The Least Intrusive Effective Behavior Intervention (LIEBI) Algorithm and Levels of Intrusiveness Table: A Proposed Best-Practices Model

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There is very little published in the animal behavior consulting literature that directly addresses the topic of how consultants 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 in public and professional forums. In this essay, 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 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.

Preliminary Concepts

It is important to avoid dogmatic positions and groupthink ("type of thought exhibited by group members who try to minimize conflict and reach consensus without critically testing, analyzing, and evaluating ideas;" "Groupthink," n.d.) in 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 in question. 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. Furthermore, effectiveness is not sufficient to justify highly intrusive interventions (Friedman, 2009). 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.

I will clarify some important terms. The word *aversive* refers to stimulation that an organism will act to escape or avoid. Whether stimulation is aversive or not is an all-or-none phenomenon. Stimulation either is or is not aversive. Once we have determined that stimulation is aversive, we think of aversive stimulation as either more or less aversive. This is aversive*ness*. For our purposes, *intrusiveness* can be defined by the degree to which a procedure impacts a learner negatively—that is, causes harm in one way or another. The more problematic the side effects an intervention is likely to generate (e.g., injury, generalized problematic emotional behavior including fear or anxiety, increased aggressive behaviors, apathy or generalized behavioral suppression, countercontrol), the more harm is likely to be done and the more intrusive the intervention

would be considered. Some (see Carter & Wheeler, 2005) define intrusiveness by how socially acceptable the intervention is and the degree to which the learner can control the aversive stimulation. If this is intended as a means of judging which procedures are likely to cause more or less harm (as defined above) in a given context, it seems acceptable; however, if degree of intrusiveness is intended to be determined by surveying professionals, this leaves open the question of why a given intervention is more or less intrusive than some other intervention. Measuring side effects as a measure of harm and hence intrusiveness seems more objective than surveying professional opinion. Whether something is socially acceptable does not address the question posed to it. I will leave further exploration of this debate for elsewhere. The LIEBI model is open to any of several measures of harm or 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, or "Least Intrusive Minimally Aversive" (LIMA) in an eclectic orientation coined "cynopraxis" by Lindsay (2001, p. 38). The latter has become popular in recent years in some dog training circles, although LIMA seems conceptually awkward and redundant (it is not clear what the difference is between "least intrusive" and "minimally aversive," and "minimally aversive" may suggest a need for some level of aversiveness). I am loath to coin a new term and thereby contribute to a "terminology tumult" (Friedman, 2006), but working effectiveness into the concept is intended to promote progress in the conceptual formulation, since we are ethically obliged to provide both effective *and* minimally intrusive interventions. Furthermore, neither LRE nor LIBI are common terms in the animal behavior consulting field. The term is not as important as the principle involved. If you are performing a literature search on the topic, these other terms may be helpful.

For other terms that are not defined in this essay, see the glossary links at the end of the essay for definitions.

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.

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 only 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 punitive interventions do not "work" in this broader context.

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 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 deserve 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 consultant 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.

In summary, we have an ethical obligation to find the least intrusive and effective intervention possible, not only because a minimally intrusive intervention is less likely to create problematic side effects and therefore be more effective in the long run, but also, more basically, out of respect for the autonomy, dignity and rights of the learner. Hence, effectiveness is important but it is not enough.

Why Implement the LIEBI Model?

Why should you use 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 "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 learner 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 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. In summary, 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 discussions of this topic outside of my own (O'Heare, 2007, pp. 307–311) are 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 behavior analytic. 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. Failure to achieve the goals leads first to careful reevaluation of the goals, the contingency statement, application-related variables, the procedure choice and the options. 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 an all-or-none phenomenon, the LIEBI model recognizes a continuum of intrusiveness. A competent professional 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.

Key and distinct features of the LIEBI model:

- Behavior analytic (scientific: operational and observable/measurable).
- Emphasizes strong standard of professional due diligence for avoiding highly intrusive interventions, with careful reevaluation and other prevention measures.

- Recognizes intrusiveness as a continuum rather than an all-or-none phenomenon and the necessity to justify higher levels of intrusiveness with due diligence.

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 refers most commonly to increasing the frequency of the behavior (Chance, 2009, p. 130). In either case, you are changing the strength of certain specific behaviors in certain environments. In most cases, eliminating a problem behavior involves replacing it with a more desirable 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 the discussion that follows, I will first follow the path on the left side of the LIEBI algorithm (Figure 1), which addresses reducing the strength of problem behaviors, and then address the right-hand side.
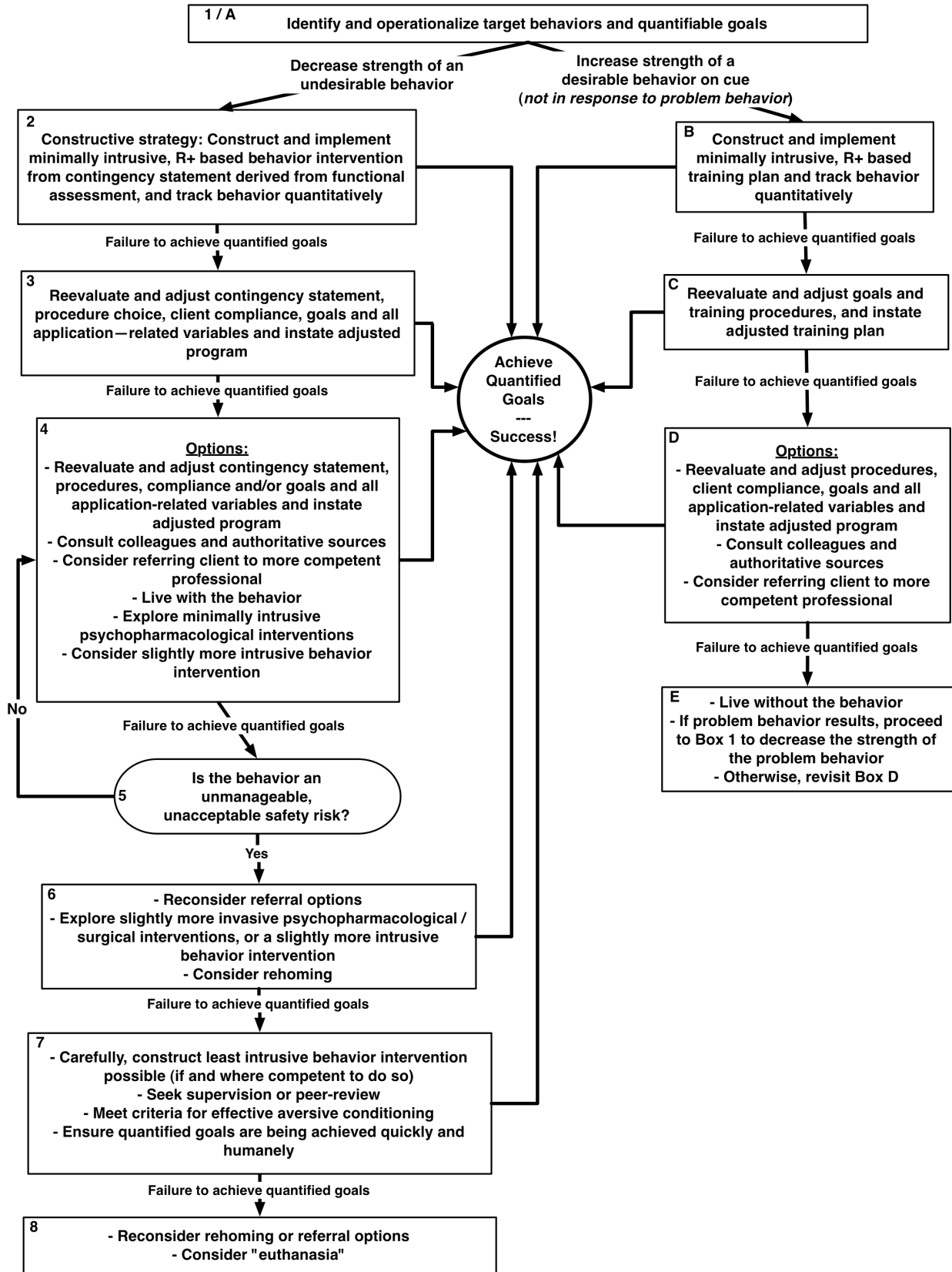
Figure 1. Algorithm for protocols in determining when to implement intrusive behavior interventions.

Decreasing the Strength of an Undesirable Behavior

Box 1/A. Identify and operationalize target behaviors and quantifiable goals. In the case of reducing the strength of a problem behavior, the problem behavior is identified based on a full functional assessment, and a quantifiable goal is flexibly determined. Although we cannot expect to predict a timeframe for achieving this goal, the goal can be developed through construction and implementation of a behavior change program in the next step. The goal itself may be adjusted through consultation with the client, as well. A functional assessment identifies the antecedents, behaviors and consequences (ABCs) and is achieved via careful interviewing (asking relevant people anecdotally about the ABCs), direct observation (correlational determination of the relationship between the ABCs) and functional analysis (experimental determination of the relationship between the ABCs). Do not proceed with a behavior change program until you have developed a high level of confidence in your contingency statement (aka summary statement) developed through your functional assessment. A contingency statement is the simple, jargon-free statement that identifies the behavior, what sets the occasion for it and what maintains it—that is, the antecedents, behavior and consequences. 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 "dominance," for instance, is unacceptable unless it is operationalized appropriately (in which case, the term "dominance" is no longer useful at all, and indeed is usually counterproductive and inflammatory). If emotional behaviors (e.g., anxiety or fear) are referred to, the specific behaviors that comprise the emotional response should be specified; they might include, perhaps, increased heart rate, changes in blood pressure, turbulent respiration, bowel movement, incontinence, defensive or escape/avoidance behaviors, freezing/behavioral suppression, blushing, pupil dilation or constriction, excessive or sudden high arousal and appeasement, and piloerection. Some of these will be more easily observed and measured in applied settings, obviously. In most cases, emotional behaviors are addressed by quantifying the operants they motivate rather than measuring behaviors such as heart rate. 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. This requires operational definitions for problems. See the resources section at the end of this essay for books on functional assessment. Careful evidence gathering cannot be underestimated at this stage and throughout the process.

Box 2. Constructive behavior change program. In this phase of the intervention, 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 statement that was generated through a proper functional assessment. The contingency statement is not a broad, generalized diagnostic label, but rather an accurate, reliable hypothesis describing the specific target behavior and the independent variables influencing it. The functional assessment leads scientifically to identification of these variables, and the contingency statement sums them up concisely. Once we know the antecedents (i.e., setting events, motivating operations—including conditioned emotional responses—and discriminative stimuli) and the consequences (i.e., specific reinforcers) that are maintaining the target behavior, we are in a position to develop a strategy and intervention that will manipulate the antecedents and the consequences so that the behavior will change. Our goal is to make the 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 scientific literature. For instance, if we hypothesize that, in a particular instance, a dog barks (or parrot

screams, or cat meows) when his or her guardian is on the phone because this behavior has historically 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 construct a differential reinforcement procedure that gradually reinforces approximations of sitting quietly and extinguishes the barking (or screaming or meowing) behavior as a reasonable, minimally intrusive intervention. Where an emotional response motivates problem operants (e.g., fear responses make escape or avoidance more valuable), the problem emotional response can be changed via respondent conditioning procedures such as systematic desensitization (note that another strategy perspective is to change the operants in order to change the emotional responses). 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 test of the hypothesized contingency statement.

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 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.

You should have proceeded with the functional assessment to the point of being confident in the accuracy of the hypothesis 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 statement is inaccurate. 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 mistaken confidence. For instance, if you did not perform a functional analysis (i.e., experimental testing of the causal relationship between a behavior and its antecedents and/or consequences) and relied only on the interview and direct observation data (i.e., tracking target behavior to identify 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 statement (hypothesis) 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 goals realistic?
- Are the procedures chosen to address the target behavior appropriate in the situation?
- Have you addressed antecedent conditions adequately? Many consultants 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
- value and magnitude of reinforcer for desirable behavior versus problem behavior.

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

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 statement 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 behavior 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. Options. 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 may be better to refer to authoritative sources or consult a colleague with specific competencies that may help you avoid having to increase the intrusiveness of your program. In many instances, this will provide you with a new perspective, possibly one that helps identify and

resolve the problem. Another option is to seek supervision on the case, which has the added benefit of helping you develop your own formal competencies. 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 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 competencies related to the issues involved in the case. The Association of Animal Behavior Professionals (http://www.associationofanimalbehaviorprofess ionals.com) is a useful resource in this regard since professional members are behavior analytically oriented and specifically dedicated to least intrusive effective methods. Another option may be the International Association of Animal Behavior Consulting (http://www.iaabc.org), although members are not necessarily behaviorally oriented. It is not a moral failing to lack competencies in certain skill sets; recognizing and acknowledging a lacking in specific competencies is laudable.

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 intervention was unsuccessful, perhaps a level 2 or 3 intervention could be considered (see Table 1, below). These approaches are still relatively minimally intrusive. Interventions above a level 3 should be reserved for Box 7 options in the LIEBI algorithm.

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 veterinary behaviorist 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? It is important to define our terms in this question. By *unacceptable safety risk*, we mean: is the behavior likely to cause significant harm to anyone at all, including the learner? 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 consultant 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 more dire. *Unmanageable* refers to the inability to find an acceptable means of preventing the 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 head halters or muzzles can be used.

I will present a couple of common examples. Problems raised in the literature 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 perimeter to prevent digging under the fence 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? This is an important question, which illustrates the idea of balancing likely risks and benefits rather than simply invoking simplistic all-or-none solutions. The consultant must consider the welfare impact of management on the companion animal and the risk involved. Some restrictions or management solutions may be so intrusive and create such a negative impact on the animal's welfare that the behavior must be considered as unmanageable, but this must be a carefully made decision.

Box 6. Reconsidering options. 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 veterinary behaviorist in order to consider potentially more intrusive psychopharmacological or surgical 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. For example, separation distress is a common problem in dogs. In many cases, medications can create the biological environment that allows the animal to countercondition to the various predeparture cues involved in the distress response and habituate to being left alone. If you have reached this stage with this kind of behavior, medication such as Prozac™, Reconcile™, Elavil™ and/or 5-HTP can set the occasion for much less distressed behaviors.

In some cases, rehoming the companion animal is a realistic and 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.

This is not to suggest that highly intrusive interventions should be avoided at all possible cost. Again, the decision is based on weighing the likely risks and benefits, all within the context of doing the least harm and respecting the animal's dignity. The decision needs to be justified. It may be justified if a sound argument can be posited that no realistic and acceptable less intrusive solutions have been effective. Again, also, we are reminded that aversiveness/intrusiveness is found on a continuum from mild to severe and it is not only an all-or-none phenomenon (as aversive versus nonaversive is). The particular intrusive intervention considered may be less intrusive than a particular management solution. Uprooting a companion animal from his or her family for rehoming, for instance, is an invasive solution. If you have not reached a level 4 intervention (see Table 1), you should consider doing so, if necessary, at this stage. 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. 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 is justified. There are many variables to be considered, though. This stage may involve level 4 through 6 interventions (see Table 1).

First, aversive behavior change programs should only be constructed by professionals who are competent to do so and should be performed and supervised or reviewed by competent professionals, as well. Competence should not mean a cursory familiarity or self study, under most circumstances, but a true competency—one developed through appropriate consultation, formal education and/or supervision by

competent instructors and supervisors. The thing about competence is that one does not always know the full scope of what one does not know; an incompetent professional is sometimes not aware of the extent of their lacking in a particular skill set, which is why formal instruction is important. Again, although "incompetence" may have a negative connotation in common usage of the word, professionally speaking, we all have various levels of competency in various skill sets. We cannot all be maximally competent in all areas. Recognizing our lack of competence in a particular skill set is admirable, not a moral failing. If the consultant is not competent to construct and implement a highly intrusive intervention, they should refer the case to someone who is. Nevertheless, whether a referral is possible or not, an incompetent professional must not undertake the task. Supervision or peer review can help you evaluate that.

Even where the professional is competent to construct and implement a highly intrusive intervention, they should seek either formal supervision in the case or peer review. Supervision involves having a more competent (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. This also helps you develop your competencies 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. 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 learner 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 competent 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, and mistakes are common.

Remember, side effects are common, even in a laboratory setting where the criteria can be met to the highest degree of control possible. Nevertheless, if one has been diligent and still arrives at this level (unlikely under normal circumstances), 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."

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 competent professionals 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. Maintenance must be designed into the

plan if the goal is achieved. If the goal is not quickly achieved, move to Box 8.

Alberto and Troutman (1990, summarized in Carter and Wheeler, 2005) propose a hierarchy of intrusiveness involving four levels:

- Level 1: Differential reinforcement of alternative behavior (DRA), differential reinforcement of other behavior (DRO), differential reinforcement of low rate behavior (DRL), and differential reinforcement of incompatible behavior (DRI)
- Level 2: Extinction
- Level 3: Response cost and negative punishment
- Level 4: Aversive stimulation.

Friedman (2009), proposes an excellent hierarchy of intervention strategies, summarized as follows:

- Level 1: Addressing distance antecedents
- Level 2: Addressing immediate antecedents
- Level 3: Positive reinforcement
- Level 4: DRA
- Level 5: Negative punishment, negative reinforcement, extinction
- Level 6: Positive punishment.

I proposed a similar ranking previously (O'Heare, 2007). I will present a very similar one here as part of the LIEBI model because it is used in conjunction with the algorithm; I hope that this improves on my previous approximation. This ranking has been influenced by Dr. Friedman's excellent work (particularly in the initial focus on antecedents) in promoting a least restrictive behavior intervention. I am also proposing a new table (Table 1) in order to include respondent-conditioning-based behavior change programs.

Table 1. Levels of Intrusiveness in Behavior Change Strategies

Level 1:   **Antecedent control procedures**
Strategy and explanation: Manipulate setting events to promote choice of desirable behaviors over problem behaviors. Address variables such as medical conditions, nutrition, mental/physical stimulation, stress-inducing environments, etc., such that problem behaviors are less likely to occur.   Manipulate motivating operations to promote and strengthen desirable behaviors over problem behaviors. Countercondition problem emotional responses with systematic desensitization in order to make consequences for motivated operants moot.   Manipulate discriminative stimuli by presenting ones that promote other behaviors and prevent presentation of ones that evoke the problem behavior.
Example: Fearful companion animal utilizing aggressive behaviors to escape the aversive stimulation is systematically desensitized to the problem antecedent, and escape/avoidance is no longer reinforcing. The aggressive behaviors become moot because the emotional response is changed. Exposure to the feared stimulus is minimized. Operant conditioning accompanies respondent conditioning procedures to promote empowerment and increase the animal's repertoire of desirable behaviors. The companion animal becomes less fearful also when an exercise program, a nutritional support plan, and general empowerment training are instated and other stressful living conditions are reduced.

Level 2:   **Shaping and response prevention**
Strategy and explanation: Antecedent control and shaping with response prevention. Instate antecedent control procedures as in level 1. Gradually replace the problem behavior with a replacement behavior through positively reinforcing approximations to it in the environment in which the problem behavior occurred. Ensure success by making the choice of the desirable behavior more likely over the problem behavior.
Example: A dog that utilizes aggressive behaviors when exposed to novel people has approximations of prosocial behaviors positively reinforced in gradually increasing intensities of exposure to strangers (usually manipulating distance and orientation) so that the dog does not perform the aggressive behaviors. Aggressive behaviors are avoided, and the new behaviors are installed gradually by shaping and empowerment training.

Level 3:   **Differential positive reinforcement**
Strategy and explanation: Antecedent control and differential positive reinforcement. Instate level 1

antecedent control procedures. Positive reinforcement of desirable replacement behavior (DRI, DRO, DRA or DRL) and extinction of problem behaviors.

Example: A dog that barks for social attention has bringing a toy targeted for positive reinforcement and barking targeted for extinction. A parrot that screams for social attention has lower-volume verbal behaviors targeted for positive reinforcement and screaming targeted for extinction. Note, extinction should never be used outside of a differential reinforcement procedure.

Level 4:

Positive reinforcement and negative punishment

Strategy and explanation: Antecedent control, positive reinforcement of desirable behaviors, and negative punishment of problem behaviors. Instate level 1 antecedent control procedures. Positive reinforcement of desirable replacement behavior (DRI, DRO, DRA or DRL) and negative punishment of problem behaviors.

Example: A dog that barks excessively for social attention has sitting and a single bark targeted for positive reinforcement and barking more than once targeted for negative punishment, including perhaps a time-out protocol. A parrot that screams excessively for social attention has lower-volume verbal behaviors targeted for positive reinforcement and screaming targeted for negative punishment, including perhaps a time-out protocol, such as having people immediately leave the room.

Level 5:

Graded differential negative reinforcement

Strategy and explanation: Antecedent control and graded negative reinforcement of desirable behaviors and extinction of problem behaviors. Instate level 1 antecedent control procedures. Present the problem stimulus at increasingly intense levels of exposure in order to keep the exposure minimally aversive, and make removal of the stimulus contingent on a desirable behavior. Problem behavior is targeted for extinction (although intensity of exposure is manipulated in order to minimize these trials).

Example: A dog that utilizes aggressive behaviors in order to escape novel people has prosocial behaviors in the presence of gradually increasing intensities of exposure to the strangers reinforced with increased distance from them. The procedure is done gradually to keep the procedure minimally aversive and prevent setting the occasion for aggressive behaviors. Where aggressive behavior accidentally occurs, extinction is used.

Level 6:
Positive reinforcement and positive punishment

Strategy and explanation: Antecedent control, positive reinforcement of desirable behaviors, and positive punishment of problem behaviors. Instate level 1 antecedent control procedures. Note that positive punishment should never be instated without consideration of reinforcers involved and must meet all other criteria for effective punishment.
Example: A dog that barks excessively has delivery of a shock made contingent on barking behaviors. Alternative behaviors such as sitting quietly or fetching a toy are targeted for positive reinforcement, and the barking behaviors decrease in strength (while alternative behaviors increase in strength).

Box 8. Consider rehoming or "euthanasia". If quick results are not achieved with the highly intrusive intervention, you need to consider the relative impacts on the dog's welfare 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. When all that is left are highly intrusive options, reconsider rehoming the dog at this point as part of weighing alternative intrusive options. When the options have been exhausted and someone's safety is jeopardized and the risks cannot be mitigated, or the dog's welfare is put at serious risk, then consideration of whether to have the animal painlessly killed by a veterinarian must be made. The entire LIEBI model is designed to avoid unnecessarily intrusive interventions—in particular, this ultimate one. The guardian must make any decisions regarding whether or not to have a companion animal painlessly killed by a veterinarian. The professional consultant is available for consulting on the topic in terms of interventions available to avoid it, but the decision 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.

Increasing the Strength of a Desirable Behavior on Cue

Boxes A through E are dedicated to situations in which you are simply training new environment–behavior relationships—in other words, training new behaviors but not as a replacement for any problem behaviors. This is what typically occurs in training classes or basic manners training. Common behaviors to train include "sit," "down," "stand," "watch me," "go to…," "leave it," "come here" (for dogs) or "step up" or "leave it" (for parrots). If the behavior is being trained in order to decrease the strength of a problem behavior, then working through the left side of the algorithm is correct procedure.

Box A. Identify target behaviors and quantifiable goals. In the case of training a new behavior, this first step involves identifying the specific target behaviors to be changed, a dimension to track quantitatively (e.g., frequency, duration, intensity) and estimating a reasonable timeframe in which to achieve the specific goals.

Box B. Construct and implement least intrusive effective training plan. Decide what procedures will be most suited to the objectives. For instance, you may elect to free shape the behavior if it is not currently in the learner's present repertoire, or you may want to chain it if it is a complex series of behaviors, or you may want to implement a prompt-based approach (e.g., "lure and reward"). Decide upon the reinforcers you can use, how to affect the motivating operations, when you will switch from a continuous reinforcement schedule to an intermittent schedule, and what schedule you will use at what stage. Decide on how to minimize distractions and how you will work on

generalizing the behaviors and fading prompts, if used. You will of course want to remain flexible, but you should devise a specific plan of action that ensures you are meeting the criteria for effective and efficient training. Implement the plan.

Box C. Reevaluate. If you are not achieving the goals that you and your client quantified, your objective at this stage is to reexamine the plan you implemented. Why are you not meeting your goals?

- Are the goals not realistic?
- Are the reinforcers sufficiently reinforcing?
- Is there a medical problem or some other limitation on the learner that influences their capability to perform or learn the behavior?
- Should you attempt free shaping rather than prompting?
- Is backward chaining better than forward chaining for the behavior?
- Are the increments in your shaping or chaining plan too large?
- Is the dog becoming frustrated with the extinction trials?
- Does the client understand the process sufficiently?
- Is ratio strain affecting performance?
- Are the procedures being implemented with sufficient mechanical skills?
- Are you meeting contingency and contiguity requirements adequately?

You are looking for the barrier that is preventing you from achieving your goals. Adjust the plan where appropriate and implement it.

Box D. Options. If you are still not achieving success, this likely means there is a problem with your plan that you were unable to identify and rectify on your first reevaluation of the problem. Take another look at the manner in which you are not meeting the goals and how the plan may be failing to achieve them. If you find the mistake, adjust the plan and implement it. Try a different approach. Failure to meet goals is usually a failure to recognize some variable in

the learner, the environment or the application of the procedures. Find it and fix it.

If you are unable to identify the problem, consider either consulting with a colleague or check your articles and books for advice on problem solving in this area. A fresh, outside perspective can often help identify the problem or new approaches. If it is an important behavior, having a colleague observe and advise on how to meet the goals can be an excellent way to achieve success. Video recording the training can often help you critique the process and can be used to solicit advice from colleagues (with the client's informed consent).

Another option, either after consultation with a colleague or instead of it, is referring the client to a colleague highly skilled in training the behavior in question. We all have various levels of skill in various areas and, if you are unable to help the client achieve their goals, perhaps there is someone else who can. This is not a sign that you are a bad trainer, but rather a sign of professionalism—you recognize that, although you may not be able to help this particular client reach their goals, there may be another trainer who can. This also shows respect for the client and your profession as a whole. You may arrange to observe the training to help improve your own skill sets in the process. See this option as an opportunity rather than a failure of your skills.

Box E. Reconsidering options. Assuming you have diligently worked through all of the steps and are still failing to achieve the goals, the options are rapidly becoming more limited. The client may elect to live without having that behavior on cue. Perhaps they can find a different solution. They might train a less ideal, but still reasonably effective, behavior to use in its place, or they may find a management approach that minimizes the effects of not having that behavior on cue. You may wish to revisit the Box D options again if the client is persistent in achieving success.

If, because of this failure to achieve success or otherwise find a creative solution, a problem behavior develops, proceed to Box 1 and move

down the left side of the algorithm to decrease the strength of the problem behavior.

Note that there are no allowances for instating highly intrusive training plans for installing new behaviors outside of the context of addressing a problem behavior. Although it is true that some behaviors are very important and can prevent problems, minimally intrusive training plans should be available to train them. If these plans fail, other behaviors or management can be chosen. The mere possibility of a problem behavior developing at some point is not generally enough to justify highly intrusive interventions. Creativity and skillfully executed training plans should be successful. It is possible that a hypothetical scenario may be thought up (or actualized) that does justify slightly more intrusive methods but, by and large, this is an extremely rare occurrence. As they say, "give a person a hammer and everything becomes a nail." I have found that "if you give a person a highly intrusive option, everything becomes an unmanageable, unacceptable safety risk." Highly intrusive training methods should not generally be required for training even the most important of behaviors and should be reserved for a much more clear and present danger.

Concluding Remarks

As Friedman (2009) stated, "effectiveness is not enough." We have an ethical obligation to provide effective and efficient interventions but also to respect the autonomy, dignity and rights of the learner 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 applied 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 learner, the consultant and the profession as a whole. It focuses on a behavior analytic 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.

Professional Resources

Websites:

http://www.associationofanimalbehaviorprofessionals.com
http://www.behavior.org
http://www.behaviorology.org

Glossaries:

http://www.associationofanimalbehaviorprofessionals.com/glossary.html
http://www.coedu.usf.edu/abaglossary/glossarymain.asp
http://web.utk.edu/~wverplan/gt57/glayout.html

Books on principles of learning and behavior analysis (general):

Chance, P. (2009). *Learning and behavior* (6th ed.). Belmont: Thomson Wadsworth.

Cooper, J. O., Heron, T. E., & Heward, W. L. (2007). *Applied behavior analysis* (2nd ed.). Upper Saddle River: Merrill Prentice Hall.

Pierce, W. D., & Cheney, C. D. (2008). *Behavior analysis and learning* (4th ed.). Mahwah: Psychology Press.

Books on functional assessment:

O'Neill, R. E., Horner, R. H., Albin, R. W., Sprague, J. R., Storey, K., & Newton, J. S. (1997). *Functional assessment and program development for problem behavior: A practical handbook*. New York: Brooks/Cole Publishing Company.

Umbreit, J., Ferro, J. B., Liaupsin, C. J., & Lane, K. L. (2007). *Functional behavioral assessment and function-based intervention: An effective, practical approach*. Upper Saddle River: Pearson Merrill Prentice Hall.

Books on behavior change programming:

Miltenberger, R. G. (2004). *Behavior modification principles and procedures* (3rd ed.). Toronto: Thomson Wadsworth.

Books on professional ethics:

Bailey, J. S., & Burch, M. R. (2005). Ethics for behavior analysts: A practical guide to the Behavior Analyst Certification Board guidelines for responsible conduct. New York: Lawrence Erlbaum Associates.

Courses with a behavioral orientation:

Companion Animal Sciences Institute: http://www.CASInstitute.com
Living and Learning with Animals: http://www.behaviorworks.org

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Sidman, M. (2000). *Coercion and its fallout* (Rev. ed.). Boston: Author's Cooperative, Inc. Publishers.