreciate the importance of antecedent conditions.
- Assuming the client is carrying out some part of the program, are they performing the procedures correctly and responding to variations appropriately?

Application-related variables include many things. This is where you are looking at all the nitty-gritty details, including examination of the following.

- Deliverability of reinforcer
- Contingency and contiguity of delivery
- Size of approximations
- Fluency of prerequisite skills
- Fidelity of extinction component
- Response effort and competing reinforcers
- Naturalness of reinforcer
- Effectiveness and magnitude of reinforcer for desirable behavior versus problem behavior.
- Schedule of reinforcement and pace at which they are changed

Remember, competing reinforcers are always available. Your goal is to ensure that you are controlling the reinforcers available for each behavior and that the relative value of each reinforcer is such that the subject will exhibit the desirable behavior rather than the undesirable behavior.

Many variables influence the strength of conditioning and what is actually being conditioned. Identify the variables that can influence the conditioning you are working on and any other conditions that may not have been considered. Training can be complex in the real world, largely because of the dynamic nature of the environment and the variables influencing conditioning. When a well-constructed program based on an accurate contingency analysis fails, this is largely where it does so. Identifying the application-related problems that are resulting in failures can be challenging. If you have achieved some success, look to why that has succeeded and other components have not for clues as to which criteria are not being adequately met. Often, video recording the training in its environment can help you better critique the problem and your approach. Consulting a colleague can be helpful for a fresh perspective.

Box 4. If the intervention has not been sufficiently effective to this point, reconsider how diligent you were with previous steps. If you have not been sufficiently effective in your intervention and reevaluation of it, it would be tempting to increase the intrusiveness of the intervention at this stage. However, instead of resorting to this option right away, it would be better to refer to authoritative sources or consult a colleague with specific proficiencies that may help you avoid having to increase the intrusiveness of your program. Often, a fresh perspective is what is called for to identify problem areas and ways around them. Another option is to seek supervision on the case, which has the added benefit of helping you develop your own formal proficiencies. This is an excellent way to meet your objectives with this intervention and also to promote your own professional development and broaden your skill sets. If you have been making some progress but it is slow, consider accepting the fact that it will simply take longer to achieve your goals.

If these options are unavailable or you are otherwise still not able to identify the problem, you should consider referring the case to a professional with specific proficiencies related to the issues involved in the case. The Association of Animal Behavior Professionals (www.associationofanimalbehaviorprofessionals.com) is a useful resource in this regard since certified members are behaviorologically oriented and specifically dedicated to non-coercive methods. It is not a moral failing to lack proficiency in certain skill sets; recognizing and acknowledging a lacking in specific proficiencies is laudable. Certified members of the International Association of Animal Behavior Consultants (www.iaabc.org) is another option.

Another option, ideally considered after reevaluation and consultation or supervision options at this stage, is to construct a slightly more intrusive intervention. For instance, if a level 1 and 2 intervention was unsuccessful, perhaps a level 3 intervention could be considered (see Table 1, below). This approach is still usually nonintrusive.

The further along the algorithm we go, the more prominent becomes the necessity to carefully weigh likely risks and benefits of intrusive interventions. If you have diligently reevaluated the case, reevaluated it again and researched authoritative sources; if consultation, supervision or referral are ineffective or not viable options; and the intervention is still not sufficiently effective, you should explore having the client consult a veterinarian in order to consider minimally intrusive psychopharmacological solutions (e.g., 5-HTP nutritional supplement or low-side-effect medications). As always, the intrusiveness of specific interventions considered must be compared, and the least intrusive effective ones will be preferable. Nutritional supplements and medications will rarely be the whole answer but they can contribute to achieving success; they can be the "foot in the door," so to speak, that may help you set the occasion for success behaviorally. They change the environment within the body that sets the occasion for the behavior. The extent of intrusiveness must be weighed against the necessity of achieving the goal. Work closely with the client and their veterinarian; the veterinarian will handle the medical component and you will handle the behavioral component, and this requires collaboration.

Box 5. Is the behavior an unmanageable, 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, and you cannot refer the client to a competent professional with specific skill sets that would make success more likely, you need to consider just how important the goal is before proceeding to construct a more intrusive behavior change program. As mentioned above, this whole process is a continuous weighing of the likely benefits and risks of any given intervention component in any given context. The question at this stage is: Is the problem behavior 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 easier a "yes" answer will be. 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" so to speak. 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. For example, tools such as muzzles can be used.

I will present a couple of common examples. 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. But neither is unmanageable as has been suggested. Keeping the dog indoors, or on leash when outdoors, putting up a fence or putting patio pavers along the fence perimeter to prevent digging out are reasonable solutions that respect the animal's dignity and provide a truly least intrusive effective solution.

The best solutions are not always learning solutions; sometimes the least intrusive approach is antecedent control measures, what many trainers refer to as management. People often make restrictive assumptions about what can and cannot be manipulated in order to prevent or mitigate the behavior. It may indeed be less expensive for someone to buy a pet containment shock collar than to have a fence erected, but this fails to respect the animal's dignity and ignores the likely side effects of using these devices (see Polsky, 2000). It is important to weigh the alternatives. The more risky the behavior, the more intrusive 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 illustrates 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 intrusive 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 6. To reiterate, the further along the algorithm we go, the more prominent becomes the necessity to carefully weigh likely risks and benefits of intrusive interventions, and the more challenging the case becomes. If the problem has reached this point and the behavior is determined to be an unmanageable and unacceptable safety risk, you should explore having the client consult a veterinarian in order to consider potentially more intrusive medical solutions. As before, these will rarely be the whole answer but they can contribute to achieving success. Sometimes, nutritional supplements, medications or even surgical interventions can make some unmanageable and unacceptable safety risk cases manageable or acceptable. 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.

In some cases, rehoming the dog is a safe alternative to proceeding to highly intrusive behavior change programs. 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; moving to a home where they will have no contact with children is one available option. 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 reality, this option is rarely realistic because of the risks involved and paucity of homes available for companion animals exhibiting serious problem behaviors. Other options the professional might consider is working more intensively with the dog, perhaps *pro bono*, either with more frequent consultations or by taking the dog in for a board and train arrangement, or if this is not possible, then arranging for it with a colleague who does have the facilities for it.

If you have not reached a level 3 intervention (see Table 1), you should consider doing so, if necessary, at this stage and as a last resort, if you have been operating at a level 3 intervention, consider a level 4 intervention. The further along we get, the more complex are the decisions. Diligence at this level requires careful consideration and justification.

Box 7. Construct higher-level least intrusive effective behavior intervention. This box begins the red zone. The red zone represents more extreme invasive procedures and ought not be entered into lightly. Many professionals refuse to move to box 7 and 8 on principle. In contrast to resolving serious problem behaviors,

simply training new behaviors should never justify box 7 or 8 solutions. In these cases, guardians should simply choose a different behavior to train and 'live without' the behavior they cannot seem to train otherwise. As for resolving serious behavior problems and assuming the professional is adequately proficient to handle the case and diligent about it, it would be extremely rare that a case should ever get to this point and even if it did, most positive reinforcement base professionals will insist on reevaluation in box 6 until success s reached. On the other hand, some unmanageable and unacceptable safety risk related behaviors cannot wait. In cases where box 7 is considered, this usually indicates a lack of diligence in working through previous boxes or lack of proficiency and many professionals consider this an unacceptable justification for moving to box 7 interventions.

If the problem has been resistant to diligent attempts at a solution through the various means discussed and other creative resolution strategies, and it is determined to be an unmanageable and unacceptable safety risk, then constructing a more intrusive behavior change program that is less intrusive than the alternatives may be justified. There are many variables to be considered, though. This stage may involve level 5 or 6 interventions (see Table 1).

First, aversive behavior change programs should only be constructed by professionals who are proficient in doing so and should be performed and supervised or reviewed by competent professionals, as well. Proficiency should 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 skill sets. We cannot all be maximally proficient in all areas. Recognizing our lack of proficiency in a particular skill set is admirable, not a moral failing. If the technologist is not competent to construct and implement a highly intrusive intervention, they should refer the case to someone who is (and getting this stage of intrusiveness usually indicates lack of proficiency in finding a positive reinforcement based solution). 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 that.

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 more proficient (in that particular skill set) professional take responsibility for the decisions of the case and approve your actions in implementing it. Typically, you consult with your supervisor between sessions in order to review the data, what your actions have been and what you want to do next, and your supervisor helps ensure you provide the best possible service. This may be done via video conferencing, phone or even email, where feasible (depending on the preference of the supervisor, as long as it allows for effective supervision). This also helps you develop your proficiencies for future cases. Peer review (or consultation) involves having a competent colleague review, with you, your plans and the results on an ongoing basis throughout the process as just as required. They will provide a "reality check" and a critical eye to 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 that the subject is receiving the best possible service, which is good for them, us as professionals and our profession as a whole.

The criteria for effective punishment of a problem behavior (e.g., contingency, contiguity, intensity, sufficient introductory level of intensity, control of reinforcers, and manipulation of reinforcer deprivation; Chance, 2009, pp. 210–217) or negative reinforcement of a replacement behavior must be observed carefully. I will not elaborate here on the criteria, as proficient professionals should be very familiar 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, mistakes are common and remember that side effects are an intrinsic component of utilizing aversive stimulation and common even in highly controlled laboratory settings and they cannot completely be mitigated.

If one has been truly diligent and still arrives at this level (highly unlikely), then this level of intrusiveness may become necessary. This level represents the often-proposed scenario of having to act "to save the dog's life" but getting to this level usually results from incompetent training and lack of diligence in finding less intrusive solutions in my opinion.

Once the highly intrusive intervention is carefully designed, review or supervision is in place, and all agree that the intervention is necessary, considering the behavior and goals in question, it can be implemented. Only professionals proficient in designing and implementing aversive behavior change programs should carry out the program. This is not something you can generally expect a guardian to perform, except in certain situations (such as 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 judged objectively. If the plan is designed and implemented well, the strength of the problem behavior should decline quickly to an acceptable level. Once an invasive plan is implemented and it is determined to be initially successful, the technologist ought to transition to a less invasive and more positive reinforcement based set on controls in order to fill the suppression void left by aversive methods. Maintenance must be designed into the plan as well. If the goal is not quickly achieved, move to Box 8.

Box 8. Consider rehoming or "euthanasia". Again, this is a red zone box, which many professionals avoid. If quick results are not achieved with the highly intrusive intervention, you need to consider the relative impacts on the dog's quality of life and whether adjustment of the program is justified or whether consideration of other options is warranted. Assuming you have worked diligently through the LIEBI model, you are left with very few realistic options and a very dangerous and uncontrollable subject. When all that is left are highly intrusive options, reconsider rehoming the dog at this point as part of weighing alternative intrusive options, as long as it can be done safely. When the options have been exhausted and someone's safety is jeopardized and the risks cannot be mitigated, or the dog's quality of life is drastically reduced, then consideration of whether to have the subject euthanized by a veterinarian must be made. The entire LIEBI model is designed to avoid unnecessarily intrusive interventions—in particular, this ultimate one. The professional technologist is available for consulting on the topic in terms of interventions available to avoid it, but the decision to euthanize is the guardian's. A benefit of working diligently through such a stringent process is that you can help mitigate guilt based on failure to exhaust all possible options before resorting to this choice.

Levels of Intrusiveness Table

Below I will introduce a series of strategies and procedures ranked by level of intrusiveness/aversiveness. These levels are referred to in the algorithm in Figure 1. As one works through the algorithm these strategies and procedures can be utilized as appropriate. One challenge with presenting such a ranking of intrusiveness/aversiveness is that just how intrusive a procedure will be depends largely not just on intrinsic features of the strategy or procedure itself but also on how the procedure is implemented and on the history of conditioning of the subject in question. Technologists can use these levels as a guide but they must remain aware of the variation possible within and between levels. The levels on intrusiveness table is provided just as a general guide.

This article will not present a list of disallowed or outlawed specific tools or methods. This model is simply not the place for that kind of prohibition for the following reasons. First, this model is intended to be comprehensive and all encompassing and to provide guidelines through *all* possible situations including the very worst-case scenarios that would be extremely rare all the way from simply preempting a problem behavior without even interacting with the subject all the way to consideration of euthanasia. If the model is going to be comprehensive in this manner then it cannot simply stop short and ban the red zone or level 6 interventions. Although worst-case scenarios will be *extremely* rare they are theoretically possible and the model 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. It also makes little sense to

ban a specific tool and then allow euthanasia. If the model is going to proceed all the way to the red zone, to the worst-case scenarios, then it must not then prohibit outright the tools and methods utilized in the red zone. Rather than stop the model short of the red zone and providing an incomplete model, it identifies that level of intrusiveness as a red zone with appropriate cautions and provides the guidance required to minimize intrusiveness even at that level of intrusiveness. Instead of stopping the model short by banning consideration of the red zone, a different strategy is utilized to achieve similar results while still emphasizing the very least intrusive practices possible in any scenario that a technologist might theoretical potentially face. The entire model is built on the idea of helping the user avoid increasing aversiveness. 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*, something we always emphasize with our clients (because it is more productive). The focus is on arming the technologist with a set of guidelines, strategies and tactics 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 red zone or level 6 interventions. The entire model is intensely focused on emphasizing the weighing of risks versus benefits of any methods and tools used and on avoiding unnecessarily aversive tools and methods, no matter what they might be. Make no mistake about it; the LIEBI model presents a strong stand for utilizing the least intrusive interventions possible but does so in a more productive way than specifically outlawing specific things. Many professionals are dedicated to never utilizing certain tools or methods and certain associations codify this in their codes of ethics and professional practice guidelines and the LIEBI model is perfectly consistent with this dedication.

That said, certain tools such as devices that deliver a shock to the subject are highly controversial. These devises would obviously be reserved for the red zone and Level 6 in the table below. There are many professionals (myself among them) who are strongly dedicated to avoiding the use of such tools and as mentioned previously there are organizations that disallow their use by members completely. This ban often applies to choke chains and prong collars as well. Methods that would be restricted to the red zone and Level 6 would include striking the subject or hanging/helicoptering and alpha-rolling. Again, there are many professionals strongly dedicated to avoiding the use of such methods. The LIEBI model does not make a specific ban on any tools or methods but does strongly emphasize avoiding their use and addresses the issue by providing as much guidance as possible to professionals in *how* to avoid getting to the red zone and Level 6.

Table 1 is provided to correspond to the algorithm, providing guidance on what might be considered a set of strategies ranked by intrusiveness. This is just a guide. As discussed, ranking aversiveness can only be estimated or approximated because aversiveness involves a stimulus and a response to it and that response is heavily influenced by a history of conditioning and even genetic variation. Aversiveness is not an intrinsic feature of the stimulus itself. There may be wide variation in the application of such strategies and the history of conditioning of each individual subject. These variables will determine how aversive an intervention will be. Consequently, there will be wide variation in aversiveness within some of the latter levels in the table and between levels as well. Therefore, the table should be used solely as a guide rather than a strict unvarying fact. Decisions regarding which strategies and procedures to implement and continue using once the response to it is determined (or predicted from previous responses) should be made on a case by case basis. Nevertheless, the table is provided because by and large, the ranking seems mostly reliable and useful.

Table 1. Levels of Intrusiveness in Behavior Change Strategies

Level 1: **Antecedent Control Procedures** **(Least Intrusive/Aversive)**
Antecedent control procedures focus on managing the functionally related events that come before the behavior. Preempt/prevent problem behavior by manipulating evocative stimuli, presenting ones that promote replacement behaviors and preventing ones that evoke problem behavior (i.e., management). Manipulate function-altering stimulation to promote performance of desirable behaviors over problem behaviors, addressing variables such as medical conditions, nutrition, physical stimulation, stress-inducing environmental stimulation, etc., such that problem behaviors are less likely to occur and

counterconditioning problem emotional responses by utilizing exclusively positive reinforcers in order to reduce motivation for problem operants. Level 1 is all about making changes to the antecedent environment or directly to the subject's body in a way that sets the occasion for more acceptable behaviors over unacceptable behaviors.

Level 2:
Positive Reinforcement Utilizing Graded Task Approach
(Minimally Intrusive/Aversive)

Antecedent control and positive reinforcement focusing on setting the subject up for success and reinforcing desirable target behaviors. Instate antecedent control procedures as in level 1. Gradually replace the problem behavior with an alternative behavior through positively reinforcing an incompatible or alternative replacement behavior either by reinforcing approximations of the terminal behavior or in its final form. Utilize a graded task 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 perform the problem behavior and training different components separately to make success more likely. This might involve training replacement behaviors completely outside of problem contexts to a mastery level and then gradually introducing it to the problem situation while manipulating such variables as distance, duration and distraction. The key feature of level 2 is to work gradually and incrementally so that an acceptable replacement behavior can be installed where the problem behavior was once evoked.

Level 3:
Differential Positive Reinforcement
(Minimal Plus Intrusive/Aversive)

Antecedent control and differential positive reinforcement. Instate level 1 antecedent control procedures and continue to utilize a graded task approach. Positive reinforcement of desirable replacement behavior (DRI, DRO, DRA or DRL) and extinction of problem behaviors. The emphasis should be to minimize extinction trials when possible with a graded task approach. Extinction is a component of differential reinforcement and while somewhat aversive, is extremely effective where the reinforcers can be controlled. Extinction, where possible, should only ever be used on conjunction with positive reinforcement of a replacement behavior that ideally accesses the same or similar reinforcers.

Level 4:
Positive Reinforcement and Negative Punishment
(Moderately Intrusive/Aversive)

Antecedent control, positive reinforcement of desirable behaviors, and negative punishment of problem behaviors. Instate level 1 antecedent control procedures and continue to utilize a graded task approach. Positive reinforcement of desirable replacement behavior (incompatible or alternative) and negative punishment of problem behaviors (time-outs, usually only several seconds, in most cases). The emphasis should be to minimize punitive trials when possible. Although often but not always more aversive than extinction, negative punishment often cuts short contact with the reinforcer and is useful when extinction is not possible because contact with the reinforcer is not possible as when the behavior directly and intrinsically contacts the reinforcer. Simply turning away from a dog for several seconds after administering a conditioned negative punisher is minimally intrusive while removing a dog to a time-out area is often more aversive and wrought with practical application related difficulties. As always, the aversive trials ought to be minimized as much as possible. Side effects can be expected in many if not most cases of its use.

Level 5:
Graded Differential Negative Reinforcement
(Intrusive/Aversive although variable depending on application and individual)

Antecedent control and graded negative reinforcement of desirable behaviors and extinction of problem behaviors. Instate level 1 antecedent control procedures and continue to utilize a graded task approach. Present the problem stimulus at increasingly intense levels of exposure in order to keep the exposure minimally aversive, and make increased distance from the stimulus (whether the stimulus is removed or the

subject is) contingent on a desirable behavior (which might be the escape behavior itself generated by aversive stimulation). Problem behavior is targeted for extinction (although intensity of exposure is manipulated in order to minimize these trials). Let us be clear, logically, this procedure cannot be achieved without aversive stimulation. Contact with the aversive stimulus even at reduced intensity will be either punitive of behavior it consequates or it will be reinforcing for behaviors that terminate it. If the stimulus is not aversive then negative reinforcement is not possible. The real question is how aversive it will be and that can vary. If done carefully and in this graded manner, it should usually be less aversive than positive punishment based methods and because the reinforcer is intrinsic (or what some call more "natural"), the procedure should be quite effective. But aside from effectiveness, side effects can be expected and should be remediated carefully. This is a popular procedure among many technologists and is found elaborated under a couple different proprietary names but this ought not be a first line procedure; it is not in the red zone but it should only be utilized if necessary in conjunction with the model's efforts to find a less intrusive solution first.

Level 6:
Positive Reinforcement and Positive Punishment
Red Zone
(Maximally Intrusive/Aversive although variable depending on application and individual)

Antecedent control, positive reinforcement of desirable behaviors, and positive punishment of problem behaviors. Instate level 1 antecedent control procedures. Positive punishment should never be instated without consideration of reinforcers involved and must meet all other criteria (e.g., contingency, contiguity, intensity) for effective punishment. Punishment merely suppresses behavior. The void created by punishment needs to be filled with a positively reinforced alternative behavior that accesses the same or similar reinforcers if acceptable or if not, then certainly highly effective reinforcers. Once successful, transition quickly to nonaversive methods. Side effects are almost guaranteed and may be robust and resilient against remediation. This is the level in which highly contentious tools and methods are utilized and they are rightly restricted to the red zone.

Summary

We have an ethical obligation to provide effective and efficient interventions but also to respect the autonomy, dignity and moral rights of the subject and make our interventions as minimally intrusive/aversive as possible to achieve our reasonably determined behavioral goals. The LIEBI principle has been prominent in the science of behavior analysis for approximately 40 years in various forms and with various phraseologies (Bailey & Burch, 2005). In the field of companion animal training and behavior consulting, this principle is a more recent development thanks to such trainers as Jean Donaldson, Ian Dunbar and Karen Pryor. The LIEBI model (algorithm and levels of intrusiveness hierarchy) is proposed as a way to offer direction in meeting our professional and ethical obligations to our clients, the subject, the technologist and the profession as a whole. It focuses on a behaviorological approach and emphasizes due professional diligence in finding the Least Intrusive Effective Behavior Intervention possible, while helping guardians train their companion animals, either proactively or reactively, to resolve problem behaviors.

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