The Science and Technology of

DOG TRAINING

Second Edition

James O'Heare

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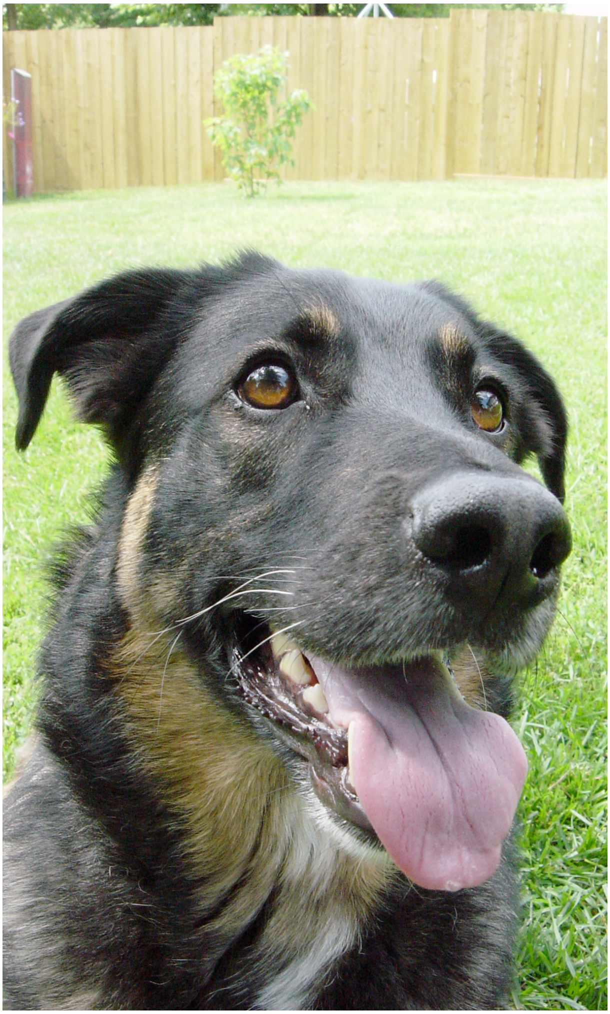
for Roscoe 1999-2012, my best friend ever!



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I would like to Dr. Stephen Ledoux for a highly reinforcing educational experience and for assistance with this book.

Thank you Kamrin MacKnight for proofreading.

PREFACE – READ THIS FIRST!

The Science and Technology of Dog Training is written to help novice, through professional, dog trainers and behavior technologists expand their knowledge and skills in the natural science of behavior and technology of dog training. There are many excellent books available on dog training, but most cover only the most basic principles of behavior and training procedures. This is a suitable strategy for a broader audience, interested in the basics, without having to become familiar with technical terms, or the science behind the technology. My general objective in this book is to provide a solid foundation in the natural science of behavior, including the proper scientific terminology, and apply that science to the technology of dog training, providing guidance on basic through advanced, training principles, strategies, and procedures.

In the past, professional dog training was not systematically based on a natural science of behavior, but rather a more or less haphazard bag-of-tricks established by trial and error. Because it was more intuitive than systematic and principled, it was difficult to condition in new trainers. A lot has changed in the last few decades, and professional dog training is now held to a much higher standard. Professionals engaged in this trade are expected to be proficient in the technology of training, and that training should be informed by an empirically supported natural science of behavior. If one wants to formulate effective and efficient training plans to achieve specific behavioral objectives, more than a hodgepodge collection of intuitions and tricks-of-the-trade is required. This is especially the case for anything beyond the very simplest of objectives.

Specifically provided here are: (a) a solid scientific foundation in the principles of behavior from which training techniques and strategies are derived; (b) greater detail beyond the acquisition stage of training; and (c) exercises to help trainers expand their training behavior repertoire.

I assume the reader has an interest in the natural science and technology of dog training, either to provide a more solid foundation for established professionals who already train dogs regularly, or to provide a solid foundation for those just beginning to develop their training proficiencies. I do not assume prior knowledge of any science or technology. The conditioning curve might be a little more daunting for those without a background in the science of behavior. The principles, techniques, and behaviors that I address are not new, are addressed without resorting to fads, and I use the appropriate terminology and principles that are involved. No gimmicks, or trademarked 'one-true-way' approaches are provided here. Instead, I provide a foundational treatment of the natural science of behavior, and technology of dog training presented from basics through to advanced techniques. New terms are shown in ***bold italicized font*** where they are introduced or discussed in detail, so they are easy to find.

This book is not intended to be a casual read. Achieving the behavioral repertoire expansion that this book promises will require careful study and the reading of sections more than once. The material is dense and concise. With active careful study, as opposed to a cursory reading, the trainer can expect a far superior level of repertoire expansion. Ideally, it will also involve actively working with the principles, strategies, and procedures hands-on. For those who require a more basic introduction to prepare them for the material in this book, I recommend my book, *Training Dogs* and/or *How Dogs Learn* by Mary Burch and Jon Bailey.

In some cases, particularly in the planning stage, you might believe that what I propose is overkill. This may indeed be the case for those who have been conditioned through extensive experience to exhibit these planning behaviors "in their head" and/or in a truncated manner. However, the most successful strategy, in getting to this stage, is to practice the full set of project planning behaviors, including preparing detailed written training plans, until the process can be truncated without a loss of accuracy, efficiency, and effectiveness. In other words, take the time now to engage in all of the appropriate planning processes and you will eventually be able to truncate and condense the process. Attempting to prematurely truncate the planning process will result in a deficient requisite behavior (foundation) and less proficient training skills. So, bear with me, while I describe more elaborate procedures than you might believe necessary for your own skill level. Become familiar with these procedures, and then truncate the process as appropriate without diminishing the systematic planning benefits. One might also believe that the material in chapter one, on the basic principles of behavior, is too in-depth. I would argue that it is not, and that all dog trainers should have a strong proficiency in the principles of behavior included in that chapter.

The Science and Technology of Dog Training is written specifically to cover all topic points at an appropriate depth for Association of Animal Behavior Professionals core areas of competence in "Principles of Behavior" and "Dog Training." Achieving the behavioral objectives established in this book will thoroughly prepare the candidate for the AABP Proficiency Exam in these two core areas of competence.

Dog training has also come a long way in terms of its use of less coercive methods. Recognizing the devastating and resilient problematic side effects of using aversive stimulation to control behavior has become apparent. Many trainers have shifted the technology of training behaviors toward added reinforcement-emphasized strategies. This book emphasizes the importance of utilizing these added reinforcement-emphasized strategies to train behavior.

An appendix is included that provides the reader with a set of specific exercises to complete, each one designed to help expand the reader's repertoire of effective and efficient dog training behaviors. These exercises should be useful and informative for both novice and professional trainers.

This second edition includes a general updating of the content presented in the first edition. Please note that the current book is very similar to *The Science and Technology of Animal Training*, except that it only involves dogs. The STAT book was written as a university textbook on animal training and covers the content of this book plus chapters on birds, cats, and horses.

As with all my books, this book remains a work in progress that I will update with new editions in order to shape an improved final product. I hope you find it useful for your own purposes.

FORWARD BY STEPHEN F. LEDOUX

On this space rock, humans are not alone. We share the planet with many other species. For some of these species, particularly those that we describe as companion animals, we have developed an often mutually profound affinity. Cats and dogs top the list.

Many humans make a substantial time and energy commitment to the care and training of our dogs, sometimes rivaling our commitments to parenting our children. And an ever–increasing number of us are recognizing that this connection runs more than skin deep. Our concerns with managing the causes of behavior, whether the behavior of our companion animals, our children, our fellow humans, or even ourselves, remain ever present. Unfortunately, the value of science in these endeavors sometimes comes as a surprise.

Yet the value of science is in our successes, especially in the form of a sound and substantiated systematic approach, such as that found in the natural science of behavior that we call behaviorology. The openness of the researched principles and designed practices of science certainly save us from the pitfalls of chance, accidents, fads, and secret–knowledge systems that arise when we follow uninformed trial and error patterns, and handed–down tricks and intuitions.

James O'Heare's book, *The Science and Technology of Dog Training*, recognizes all that and more. It provides a thorough, albeit basic, introduction to all the aspects of behaviorology that relate to companion–animal training, especially to dog training, as the best way to understand them and train them. This enables the reader to see *why* one thing works while another fails. Rather than merely following steps in a cook–book of techniques for a simple set of prescribed animal–behavior tricks, this book enables the improving animal trainer to move on to advanced techniques capable of producing complicated behavioral outcomes, all the while emphasizing positive rather than coercive strategies which, again, is how we would treat each other, and our children, to the best effect. As such, this book benefits all levels of readers, from beginners striving to become skilled, to already established professionals.

Finally, by adhering to natural behavior science, this book helps those who love other animals glimpse the value of behaviorology for cleaning up our own human behavior acts. Humanity faces some big problems, such as pollution, overpopulation, and war. All these problems, and their solutions, involve human behavior, and thus benefit by the input of behaviorology. If we fail to solve these problems, then we endanger not only ourselves but our beloved companion animals as well. By becoming more familiar with behaviorology in general, one becomes more capable not only at animal training projects but also at helping create a better world, one that can remain suitable both for us and our animal friends.

Stephen F. Ledoux, Ph.D., DLBC

Author of *Running Out of Time—Introducing Behaviorology to Help Solve Global Problems* and *What Causes Human Behavior—Stars, Selves, or Contingencies?*

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CHAPTER 1. INTRODUCTION TO THE DISCIPLINE OF BEHAVIOROLOGY

Behavioral Objectives

The objective of this chapter is to measurably expand the reader's repertoire of behaviors in relation to describing and relating the history and characteristics of behaviorology as well as the distinctions between it and other disciplines. Upon successful integration of the concepts outlined in this chapter, the reader, where exposed to contingencies to do so, will accurately[1]:

- define and discriminate among science and natural science;
- identify the basic assumptions of natural science including naturalism and determinism; and
- differentiate between behaviorology and other disciplines or branches of disciplines such as psychology, behavior analysis and ethology.

The material in this chapter will introduce you to the natural science of behavior, behaviorology and the philosophy of science that informs it. This will help set the stage for the material in the rest of the book.

Behaviorology

Definition and History

Behaviorology, most simply, is the natural science and technology of behavior. More specifically, behaviorology is the natural science and technology of environment–behavior functional relations. The science of behaviorology began in the 1930s, when B. F. Skinner established radical behaviorism, the philosophical foundation of a natural science of behavior discussed here. Skinner operated from within the discipline of psychology, even though his philosophical orientation was incommensurable with psychology. It was called "operant psychology" at that time. Skinner tried, to no avail, to transform psychology into a natural science of behavior,

[1] Readers will note the phrase "exposed to contingencies" throughout the book. This might evoke consideration is some readers of the contingencies we arrange for dogs. However, this phrase also relates to the exposure of the trainer to contingencies that relate to their own behaviors.

and in the 1970s, the "operant psychology" school of thought became "behavior analysis." This step was a move to distance itself from mainstream psychology, but behavior analysis remained a branch of psychology. After much debate and many years of attempts to make psychology into a natural science, many natural scientists of behavior recognized that they could not change psychology's fundamental transformational paradigm and that remaining associated with the discipline of psychology would compromise their integrity as psychology imposed its influence over the practice of behavior analysis. Many natural scientists of behavior recognized that complete independence was necessary, in order to maintain scientific integrity, but psychology had claimed ownership of behavior analysis and no change in that status was likely to occur. In the 1980s, the entirely independent discipline of behaviorology was founded, with a professional association, educational institution, and peer reviewed journal.[2] Behaviorology is the *only* completely independent natural science of behavior. For an excellent and concise description of the development of behaviorology, see Ledoux (2014) and for a more in-depth description, see Ledoux (2015).

Philosophy of Natural Science

There are different fundamental approaches to studying nature, different "methods of knowing" if you will. Natural science is one such approach, the most effective as it happens, by a long shot. I define and discuss natural science and the basic assumptions under which it proceeds in detail below.

Natural Science

Natural science (aka ***science***) is an empirical approach to studying the phenomena of nature based on certain philosophical assumptions that together go by the name naturalism. ***Naturalism*** is a philosophy of science, utilized by all natural sciences, which holds that *only natural events exist, there are no non-real or non-natural events, and all natural events are theoretically measurable in terms of mass, time, distance, temperature, and/or charge*. Natural scientists simply do not study proposed non-natural or

[2] See www.behaviorology.org

supernatural events; nor may they postulate them as part of an explanation for natural events. If a supposed event is not at least theoretically measurable, it is not natural, and not an appropriate topic of study. It is only through careful adherence to these assumptions and constraints that natural science can generate such robust, reliable products (such as space shuttles, vaccines, massive skyscrapers, and personal computers) when compared to other, less stringently constrained (mystical) methods of studying nature.[3] Clark (2007) put it eloquently: "To be a thorough-going naturalist is to accept yourself as an entirely natural phenomenon. Just as science shows no evidence for a supernatural god "up there," there's no evidence for an immaterial soul or mental agent "in here," supervising the body and brain."

A derivative assumption of naturalism is that of ***determinism***, which states any detectable event represents the culmination of an unbroken and unbreakable natural history—that is, all things are part of a continuous sequence or network of causes and effects and there can be no intrusion into this sequence by non-natural events. In other words, nothing occurs spontaneously, initiatively, or proactively; all events are completely orderly and lawful—that is, caused/reactive. This orderly and lawful characteristic of nature allows us to study it and derive laws and principles that describe these causal relations that we refer to as functional relations.[4]

As an assumption, naturalism cannot be proved "true." It cannot be proven any more than any other basic or axiomatic assumptions, including mystical ones underlying religion and pseudoscience. Then again, scientists do not claim their assumptions to be the "truth," as do adherents of most alternative perspectives—it is an assumption and this carefulness with knowledge is part of the reason science is so incredibly successful. The utility of a philosophy, including its basic assumptions, is determined by how effective and efficient it is at generating parsimonious, robust, and reliable products and how well it withstands efforts to refute it. Scientists are not required to "believe in" naturalism as though it is a

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[3] By comparison, for example, psychology is notoriously ineffective at explaining behavior and even less effective in controlling behavior. Likewise, astrology fails to generate effective predictions of behavior.

[4] Quantum mechanics is sometimes raised as evidence against naturalism and determinism. However, it is important to note that the principles of quantum mechanics apply to subatomic particles; classical physics applies to larger scales of interest. Furthermore, take note that lack of predictability is not the same as indeterminism. Stephen Hawking (2010) argues well that quantum mechanics does not disprove scientific determinism.

fact; they are required to operate under the stated assumptions and within these constraints when they carry out scientific work. It happens that the assumptions of naturalism result in the most parsimonious, robust, and reliable products (i.e., theories, technologies etc.). To the extent that theorists and researchers adhere to the assumption of naturalism, the outcomes of their efforts are effective and efficient. To the extent that one fails to adhere to it, the products of their "study of" is ineffective. Psychology, for instance, is notoriously ineffective and inefficient, largely because it does not require adherence to naturalism.

Psychology, in contrast to natural science, does not require the constraints and assumptions required by the philosophy of natural science—naturalism—and that being the case, psychology cannot be a natural science. Psychology emphasizes the explanation of behavior by the actions of a so-called "mind," a non-natural "thing" or "force" from a mental (nonphysical) dimension that cannot be observed and directly measured, and supposedly directs the actions of the body. Indeed, psychology is "the study of mind and behavior." Moreover, there are other disciplines that do not adhere to natural science constraints and assumptions (e.g., astrology), and as such, they cannot claim the status of natural science either. Mystical assumptions and accounts preclude any discipline from the status of natural science, regardless of whether they also happen to use some scientific methods to study non-natural events as either dependent or independent variables.

Psychology is not a science. Psychology utilizes scientific *methods*, but allows for non-natural phenomena to be studied and non-natural explanations for phenomena. Indeed, the so-called "mind" is a non-natural force at the very heart of the discipline. One may also refer to a non-science that utilizes scientific methods as a "pseudoscience." A pseudoscience is an activity that may resemble science in some way, including the use of some scientific methods, but which is based on fallacious assumptions (vocabulary.com, n.d.). The proffering of non-natural events is to engage in activities that are based on fallacious assumptions. Within the realm of behavior, theology and psychology fall into this category. The current comprehensive natural science disciplines include biology, geology, physics, chemistry, and behaviorology. Behaviorology is the only natural science of behavior.

Radical Behaviorism

Behaviorology was founded on a philosophical framework called "radical behaviorism," devised by B. F. Skinner in the 1930s.[5] Radical behaviorism simply extends the assumptions of naturalism to the discipline of studying behavior. Although Skinner was employed within an academic psychology department, his subject matter and approach were different from those utilized in psychology, indeed they were incommensurable. Where psychology postulated an inner agent called the "psyche" or "mind" in order to study "mental" processes, Skinner proposed the study of behavior itself, for its own sake, and from a strictly natural science perspective, without reference to hypothetical (i.e., non-real) constructs. Taking his inspiration from the selection causation paradigm used in biology, Skinner improved vastly upon some other "behaviorisms" that existed at the time. Radical behaviorism is hence a philosophy of natural science and places behaviorology at the natural science roundtable.

Radical behaviorism is characterized by three fundamental assumptions:

- behavior is an entirely natural phenomenon, respecting the continuity of events in space and time, which, accumulates as a natural history of fully caused events;
- the emphasis is on analyzing the environment–behavior functional relations, experimental control over dependent variables and the application of that control in culturally beneficial ways; and
- private events such as thinking or emoting are real behaviors occurring in accordance with the same set of laws and principles as more overt behavior.

[5] Note that the word radical, in this use, refers to "fundamental" or "thorough-going" and not to any kind of extremism; it is merely unfortunate archaic terminology selected to distinguish it from other forms of behaviorism.

Modes of Causation

Natural science disciplines study the causal relations between real variables.[6] The ***dependent variable*** refers to the phenomenon to be explained (in our case, behavior) and the ***independent variable*** refers to the event that is said to cause or explain it (in our case, environmental stimulation). I explore this further in chapter 2. Different modes of causation make up the relationships between these variables. Physics and chemistry rely heavily on ***mechanistic causation***, which deals with what comes immediately before something else and reliably triggers its occurrence—the second thing *depends on* the first. For example, I might say "sit" and that would trigger/cause my dog to sit. Biology and behaviorology rely heavily on ***selection causation***, which deals with selection by consequences—that which comes immediately after something influences the future likelihood of that thing occurring again. For example, because I deliver a treat to my dog every time he sits upon my saying "sit," he is more likely to sit in the future, and the consequence that sitting generated *causes* an increase in the likelihood of future sitting behavior.

Selection by Consequences

Behaviorology recognizes and utilizes both mechanistic and selection causation in explaining and controlling behavior. However, the selection mode of causation is the unique and central feature in explaining and controlling operant behavior within behaviorology. Operant behavior is behavior selected for by consequences. ***Selection by consequences*** may generally be understood as iterations through cycles of (a) <u>variation</u>, (b) <u>interaction</u> with the environment, and (c) differential <u>replication</u> as a function of that interaction (Moore, 2008, pp. 136–137). Selection by consequences results in three different types of evolution: biological evolution; repertoire evolution; and cultural evolution. I describe repertoire evolution below.

[6] Actually, natural sciences do not always involve the study of causal relations. For example, cause is not addressed at all in gravitational astronomy. See Moore (2008, p. 275). Causal relations are, nevertheless, central to the practice of most natural sciences.

About 85 years ago, B. F. Skinner (1938/1991) elucidated the process of ***repertoire evolution***, the selection of repertoires of behavior due to consequences within an individual organism across the lifespan of that individual. The term ***repertoire*** of behavior refers to the full range of behaviors a subject exhibits and can be broken down into categories (e.g., a repertoire of verbal behaviors). An individual's repertoire of behavior evolves moment-by-moment by way of selection by consequences via ***contingencies of reinforcement***.[7] Throughout the life of an individual, various behaviors are strengthened by reinforcement, suppressed by punishment, and weakened by extinction on a moment-by-moment basis, as the behaviors are consequated and the relative frequencies of each of the behaviors changes over time. There is *variation* within the distribution of operant behavior. *Interaction* with the environment involves exhibiting behavior that generates changes in the environment that then impact the individual. Differential *replication* occurs through reinforcement, punishment, and extinction of operant behaviors within the individual's repertoire. As a result of repeated iterations through this cycle, the individual develops a repertoire of operant behavior. This repertoire is established through selection by consequences. Behaviorologists study behavior at this level of analysis.

Behaviorology involves the experimental analysis of environment–behavior functional relations, as well as the establishment and application of an efficient and effective technology for controlling behavior. Because of the completely naturalistic character of behaviorology and its emphasis on environment–behavior functional relations, behaviorology is highly effective and efficient in controlling behavior (e.g., training).

More information about behaviorology is available at www.behaviorology.org. In order to provide a means to effectively differentiate between other disciplines, I discuss branches of disciplines and general approaches that assess behavior in detail below.

[7] Contingencies of reinforcement, in this broad usage refer to contingencies featuring reinforcement, punishment, or extinction.

Behavior Analysis

Many readers are likely to be familiar with behavior analysis. Behavior analysis is a division of psychology (APA, 2014; Fraley & Ledoux, 2002), one that many would argue is struggling with its identity and credibility. On the one hand, behavior analysis was initially founded to become a natural science of behavior and it has made moves to distance itself from the rest of psychology, while remaining tied to psychology. On the other hand, members with an eclectic, rather than completely natural science background have been recruited, which has resulted in a failure to assert, declare, and secure complete independence from psychology, as those in psychology claimed and continue to claim behavior analysis as an aspect of psychology. On the one hand, behavior analysis would ideally be a natural science of behavior, but on the other hand, it is tied to a pseudoscience parent discipline, the result of which is a dilution and compromising of its integrity as a label.

Many would argue that behavior analysis cannot be a comprehensive and independent discipline until behavior analysis asserts, declares, and secures complete separation and independence from psychology (including forcing psychology to release any claim on the label). Until then, the problem of credibility will remain. Many behavior analysts are psychologists with minimal training in natural science, which results in the dilution of natural science integrity and a membership more inclined to remain tied to a pseudoscience.

Behaviorology, on the other hand, is a comprehensive, and completely separate and independent natural science of behavior. It is absolutely no kind, type, division, or branch of psychology. Behaviorologists work cooperatively with behavior analysts, where appropriate, but until behavior analysts assert, declare, and secure *complete* independence from psychology, behaviorology remains distinct from behavior analysis to protect its credibility as a comprehensive and independent natural science of behavior.

That is *not* to say there are not a great many behavior analysts who have been trained completely from a natural science orientation or who eschew their mystical training and who practice with the highest professional integrity as individuals. Indeed, there are. Furthermore, consistent with the eclectic and diverse membership, many behavior analysts accept their technician level role, while others do not. Behavior analysis does have its own professional associations and peer-reviewed journals. Some further promising developments for behavior analysis include the founding of a Department of Behavior Analysis at the University of North Texas that is separate from the Department of Psychology and certification beyond the 5-course technician level at the bachelor, master, and doctoral level. Organizationally however, the behavior analysis label ambiguously represents a kind of psychology. If behavior analysis does declare and secure complete independence (including forcing the APA to relinquish the division name), require members be strictly natural scientists, and require terminal degree level training in the natural science of behavior, then behaviorology and behavior analysis would surely merge in one way or another, bringing all natural scientists of behavior back together, completely independent of psychology.

Ethology

Ethology is a branch of biology that studies nonhuman behavior patterns that evolve in "natural" habitats, either in the species as a group, smaller population groups, or individuals, with an emphasis on behavior patterns that do not depend on, or are believed by ethologists to depend on, operant conditioning. Ethology studies behavior from the phylogenetic level of analysis. That is, ethologists are interested in innate behavior and how it evolved, rather than studying the functional relationship between the behavior of an individual animal and the environment (ontology). Examples, of the kinds of behavior patterns ethologists describe and catalogue, include "fixed action patterns," "modal action patterns" and "reaction chains." Ethology has extensively catalogued the innate behavior patterns of many non-human species and can inform behaviorology with respect to the topographies of these behaviors and to the likely selective pressures that resulted in the evolution of physical traits that contribute to the behavior. Behaviorologists would generally not be particularly interested in the stories said to explain why certain physical traits evolved. Furthermore, although the topographies of these behavior patterns and discrete innate responses are more or less correlated with certain functions, they are not the same thing and behaviorologists study the function of behavior at the ontological level of analysis. They do so because this is the most productive approach at the level of analysis concerned with control of the behavior of individuals. For instance, although the topographies of growling, snarling, snapping, and lunging in dogs is strongly correlated with escape/avoidance functions, they are not always and necessarily so. A dog can be trained to exhibit these behaviors with added reinforcement. While appreciating certain topographically described behavior patterns that tend to be correlated with certain specific functions, the work of behaviorologists and behavior technologists is to identify the ontological *function* of behaviors. Ethologists and behaviorologists do not study the same thing at the same level of analysis. Readers are cautioned against utilizing ethological notions and theories as explanations for behavior at a level of analysis appropriate to explaining and changing the behavior of individuals. In other words, ethologists simply do not "do" what behaviorologists "do" and it can be misleading and counterproductive to believe otherwise.

Medical Paradigm

Historically, before the appropriate expansion of a natural science of behavior into the animal behavior field in the mid-1900s, companion animal guardians conveniently turned to veterinarians with questions about how to train their companion animals or resolve problem behaviors. Veterinarians obliged their clients by applying a similar approach to dealing with problematic behaviors as they did for disease processes—by labeling and categorizing them, and drawing on ethology and psychology to devise treatment protocols, mainly through trial and error.[8] The labeling and categorizing of behavior patterns, and the rather haphazard approach, generated a hodgepodge of handed-down anecdotal treatment protocols. These are dressed up with clinical terminology, which provides an air of credibility, but the results are not impressive. The behavior is left unexplained and the connection between the assessment and the "treatment" is dubious. This approach is referred to as the ***medical model***. Some veterinarians continue to operate as though they are competent to work with clients on behavior issues. Of course, while a veterinary license assures of competence in medical care, it provides no such assurance with

[8] Sometimes, the label or category was put forth as the explanation for the behavior, resulting in a nominal fallacy (i.e., is the mistaken assumption that naming something explains it).

respect to behavior. Some veterinarians may be properly trained in behaviorology or behavior analysis of course, and as such, this would assure the public of competence in that discipline. However, a veterinary license is not a relevant credential for dealing with behavior. Indeed, there is a veterinary board certification in animal behavior based mainly on the medical model approach. Behaviorologists would *not* consider this an appropriate credential for dealing with behavior either. Only natural science of behavior credentials assures of competence in addressing behavior in companion animals.

Other organizations exist for non-veterinarians that certify members as “applied behaviorists,” but they are largely ethology and psychology focused, operating under an outdated and inappropriate medical model and ethological approach as well and hence also unsuitable as qualified technologists of behavior. With the emergence of a natural science of behavior, the training of companion animals, and assessment and resolution of problematic behaviors can now be handled systematically, and in a principled manner, based on the laws and principles of behavior.

Orientation of This Book

This book proceeds from a behaviorological orientation. There is no speculation about what animals may or may not understand, desire, or want, or what might be occurring inside a so-called “mind” between stimulation and behavior. There is no discussion of other fictitious constructs such as “dominance.” Nor will problem behaviors be labeled with names to provide supposed explanation for them. Instead, the focus of this book is on the actual functional relations associated with the behaviors of concern.

Continuing Education

Ledoux (2015) provides an excellent and comprehensive introduction to the history and emergence of behaviorology.

Moore (2008) provides an in-depth treatment of radical behaviorism, although it ignores the role that behaviorology plays in the natural science of behavior, which is common among behavior analysts, who typically ignore, or are oblivious to, the credibility issues associated with behavior analysis.

CHAPTER 2. FOUNDATIONAL PRINCIPLES OF BEHAVIOR

Behavioral Objectives

The objective of this chapter is to measurably expand the reader's repertoire of behaviors in relation to describing and relating the principles of behavior. Upon successfully integrating the concepts outlined in this chapter, the reader, where exposed to contingencies to do so, will accurately:

- define behavior, stimulus, and conditioning;
- identify the cause of behavior at a level of analysis appropriate to training;
- distinguish between operant and respondent conditioning;
- identify the terms in the 3-term operant contingency and explain their relationship to one another;
- describe the physics of environment–behavior relations;
- define and relate added and subtracted reinforcement, added and subtracted punishment, extinction, and analyze behavior scenarios to determine which principles operate on them;
- identify the variables that affect the strength of operant conditioning;
- define the schedules of reinforcement, under what circumstances each is useful and what effect they have on conditioning;
- define operant generalization and discrimination as well as the roles they play in training;
- explain how to transfer stimulus control;
- define differential reinforcement and its variants;
- define respondent conditioning and its role in the operant contingency and training;
- define habituation, potentiation, and sensitization processes as well as respondent extinction; and
- graph behavior objectives, establish a baseline on the current strength of the behavior, and continue to track the behavior throughout a training project.

Introduction

Behaviorologists are concerned with describing and explaining the relationship between behavior and the environment. The environment causes behavior. Our goal is to identify the principles that govern this functional relationship and, specifically, exactly what independent variables in the environment are causing the behavior in any given case. This allows us to make the necessary adjustments to the environment and thereby control the behavior. This chapter provides a basic review of the foundational principles of behavior in which behavior technologists should be strongly versed. For a more in-depth coverage of this topic, see my book, *Problem Animal Behavior*.

For those relatively new to the natural science of behavior, this chapter is designed to be read (actively) twice. Terms are used before they are formally defined and rereading will ensure appropriate conditioning of the content for these readers.

Various terms refer to the systematic changing of behavior, including "***behavioral engineering***," "***contingency engineering***," and "***behavior change programming***." This process entails arranging the environmental circumstances (independent variables) such that conditioning occurs, resulting in specific, relatively enduring, changes in behavior (dependent variable). The objective of a contingency management project is to change behavior as efficiently and effectively as possible toward established objectives. Behaviorologists and behavior technologists establish specific behavior objectives, and systematically identify and apply standard behavioral engineering strategies and tactics, to condition the subject to exhibit specific behavior and to bring that behavior under the control of specified stimuli. Animal trainers tend to focus on addressing behavioral deficits, leaving the resolving of behavior excesses to behaviorologists and animal behavior technologists. The appropriate principles are applied in formulating procedures or protocols that will achieve the objectives, and then they are carried out. This is achieved by controlling the causes of behavior—the environment. The change made to the environment causes the resulting change in behavior. Coverage of the principles of behavior will provide the basic natural science foundation from such a technology is derived. An appreciation of these strategies and principles allows the trainer to analyze behavioral events and design appropriate interventions that will effectively and efficiently change behavior toward established goals.

Environment–Behavior Functional Relations

Behavior, Stimulation, and Functional Relations

Behavior

Behavior is any measurable, neurally mediated reaction of a body part to stimulation. As a natural science, the dependent variable (i.e., behavior) must be directly measurable. If the dependent variable is not at least theoretically measurable, then it is not natural and it is outside of the scope of what natural science can study.

The reaction might be neuromuscular or solely neural. In other words, it can involve the externally noticeable movements of body parts by innervated muscles, or it can be solely neural, including consciousness-related behaviors (e.g., those behaviors commonly referred to as thinking, recognizing, comprehending, and/or visualizing) and observable only to the individual exhibiting the behavior. Private behaviors such as these are behaviors, because they are directly observable and measurable, even if just to an audience of one—the organism exhibiting the behavior.

The stimulation (i.e., contact with the environment) that causes the reaction can come from anywhere outside of the specific body part that is reacting, be it outside of the body or within it. This is one reason that we specifically include and identify the behavior of a body part in the overall definition of behavior.

Being "neurally-mediated" means the energy transferred from the environment causes neural behaviors to occur that then mediate the reaction(s) of other body part(s). Note that behaviorologists are interested in the functional relationship between the stimulation and reaction of the body part to the stimulus. Physiologists study the mediating neural behaviors—the *how* of the behavior—whereas behaviorologists study the *why* of behavior, that is, the relationship between stimulation and the reaction (i.e., behavior).

The word "reaction," as opposed to some other word such as "response," highlights the reactive and passive (rather than active and initiative) nature of behavior, in that behavior is fully caused and not autonomously initiated by a supposed inner agent without physical status that may "will" the body to act. Behavior is simply the body's reaction to stimulation. In beings with a nervous system, we call this "behavior."

Emotional responses are real behaviors (of the respondent type, as opposed to operant, as discussed below), involving the release of chemicals into the bloodstream by glands and certain neural processes (also as discussed below).

To assure appropriate discrimination with respect to the word "behavior," it is also important to distinguish between traits and behaviors. Laypeople may refer to traits such as "stubbornness," "rudeness," "spitefulness," "selfishness," "aggression," or "hostility" to describe an animal's behavior, yet although these descriptors might be evoked when under contingencies to render a general verbal description of a pattern of behavior, they are not behaviors *per se*.

Let us explore a number of more specific terms related to behavior. Whereas the term ***behavior*** is general or generic, a ***response*** is a particular occurrence of a behavior. No two responses will ever be precisely the same in every way. Thus, a response is a one-time event. By definition, one cannot repeat a one-time event and therefore we cannot track it quantitatively (except to say that one event occurred). If drinking in general is an example of a behavior, drinking on one particular occasion is a response.

When we are under contingencies to identify a number of related responses, usually so that we may identify instances of their occurrence and count them, a way is needed to define sets of related responses. The concept of a response class resolves this problem. A ***response class*** refers to a set of individual responses that share a common eliciting stimulus (for respondent behaviors, discussed below), or, consequential effect on the environment (for operant behaviors).

One of the most important classes of responses that behaviorologists deal with is operant behavior. As we will explore in detail below, an ***operant behavior*** is behavior that is influenced by consequences. An ***operant response class***, as a set of behaviors, may differ topographically, but they share a common effect on the environment (the consequence). That is, members of a response class share in common, not how they look or sound etc., but the consequence they generate. The concept of a response class allows us to categorize and analyze iterations of functionally equivalent responses over time.

We are often under contingencies to refer to the member responses within a response class, and for that we use the phrase "response class members." ***Response class members*** are simply responses within a response class.

As mentioned, response classes are defined solely functionally, that is by their shared effect on the environment, which is another way of saying that they share the same consequence. Let's establish a running example so that we may apply it to these various concepts. Let's use the behavior, "drinking." A specific instance of drinking would be a response. The response class of drinking would be defined by consuming a liquid. Any form of behavior that results in consuming the liquid is a member of the response class. Our interest is in liquid getting consumed and so that is our response class. Now, consuming water can look (sound, etc.) different, depending on exactly how it occurs. In other words, there are many forms it might take, but they all share the consequence of liquid being consumed and so they are all "drinking." One might sip, or chug-a-lug, suck through a straw, or toss water from one's hands after scooping it from a stream. There is a vast number of topographies for the behavior but we utilize the notion of a response class to conveniently clump a number of *functionally* equivalent responses together and treat them as repeatable behaviors.

Let's say that we are under contingencies to specify a form of interest. In many cases, an entire response class is a problem—that is, any form it takes is a problem. But, in many cases, the problem is not the shared outcome, but rather how that outcome is generated. In other words, some forms of the response class are acceptable and other forms are not. In these kinds of cases, we need a mechanism by which to define specific forms within a response class. For example, chug-a-lugging might be a problematic form whereas sipping is not.

A ***response class form*** is a set of responses within a response class that share a specific topographic feature or criterion. Within the response class of drinking, we might define chug-a-lugging as our behavior of concern. We could define this by the liquid being consumed from a container in large gulps in rapid succession, maintaining contact with the container between gulps. This then is the response class form of concern, which separates that form within the response class from all other forms that drinking might take, and we might call this chug-a-lugging for conciseness. This allows us to determine when, among any number of behaviors, this response class form occurs and does not occur. We can therefore count them and calculate the rate or relative frequency (terms to be discussed below) through time, which will inform us regarding the strength of that behavior. This in turn allows us to set goals regarding changing the strength of the behavior and to compare the strength of the behavior before and after an intervention of some kind.

Let's explore a different example related to dogs in a common scenario. As mentioned, behavior technologists are frequently under contingencies to define some response class members as problematic and others not. In these kinds of situations, we frequently seek to install the non-problematic response class members to the exclusion of the problematic members. This requires us to be able to categorize the different sets of response class members. When the difference between the two sets of response class members is a matter of the form or topography of the behaviors, we refer to each of these sets as "response class forms."

Let's say that a dog jumps up on people who enter the front door and that social contact reinforces this behavior. The response class would include any behavior, no matter how it looks, that generates social contact/attention/interaction during greetings at the door. This would include jumping up but it would also include sitting, so long as they both generate social contact when greeting at the door. Behavior technologists might seek to solve this problem by training the dog to sit instead of jumping up. In this example, jumping up is a response class form and sitting is a response class form and they are both response class forms of the same response class. Now that we have a way to differentiate between the two sets of similar response class members, we can easily determine when one or the other occurs. That means we can count them and determine exactly the rate or relative frequency of each response class form. Identifying the response class form also allows us to set different procedures for each kind of behavior. For example, from now on, sitting will result in social attention and jumping up will no longer result in social attention—the guardian will turn and face away rather than petting and saying nice things to the dog.

The different terms relate to the differing contingencies we might be under. If we are referring to an individual behavioral event, then we refer to a "response." If you come home and your dog jumps up on you, referring to that instance of behavior would call for referring to that response. If we want to count functionally equivalent responses across time, then we utilize the concept of a response class. Particularly in applied settings, while we are counting response class members, we are frequently under contingencies to also include some topographic (i.e., form) criteria as well in order to differentiate one form from all of the others. Under these circumstances, we utilize the concept of response class form. In cases in which we merely need to identify functionally equivalent responses, it does not matter what the behavior looks like—just what the outcome is that is maintaining it. For example, any form within the response class that results in the dog consuming contents from the garbage can is a problem, and the function is always key, so we stick with the response class as a whole. Jumping up on the other hand might be an example of a situation in which we are under contingencies to define only a specific form of the response class as problematic. There are many acceptable response class forms that access social attention upon greeting that are acceptable (e.g., sitting) and then there are the ones that are a problem (e.g., lifting front feet up and putting them on people).

The above examples have involved operant responses and response classes. The other major class of responses is referred to as "respondent." ***Respondent behaviors*** constitute a class of responses that are insensitive to consequential stimulation. They are elicited by conditioned or unconditioned antecedent stimuli and are uninterruptable by interjected streams of energy once the eliciting stimuli reach their eliciting threshold. This kind of behavior is explored below in detail, as well as the distinction between operant and respondent behaviors. But, for our purposes here, a ***respondent response class*** includes all respondents that share the same eliciting stimulus—the stimulus that triggers the respondent. With operants, it is all responses that share a common consequence, but for respondents, a response class is all respondents that share a common eliciting stimulus.

Categories of Behavior

There are many ways to classify, categorize, and differentiate among behaviors. A descriptive system may differentiate between: *motor behaviors*, which involve neuromuscular movements; *emotional behaviors*, which involve the release of chemicals into the bloodstream by glands and certain neural; processes; *neural behaviors*, which involve only neural reactions without muscular movement; *verbal behavior*, which is behavior, the consequences of which are mediated by an organism when the mediating organism is behaving in ways that have been conditioned and maintained in the same verbal environment; and making a fundamental distinction between *overt behaviors*, which are observable by others versus *covert behaviors*, which are observable only to the mediator of the behavior (Ledoux, 2014, pp. 88–92). Though there is utility in these distinctions, behaviorologists are more interested in functional distinctions. The most fundamental functional distinction is between operants and respondents (Ledoux, 2014, pp. 94–98).

Operant versus Respondent Behavior

Behaviorologists recognize and differentiate between two fundamentally distinct kinds of behavior alluded to above—operants and respondents. ***Operant behavior*** is behavior that "operates on the environment" in ways that generate feedback to the nervous system, which then changes behavior in ways that result in increases or decreases in the rate or relative frequency of the behavior on subsequent occasions. Simply, operant behavior is behavior that is influenced by the consequences it generates. Any behavior that can be reinforced, punished, or extinguished is operant. Examples of operant behavior include sitting, walking, and speaking.

Conditioning is a biological process. In the case of conditioning operant behaviors, an organism reacts (i.e., responds) to stimuli, the operant response causes changes to the environment, which are then detected by the subject's nervous system, which is then changed in ways that result in that nervous system being more or less reactive to similar stimuli on subsequent occasions of their occurrence. In other words, the environmental feedback (e.g., seeing a crushed can, and feeling and perhaps hearing it collapse) generated by the behavior (e.g., crushing a can in your hand) causes either an increase or decrease in the likelihood of the body to exhibit that behavior on subsequent similar occasions.

If a number of operant behaviors are maintained by the same outcome (i.e., reinforcer), they would be members of the same operant response class—these operant behaviors are ***functionally equivalent*** (though they are not necessarily topographically equivalent). This is an important point to recognize when defining behavior functionally rather than topographically or descriptively. For example, reaching out, turning a knob, and pulling a door open is maintained by the opening door reinforcer, but so too is opening the door with a button that causes the door to open or even saying "open the door" and someone else opens the door, because you said to do so. All of these topographically differing behaviors are functionally equivalent—they share a consequence in common: the door becoming open. The rate of the operant and the form that the operant takes, will be shaped over time by how successful they are at generating reinforcing outcomes. If any of these forms fail to generate reinforcement, then that form will become less likely. If the behavior results in some aversive (i.e., painful or uncomfortable) outcome, then the operant will likely be suppressed. However, if the behavior does commonly result in the door becoming opened (where that outcome is reinforcing), then the likelihood of that behavior occurring will be maintained or increased in the future. This is what it means for the operant to be sensitive to, or influenced by, consequences.

The other major type of behavior that behaviorologists are interested in is respondent behavior. ***Respondent behaviors*** constitute a class of responses that are *INsensitive* to consequential stimulation. In other words, whatever stimulus changes occur after the respondent behavior, they will not influence the future likelihood of the respondent occurring in the future, as with operant behaviors. Respondent behaviors tend to be simple, invariant/stereotyped reactions.

Another interesting quality about respondent behaviors is that they are uninterruptable by interjected streams of energy once the eliciting stimuli reach their eliciting threshold. If an operant behavior is evoked and about to occur but some more powerful evocative stimulus occurs, the subject will likely exhibit the newly evoked behaviors instead of the operant one that was about to be evoked. One may, for instance, be "distracted" out of exhibiting an operant behavior. With a respondent behavior, on the other hand, if the eliciting stimulus has reached a point at which it will elicit the respondent behavior, other emerging contingencies will not prevent the response. One may physically force a body in such a way that makes the respondent impossible but that is a different matter. Respondents include such behavior as blinking when a puff of air impacts the eyeball, salivating when food is placed in the mouth, and the release of various chemicals into the bloodstream from glands and certain neural processes referred to as "emotional behaviors" elicited by various forms of stimulation.

Some respondents are unconditioned in that no conditioning is required for the body to elicit the behavior. In these cases, a specific stimulus elicits the specific respondent with no previous conditioning to establish that relation. However, neutral stimuli can also come to elicit a respondent behavior similar to these unconditioned responses. This kind of response is referred to as a "conditioned response." That is, respondent behaviors can be part of functional relations with an eliciting stimulus that is unconditioned (the body is simply structured to react that way to that stimulus) or conditioned (the body is not simply structured to react that way to *that* stimulus, but a conditioning process occurs that makes that reaction happen). In the case of respondents, the reaction component remains the same; what can change through conditioning is what stimulus elicits it.

The environment is said to *elicit* respondent behaviors and *evoke* operant behaviors. This emphasizes the distinction between these two fundamentally different kinds of behavior.

The key distinction between operants and respondents is that operants are sensitive to, and indeed driven by, the consequences that they generate, whereas respondents are not. Stimulation might occur after respondents, but they will not influence the likelihood of the respondent occurring in the future. If the rate of a behavior is influenced by the consequences that it generates, then it is an operant.

Operant and respondent behaviors and the related conditioning processes are always occurring, including simultaneously and often they interact in complex ways. For example, emotional behaviors are always being elicited. ***Emotional behaviors*** involve the release of chemicals into the bloodstream by glands and certain neural processes. In some cases, these chemicals impact operant behaviors, setting the occasion to access or escape certain stimuli for example. The emotional behaviors are respondent (because they are insensitive to consequences) and the approach or escape behaviors are operant (because they are sensitive to consequences) and they not only occur at approximately the same time but they interact.

Stimulation

A ***stimulus*** is a measurable energy change that causes a bodily reaction. The "***environment***" (i.e., stimulation) is the total of all measurable energy changes that an organism reacts to. Every interaction between behavior and the environment involves energy. Indeed, behavior *is* the reaction of a body part to changes in energy. We conventionally refer to any detectable energy changes that a body part reacts to, other than the body part exhibiting the reaction, as the "environment" for clarity purposes. While energy change is ubiquitous and continuous, we commonly simplify our analysis of behavioral events by framing stimulation in discrete units that we then call stimuli (singular, stimulus).

The environment occurs on either side of the skin and no special laws or principles of behaviors are required to deal with those that occur within the body of the behaver. The term ***endovironment*** refers to the environment inside the body and the term ***ectovironment*** refers to the environment outside of the body.

When we refer to "a stimulus," we are usually referring to a discrete feature of the environment, an energy change of a particular kind. In this way, we simplify what can be a very complex set of events. If, for instance, a certain profile or arrangement of photons impacts the optic nerve, this change in energy constitutes an "event" and is called a stimulus.

Stimulation results in a nervous system's reaction to it. A cascade of neural firings is triggered (i.e., elicited) and further chain reactions occur. All of these reactions are behaviors. The neural processes are behaviors themselves and can be considered the mediation of other, often larger-scale, reactions. That is, the cascade of neural processes, the physiological changes, and any neuromuscular actions that take place are components of the reaction at a scale that evokes the word "behavior."

If the behavior of interest is a large-scale reaction, such as putting on sunglasses, then the extensive chain reaction that occurs between the light impacting the eye and the putting on of the sunglasses is considered the mediation of that behavior; it is simply *how* the behavior is triggered. In an analysis at this scale, we are not particularly interested in the details of the cascade of chain reactions that culminate in the putting on of the sunglasses. A physiologist would be interested in all of these intricate neural and endocrine processes. Instead, the appropriate scale of analysis for behaviorologists and behavior technologists in this kind of analysis is the light impacting the optic nerve (stimulus) and the putting on of the sunglasses (behavior). Our physiologist colleagues study the mediation processes—the *how* of the behavior (the neural patterns)—and behaviorologists study the *why* of the behavior (the evocative stimulus, the evoked operant and the history of reinforcement that has led to this relation).

Functional Relations and Contingencies

Structure of Operant Contingencies

Nature is composed of an unbreakable continuity of completely natural events that accumulate in a natural history that is fully caused, orderly, and lawful. To assume otherwise is unsupported and is simply not fruitful. It is only with such regularity that nature can be studied. In natural science, the event that is being explained or accounted for (the thing being caused) is referred to as the ***dependent variable*** and the event that causes it is referred to as the ***independent variable***.

Natural science identifies and describes the functional relationship between real dependent and independent variables as they occur in nature and this description serves as an explanation for the dependent variable. A ***functional relation*** is a relation between two events in which a dependent variable changes systematically as a function of changes in one or more independent variables. In behaviorology, the dependent variable is the behavior under consideration, and the independent variable is the stimulation that is necessary and sufficient to trigger the behavior or result in a change in its rate or relative frequency. Therefore, behaviorologists study the functional relations between behavior (the dependent variable) and the environment (the independent variable).[9]

For instance, when the likelihood of a behavior occurring changes reliably as a result of the presentation of a stimulus, we would say that this is a functional relation. Likewise, when the rate or relative frequency of a behavior changes as a result of stimulation presented immediately following that behavior, we would say that this is a functional relation. Thus, when we refer to a functional relation, it is the relationship between two events that we are talking about; one *depends* on the other to occur.

Under contingencies to identify potential and actual instances of functional relations, we identify a relation or hypothesized relation as functional when it has been experimentally determined/confirmed. A functional relation may exist without our having confirmed its existence, but when we state that a functional relation exists, we are really saying that we have confirmed it experimentally.

A ***contingency*** describes a functional relation or set of functional relations between a response class and a class of antecedent and/or consequent stimulus changes. In other words, a contingency describes a set of variables and the functional relationship between them. Whereas the term "functional relation" is used to specify a relationship between two events, specifically, a stimulus and a behavior in our case, emphasizing the dependent nature of the relation, the word contingency is used to refer to the terms (i.e., the events) *and* the relation between them and may include any number of terms and functional relations from a simple stimulus-response contingency to a many-term operant contingency with multiple antecedent, behavior, or postcedent terms.

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[9] You may have been wondering why we refer to the relation as "functional" rather than "causal"." There are two reasons. There are several uses for the word causal. For instance, there are mechanistic and selection causation and these are both quite different kinds of relationships between two events. Therefore, using the word causal may be vague. More importantly however, any instance to the contrary would refute the idea that something is a cause, and since we cannot observe every single instance of a relation through the entire history of instances of it, the word "functional" is more accurate and justified. Of course, with an accumulation of instances in which the relation is supported and not refuted, confidence grows that the relation is indeed likely causal. The term "functional relation" (as opposed to causal relation) is used to ensure greater clarity and precision, a level of carefulness quintessential to natural science.

Contingencies are brief events, the terms of which separated by mere seconds, when separated at all. Getting a good grade hours or days after completing homework or doing a test may indeed lead to an increase in the likelihood of completing homework but this would not be an example of a contingency of reinforcement. These longer-term sequences of events including behaviors can be (and are) explained by the natural science of behavior but they usually involve extensive verbal behaviors (i.e., thinking) that involves verbal "rules," "instructions" and other verbal behaviors that tie the response class to the more distant consequence (they are sometimes called ***meta-contingencies***). This, however, is beyond the scope of this book. The kinds of "contingencies of reinforcement" we are concerned with involve terms that occur contiguously, that is, in extremely close spatial and temporal proximity. So, a person says "sit," a nearby dog sits, gets a treat right away, and then the dog is more likely to sit when the word "sit" is vocalized again in the future, particularly if the dog is not satiated with food at that time or other competing contingencies are not taking place at the same time. The utterance "sit," the sitting behavior, and the treat delivery, all occur within just a couple/few seconds. Any longer between any of the terms in this contingency and conditioning becomes unlikely.

When we refer to contingencies as being brief, generally occurring within a couple/few seconds, we are talking about the time between component two-term contingencies. The time between the stimulation and the behavior is key, not the total time taken by all of the events in a three- or more term contingency. A behavior can be maintained for an extended duration, well beyond a few seconds but what matters for the appropriate conditioning to take place is the time between the evocative stimulus and the initiation of the behavior and between the finishing of the behavior and the consequence.

In analyzing episodes of behavior and the functional relations of which the behavior is a component, behaviorologists and behavior technologists engage in what is called a "contingency analysis." A ***contingency analysis*** may refer to either (a) the *procedure* involved in analyzing episodes of behavior to identify the components of the contingencies involved, or (b) the descriptive notation of the contingency—the *product* of the analysis process. During a contingency analysis *process*, behaviorologists experimentally determine the functional relations that a specified behavior of concern is a component of, and what is written out or otherwise verbalized is the product, which is also called a contingency analysis (or sometimes a "contingency statement," or simply, "contingency").

Let us begin our coverage of contingencies and contingency analyses with the broadest representation of the simplest contingency formula to represent an episode of behavior. The broadest formulation of a potential (hypothesized) ***three-term contingency*** is depicted as A – B – P. In this sequence of events, A is the antecedent stimulus, B is the behavior, and P is the postcedent stimulus.[10] ***Antecedent stimuli*** are those events that occur immediately before a target behavior and ***postcedent stimuli*** are those events that occur immediately following the behavior. An en-dash (–) indicates a potential, but as yet undetermined, relation between the terms in the analysis. Therefore, we have here a representation of a sequence of events rather than a confirmed contingency at this point.

Many events are likely to occur before and after a given response, but they are not necessarily all functionally related to the response class. Once a functional relation between the response class and stimulus class has been confirmed, the en-dash is replaced with an arrow (e.g., →). Once it is determined that an antecedent stimulus is functionally related to the behavior and evokes it, we refer to that antecedent stimulus as an ***evocative stimulus*** (S^{Ev})[11,12]. Once it is confirmed that a postcedent stimulus is functionally related to the response class and either changes or maintains the rate or relative frequency of the response class, it is referred to as a

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[10] Please recall that the word "means" is a colloquial verbal shortcut. Words do not have inherent meaning. Nor do they develop "meaning" in the sense of referring to a mental lexicon stored in the mind, as psychology would suggest. The "meaning" of something (including words) is a colloquial reference to what evokes and maintains the behavior of uttering the word (Johnston & Pennypacker, 2009). If a red truck with sirens and red flashing lights evokes the verbalization "fire truck" and someone else says "yes that's right," then the so called "meaning" of that phrase is simply a reference to that relation—the reinforcement of its vocalization in the presence of a red truck with sirens. In behaviorology, verbal behavior is treated as operant behavior, requiring no reference to non-real events. Instead, it operates in accordance with the established laws and principles of operant conditioning. Without the verbal shortcut, I would need to explain how the utterance *ante* is evoked by stimulus features that are similar to the stimulus features that evoke the word before. While behaviorologists rightly favor accuracy over convenience in language, more accurate verbal behavior in this book may confuse some readers, making working through the book aversive. A balance must be found until readers move on to study radical behaviorism and verbal behavior in greater depth. A footnote provides an opportunity to expand the reader's repertoire on these finer points and perhaps prompt interest in further study.

[11] The older term "discriminative stimulus" (S^D) is acceptable as well, particularly within behavior analysis. However, the newer term "evocative stimulus" is now more commonly used within behaviorology and is considered the proper term.

[12] Other categories of antecedent stimulation (function-altering stimulation) are introduced below.

selector. If it is determined that that selector is generated by the behavior, and not merely coincidental, it is referred to as a ***consequence***. (These terms are discussed in detail below, but their introduction here allows for a fuller appreciation of functional relations in general.) Thus, the antecedent stimulus *functionally controls* the behavior, which in turn, *functionally controls* the postcedent stimulus. There are other ways to frame the relationship. For example, the postcedent stimulus is *contingent upon* the occurrence of the behavior and the behavior is *contingent upon* the occurrence of the antecedent stimulus. Alternatively, one might say the postcedent stimulus *depends* on the behavior, which *depends* on the antecedent stimulus. Thus, the conditioning of operant behaviors requires at least a three-term (antecedent → behavior → consequence) contingency, of the general stimulus–response–stimulus form.

This brings us to the widely known mnemonic acronym "ABCs of behaviorology." A stands for antecedent, B stands for behavior, and C stands for consequence. A and C represent components of the environment, stimuli that are functionally related to the behavior (B). Antecedent stimuli evoke the behavior (or influence the effectiveness of the evocative stimulus in one way or another), and the consequence increases or decreases the likelihood of the behavior being evoked on subsequent occasions.[13] With functional relations confirmed, we now have the contingency structure: A → B → C.

The ABCs of behaviorology, known more technically as the three-term contingency, is the basic starting point formula for analyzing episodes of behavior, which is of fundamental importance to the natural science of behavior. It is the basic starting point, because, while it specifies the necessary elements to explain an episode of behavior, behavior is often complex, a fuller accounting requiring a fourth, fifth, or more terms and even relevant concurrent contingencies. Indeed, many would say that all instances of reinforced behavior involve a four-term contingency

[13] By convention, the word "consequence," in this use as a component term of the three-term contingency, includes extinction, a process that is not a consequence per se as in a stimulus change, but rather the discontinuation of a previously functional consequence. It might be said that the word "consequence," in this usage, refers to any "***contingency of reinforcement***," which, by convention, includes any of the five basic principles of behavior found in the top half of the postcedents chart found further below and not just consequences (stimulus changes) as found in only the top right quadrant of the postcedents table. Clarity would be served with a reevaluation of the terms used in these contexts but that will await an appropriate discussion in the peer-reviewed literature.

including motivating operations (a stimulus class discussed below) since reinforcer effectiveness is conditional upon motivating conditions. The motivating operations are often assumed and not specified, unless they are a particularly relevant component of the analysis. For example, food might evoke eating behavior and the consumption may reinforce that eating behavior, but only if the subject is *deprived* with respect to food and not *satiated* with respect to food. The deprivation is the motivating operation and assumed, as well as usually not specified, even though it is a necessary element of the contingency. Notwithstanding this, no analysis of a behavior can be complete without at least the three-term contingency. There are other kinds of antecedent stimulation to consider besides the evocative stimulus (including motivating operations) and there are many different kinds of consequences, the details of which are discussed below.

Respondent Contingencies

In contrast to operant behaviors, respondent behaviors are components of a two-term (antecedent → behavior) contingency, of the general stimulus–response form. The antecedent stimulus *elicits* the respondent. The body is so structured via biological evolution as to make certain reactions to certain stimuli occur without any conditioning to establish the functional relation. These responses are uninterruptible once the organism is exposed to certain thresholds of certain kinds of stimulation and their rate is not changeable by any postcedent stimulation.

Conditioning can expand the number and kind of stimuli that can come to elicit these reactions. Respondents that require no previous conditioning are called "unconditioned responses" and respondents that occur only after conditioning establishes them, "conditioned responses."

Conditioning

Definition

Conditioning is the process by which a relatively enduring change in the behavior of an organism results from that body's interaction with the environment.[14] Conditioning is a biological process—stimulation impacts

[14] An advanced tangent: Note that a change in the rate of a behavior refers to a change from the trajectory that the rate of a behavior would take without any conditioning. In other words, if no

upon the body in a way that results in a microrestructuring (or reconfiguring) of the nervous system in such a way that the body reacts differently thereafter. In behavior analysis and psychology as a whole, the terms conditioning and learning are used mostly interchangeably.[15] Within behaviorology, the word "learning" is seen as a colloquial term, pregnant with the implication of agentialism, and is avoided in favor of the technical term "conditioning," which implies only the behavior change process.

The conditioning of respondents involves the contingent and contiguous exposure of the nervous system to a neutral stimulus and a stimulus that currently elicits a respondent. This contiguous exposure is referred to as ***pairing*** and the changes this stimulation causes in the subject's nervous system that results in the neutral stimulus coming to elicit that respondent as well is respondent conditioning, a process explored in detail below.

Effects of Conditioning on Behavior

As a result of the behavior → consequence contingency occurring, the antecedent → behavior functional relation is strengthened, suppressed, or weakened by the consequences that the behavior generates. When we say the antecedent → behavior relation is strengthened, suppressed, or weakened, this is in reference to the effects of the various conditioning processes. As we will explore in greater detail below, reinforcement *strengthens* the antecedent → behavior relation, resulting in maintenance of, or increase in, the rate or relative frequency of that behavior; punishment *suppresses* the antecedent → behavior relation, resulting in a decrease in the rate or relative frequency of that behavior; and extinction *weakens* the antecedent → behavior relation, resulting in a decrease in the rate or relative frequency of that behavior. See Figure 3 for a visual depiction of these processes.

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conditioning takes place, a behavior will deteriorate over time simply as a result of changes taking place in the subject's nervous system. Therefore, maintaining a steady state rate of responding requires conditioning as well. This maintenance is, in fact, a "change" in the rate of the behavior—a change in the trajectory of the rate of the behavior that would occur with no conditioning taking place at all. The take home message here is that conditioning involves changes and the maintenance of the rate of a behavior is also considered a change.

[15] Johnston and Pennypacker (2009, p. 356 & 359) differentiate between the two by defining conditioning as the biological process and learning as the resulting change in behavior. For some reason, Johnston and Pennypacker define conditioning as applicable to the results of reinforcement and punishment, ignoring the conditioning established by extinction and all forms of respondent processes.

Why Do Reinforcers Function as Such?

We have explored why a behavior occurs, that is, because a stimulus triggers the behavior. This raised the question of why the stimulus evokes the behavior. The evocative stimulus evokes the behavior because of a history of reinforcement associated with the behavior occurring immediately following that stimulus. The evocative stimulus establishes the *availability* of the reinforcer and the behavior brings the subject into contact with that stimulus at least occasionally.

Another question arises. Why does the reinforcer function to reinforce the behavior? What makes the stimulus effective as a reinforcer? In general, some stimuli are effective as reinforcers because of biological evolution. Thus, they require no conditioning to establish them as reinforcers. Others can be paired with unconditioned reinforcers and become conditioned reinforcers.

However, unconditioned reinforcers are not *always* effective as reinforcers; in other words, they are effective some times and not others. What makes these stimuli effective reinforcers when they are effective, as opposed to not? Unconditioned reinforcers are *conditionally* reinforcing—conditional on whether a second kind of antecedent stimulation, called a motivating operation (MO), is also present or not. This topic is discussed in greater detail later, but to appreciate the conditioning process that we are covering in this section, a brief mention is appropriate. A ***motivating operation*** is a stimulus event that establishes a condition within a body, that influences how *effective* reinforcers will be, and hence how strongly evocative the evocative stimulus will be, which in turn influences the relative frequency of the behavior. In other words, a motivating operation establishes the *effectiveness* of the reinforcer (the evocative stimulus establishes the *availability* of the reinforcer).[16]

There are two types of motivating operations: an establishing operation (EO) and an abolishing operation (AO). An ***establishing operation***, establishes (i.e., increases) the effectiveness of the reinforcer, and an ***abolishing operation*** abolishes (i.e., decreases) the effectiveness of the

[16] Traditionally, MOs are said to establish or abolish the "value" of the stimulus as a reinforcer. However, the word "value" evokes agential implications. I use the more precise and less questionable term "effectiveness" in place of "value," as the term "value" relates to the effectiveness of the stimulus as a reinforcer.

reinforcer. In the case of establishing operations, if a subject is deprived with respect to the reinforcer or the antecedent stimulus is aversive, this establishes the effectiveness of accessing it or escaping it respectively as reinforcers. In the case of abolishing operations, if the subject is satiated with respect to the reinforcer, then that abolishes the effectiveness of the reinforcer. Therefore, the evocative stimulus establishes the *availability* of the reinforcer and the motivating operation establishes or abolishes the *effectiveness* of the reinforcer. When an evocative stimulus occurs in the presence of an establishing operation, the behavior is likely to occur because that behavior has a history of effectively generating that reinforcer.

It is important not to confuse motivating operations with the colloquial term "motivation." In fact, many behaviorologists refuse to use the term "motivating operations" because such confusion seems inevitable when including the word "motivating" in a technical term, relying on the broader function-altering stimulation concept instead. In colloquial terms, the word motivation is often seen as a mysterious force that "drives" behavior. However, this is not a motivating operation. The two concepts should not to be confused. A motivating operation is a real event—a stimulus possessing physical status.

Contingency Analyses

The coverage of the three-term contingency thus far provides a foundation on which to examine the analysis of contingencies. To progress with the coverage, a review of previously covered material will be helpful.

Depicting Contingencies

By ascertaining the basic three-term contingency that operates in any particular episode of behavior, the relationship between the behavior and its environment is investigated and described, thereby explaining the "cause" of the behavior event (identifying the dependent and independent variables and their functional relationship with one another). Changes in behavior occur in accordance with several elementary principles of behavior that are described in greater detail below. Whether one is explaining a behavior event that has occurred or is planning a behavior engineering project, the contingency analysis is an important foundation for these activities.

There can be more than three relevant terms in a contingency and there often are. Furthermore, with respect to a particular response class, there may be several contingencies that operate simultaneously on the behavior, some of which may be reinforcing and others punishing. The rate of responding is determined by the net result of the contributing contingencies. Furthermore, both operant and respondent contingencies occur simultaneously and often influence each other. I discuss some of these complexities in more detail below.

To discuss contingency analysis in greater detail, more symbols are required, some of which have been introduced in context already. In the relation positions, we use arrows (i.e., →) to indicate a functional relation. If no functional relation has been confirmed, an en dash (i.e., –) is used. If a previously operational functional relation existed, but no longer does, we use an arrow with a slash through it or beside it (i.e., ↛, but also /→, /-> or similar, depending on the capabilities of the medium in which the contingency being written). In this situation, the functional link has been broken. In the term positions, "A" represents the antecedent position in a general representation of a contingency. "S^{Ev}" can be used to identify an antecedent stimulus that has been confirmed to be evocative. A question mark "?" can be used as a placeholder where the term has not been identified yet. "S^{FA}" may be used before the S^{Ev} to represent function-altering stimulation, a term discussed below. "MO" represents a motivating operation, a specific type of function-altering stimulus discussed in greater detail below. "B" represents behavior or response class in a general representation of a contingency. "P" represents postcedent stimulation and "C" is used to represent the consequence term in a general representation of a contingency, once the postcedent stimulus has been confirmed to be a consequence in that contingency.

In the consequence position, once the specific principle operative in the contingency has been identified, the outcome of the contingency is represented immediately following the consequence description. Where a general notation of a contingency is provided and the consequence term identified the kind of reinforcer, punisher, or extinction process, no further elaboration is required. But, if the notation is replaced with words to identify the stimulus (e.g., "treat") then after that, in parentheses or braces, the principles must be identified (otherwise, there is no specification of what conditioning is said to have occurred). These include

+R, +P, –R, –P and EXT (to represent the upper half principles found in the postcedents table, each of which is discussed in detail below). A general representation of a contingency may allow one of these five symbols to occupy the entire consequence term position but, if a description of the stimulus is used instead (e.g., "treat"), the principle can be identified immediately after the description. The examples below illustrate some of these symbol usages.

Below are two versions of a general representation of the potential or hypothesized three-term contingency. Note arrows have not yet been inserted, because the specific functional relations have not yet been confirmed. Indeed, the terms have not yet even been identified.

Antecedent – Response class – Postcedent

A – B – P

Once the actual antecedent stimulus that evokes the behavior has been determined, as well as the postcedent stimulus that affects the future likelihood of the behavior, the specific contingency may be depicted thusly:

"Sit" → Jake sits → Treat$^{(+R)}$

This example involves an added reinforcement consequence. As mentioned above, the specific consequating stimulus (i.e., treat) has been identified and so the conditioning principle, which implies the outcome (i.e., +R, a stimulus is *added* after the behavior and the behavior subsequently becomes *more* likely) that identifies the specific kind of functional relation involved must be included as well. Whether the behavior has been reinforced or punished has not been established simply by identifying the specific consequating stimulus involved. Specifying the principle of behavior, in this case, added reinforcement, conveys that the treat functioned as an added reinforcer, meaning that the behavior of sitting when cued to do so increases thereafter. Without the outcome being specified, the notation only conveys that a cue occurred, followed by a behavior, followed by a treat. The arrow identifies a functional relation but it does not specify what that relation is.

Analyzing Episodes of Behavior

When analyzing an episode of behavior, start with the target behavior. In any given situation, there might be multiple behaviors occurring, some operant and some respondent. When analyzing an operant behavior, start with identifying the *particular* response class or response class form that you seek to explain. This clarity makes the analysis much simpler and cleaner; failing to do so can be a source of much confusion when analyzing an episode of behavior.

? – Jake sits – ?

You may proceed to identify the evocative stimulus and the consequence once you have identified the target behavior. The process will be illustrated by identifying the evocative stimulus next, but depending on the circumstances, you may identify the consequence first, particularly if the evocative stimulus is currently unclear.

Usually, what occurs just before the behavior is what evokes it. However, if a few different salient events occur right before the behavior, test the various components by isolating and presenting them separately, in order to determine which event, or combination of events, actually evokes the behavior.

There may be one obvious stimulus class, but you may be unsure about which features of that stimulus class are evocative and which coincidental. For instance, if a male postal carrier evokes barking behavior at the door, you may not be able to readily determine which stimulus class evokes the behavior just by observing the instances of the behavior that have thus far occurred. At first, you may not be able to determine exactly what is evoking the behavior and you may leave a "?" in that term position, and move on to identify the consequence. An en dash would be used to represent a hypothesized functional relation and an arrow for a confirmed one. The evocative stimulus class might be male postal carriers, or it might be males at the door or it might be postal carriers at the door. It might even be any person at the door. Some experimentation (called "functional analysis") might be required to determine which stimuli do and do not evoke the behavior. Think of a stimulus as a stimulus package of different features. Not every feature of a stimulus package will necessarily be evocative and some features may be more evocative than others. Once you confirm the specific evocative stimulus class, you can include it in the antecedent term position and change the en dash to an arrow.

Going back to the example, let us say we have confirmed that Jake sits reliably when someone says, "sit."

"Sit" → Jake sits – ?

Next, we assess the postcedent environment for a hypothesized consequence. Usually, it will be the event occurring immediately after some occurrences of the behavior on a regular basis. Remember, when analyzing the postcedent term, that the reinforcer maintaining the behavior does not need to follow every occurrence of the behavior; it may only occur occasionally, so this sometimes makes it challenging to identify a likely candidate. It is often quite obvious what is reinforcing the target behavior. However, you might need to isolate postcedent stimuli and experimentally confirm which is the most prominent reinforcer.

Let us say that someone often gives Jake a treat right after he sits, and if we stop giving treats, the relative frequency of the behavior decreases, and then we start providing the treat again and the relative frequency of the behavior increases. In that case, we replace the en dash with an arrow, confident that we have identified at least a major source of reinforcement for the behavior. Furthermore, the stimulus is *added* following the behavior (as opposed to subtracted) and the change involves an *increase* in responding (as opposed to a decrease) thereafter. Therefore, we include the type of consequence as added reinforcement (+R).

"Sit" → Jake sits → Treat$^{(+R)}$

Of course, there may indeed be other added reinforcers and/or subtracted reinforcers participating in the control of this behavior. If more than one reinforcer is likely important in maintaining this behavior, two contingencies should be written, one above the other, and ideally ranked by the magnitude of their contribution to maintaining the behavior.

For example, when Jake sits, sometimes it may be consequated with a treat and sometimes with a quick game of tug-of-war, and in most cases, these are accompanied by praise and social contact as well. If either of these consequences is important in determining the rate of the behavior (determined experimentally), then a full accounting likely ought to also include these reinforcers:

"Sit" → Jake sits → Treat$^{(+R)}$

"Sit" → Jake sits → Tug-of-war$^{(+R)}$

"Sit" → Jake sits → Praise/petting$^{(+R)}$

You may also find a situation in which the behavior is maintained by subtracted reinforcers. This might occur if the guardian demands the sit in an aggressive or harsh manner and then subtracts their aggressive manner when Jake sits:

"SIT!!!!" → Jake sits → Harshness subsides$^{(-R)}$

This was a rather simplistic example, since it is not a problem behavior, and because the guardian trained it and the evocative stimulus and reinforcer are obvious. While this serves as a good example because of its simplicity, the evocative and consequating stimuli may not always be obvious in other circumstances.

The three-term contingency is the basic starting point to describe the functional relations between the environment and the target behavior in any given behavioral episode. It is the basic *starting point,* because we may need to expand the contingency to incorporate other terms that participate in controlling the target behavior. But, you cannot start with less than the three terms in the three-term contingency for a complete accounting, no matter how simple the episode of operant behavior.

Component Contingencies in the Three-Term Contingency

The three-term contingency is made of two two-term contingencies, as mentioned above. One two-term contingency is the behavior → consequence contingency. The other two-term contingency is the evocative stimulus → behavior contingency. These two contingencies are integrally related. The behavior → consequence contingency functions to strengthen, suppress, or weaken the evocative stimulus → behavior contingency in future trials. As a verbal short cut, one might say it functions to strengthen, suppress, or weaken the behavior or the "evocative capacity" of the antecedent stimulus. But, be aware that it does not change the behavior itself or the evocative stimulus itself, but rather the body's reaction to the evocative stimulus and hence the rate of the behavior. The consequence strengthens, weakens, or suppresses the functional relationship between the antecedent stimulus and the response class in question. These verbal shortcuts, can perhaps be misleading and inappropriate, depending on how loose we get with terms in making use of verbal shortcuts.[17] See Figure 3 for a visual depiction of these processes.

To reiterate, conditioning creates changes to the structure of the body of the organism via stimulation from the environment, which changes the organism's receptiveness to the evocative stimulus on subsequent presentations of the stimulus.[18] This causes a change in the functional relation between the evocative stimulus and the behavior, as it is the body that mediates that reaction. Across repeated trials through the contingency, you can observe the maintenance or changes in the likelihood of the evocative stimulus evoking the behavior and the consequences selecting for or against future instances of the behavior. Simply, the behavior → consequence contingency functions to change (strengthen, suppress, or weaken) the evocative stimulus → behavior contingency as the organism experiences instances of the contingency.

Externalizing Contingencies

Laypeople (including psychologists) are frequently tempted to speculate about what an animal may or may not "understand," "want," or "desire" etc., or even what they might be "realizing," "anticipating," or "thinking." It is, however, counterproductive to speculate about these things in practical contingency management projects. Thinking is a real set of

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[17] The verbal shortcuts are adding up! We often refer to behavior being reinforced, and indeed the behavior is what changes in rate or relative frequency, but it is the S^{Ev} → Behavior functional relation that is reinforced (i.e., strengthened.) Verbal shortcuts like these are useful, but it is important to appreciate what can be misleading about them if we are not careful.

[18] Note that we frequently refer to stimulation "from the environment" by convention, but stimulation *is* the environment. Our only experience of (and "evidence" of) the environment being "out there" is behaved and indeed we speculate/assume that there is an "out there." For a detailed coverage of reality as a behaved phenomenon, see Fraley 2008.

behaviors, but they are private and inaccessible. This does not mean that thinking behaviors do not occur, but it is generally more productive to trace private events through the causal chain to a link that is publicly accessible, that is, something in the environment that we directly observe. If our interest is in the directly observable operant behavior, then we trace forward in the sequence to the publicly observable behavior of concern. If we are interested in what is causing the behavior of concern, then we trace backward in the sequence to the publicly accessible and manipulable stimulus. Psychologists, operating under a transformational paradigm are interested in these intervening, usually fictional or hypothetical constructs that come between the stimulus and the behavior, but this is not productive where the goal is to explain and control real behaviors. In other words, we observe a behavior (dependent variable), and instead of speculating about the thought processes or especially any "mental transformations" as the independent variable causing it, we trace the causal chain back to a point that we *can* observe, measure, and influence.

For example, a mat might evoke approach and lying down behaviors, and there is no need to look for thinking behaviors that might come between the seeing of the mat (stimulation), and the approach and lying down behaviors. No doubt, a number of neural and physiological behaviors are also elicited and evoked inside the dog, but they are simply other behaviors, either simultaneously evoked or they are links in the causal chain occurring before the going-to-the-mat behavior. Instead of speculating about these so-called "cognitions," we identify the mat as the stimulus functionally related to the approach and lying down behavior. We refer to this analysis process as externalizing the contingency because it involves identifying stimuli and responses that are external and publicly accessible.

Increasing Complexity in Accounting for Behavior

When another variable becomes influential in controlling behavior, it can be advantageous and appropriate to include a fourth term in the contingency analysis. Whether a greater number of terms are included in the contingency analysis depends on how influential these terms are in controlling the target behavior and our interest in examining these other variables, which might provide greater explanatory power in a given behavioral episode. One can include fourth, fifth, or more terms in the antecedent, behavior, or postcedent positions of the contingency.

We now turn to a more in depth coverage of operant conditioning, including a detailed discussion of the various kinds of operant conditioning.

Operant Conditioning

In this major section, operant conditioning is explored in detail, with a focus on elaborating the various kinds of operant contingencies. ***Operant conditioning*** is a behavior change process wherein behaviors become more or less likely to occur across subsequent occasions due to the consequences that the behaviors have generated. The functional relation between the evocative stimulus and the operant is strengthened, suppressed, or weakened, depending on the kind of consequence (e.g., reinforcement, punishment, or extinction) and the current structure of the organism (i.e., including motivating operations).

The coverage of behavior, stimulation, and the conditioning process provided thus far affords a solid foundation on which to appreciate the finer details specific to operant conditioning covered in this chapter. The following sections provide a more detailed discussion of the environmental variables that control behavior, namely antecedent stimulation and postcedent stimulation. This necessarily requires some review of previously covered material.

Postcedent Principles, Processes, and Procedures

Law of Effect

The ***law of effect*** is a somewhat antiquated law because the more recent principles of reinforcement and punishment cover the same ground with more specificity, but it is the broadest representation of operant conditioning and worth presenting here. The law of effect states that consequences select for or against operant behavior—some consequences will tend to strengthen behavior, while others will tend to suppress it. We refer to behavior–strengthening consequences as ***reinforcers*** and the behavior-suppressing consequences as ***punishers***. The law of effect is the foundational law of behavior for operant conditioning. Reinforcement and punishment are the two key principles derived from the law of effect.

It is often said that consequences strengthen, suppress, or weaken behavior. This is fine when under contingencies to simplify the process with verbal shortcuts, but, as discussed above, it is not as accurate as saying that the consequences that a response class generates changes within the animal that increase or decrease the probability of that animal reacting in specific ways to the evocative stimulus on subsequent occasions of its presentation. It does not strengthen the behavior directly, but rather causes changes in the animal's body that thereby alter the effectiveness of the evocative stimulus on subsequent occasions—conditioning occurs physically within the animal. The reaction that an animal has to its environment is determined by the structure of that animal; the structure of the animal is determined by the history of conditioning that the structure of that body, initially established by genes, has undergone. Genes encode proteins, which lead to determining the structures of the body and then those structures interact with the environment and are changed with every new interaction thereafter.

Foundational Terms and Categories

A wide range of different kinds of events occur, or used to occur but now fail to, during or immediately following behavior. Some stimulus changes, or lack thereof, influence the future occurrence of the behavior they follow and others do not. Figure 1 is the postcedents chart. This chart depicts the complete range of possible outcomes involved when operant conditioning occurs. Our interest rests only with the top half of the table, where there is an effect on subsequent responding.

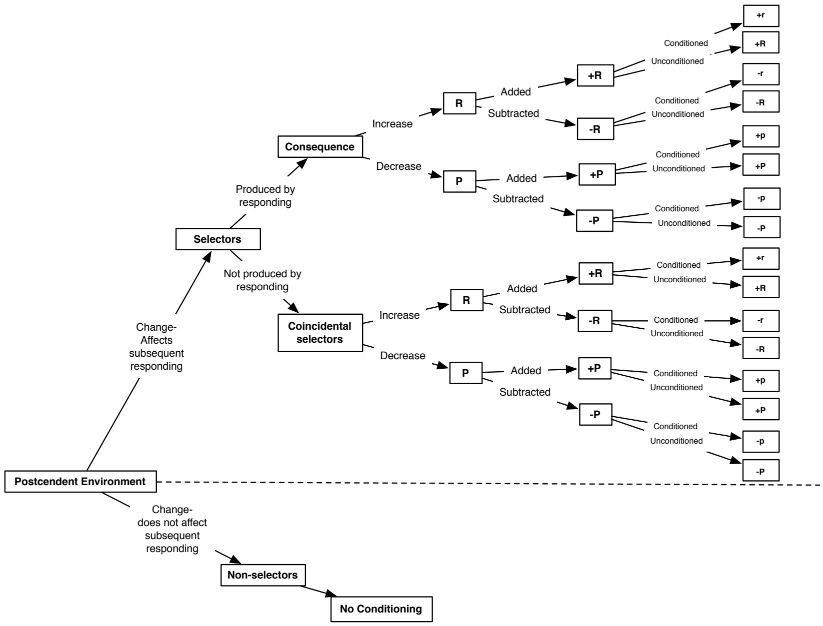

Figure 1. Postcedents chart depicting the range of possible operant conditioning outcomes. Adapted and modified from Ledoux (2002). “R” = reinforcement, “P” = punishment, “+” = added and “-” = subtracted. By convention, capital letters are used where the conditioned versus unconditioned status are unspecified.

Postcedent stimuli comprise everything that occurs immediately after the behavior. Many events occur after a behavior, and only some of them are functionally related to the behavior.

Once a postcedent stimulus is confirmed to change behavior, whether it was generated by the behavior or occurred coincidentally, it is called a ***selector***. This stimulus selects for behavior. A selector that occurs coincidentally (rather than actually being generated by the behavior) but changes behavior is called a “coincidental selector”. The behaviors maintained by coincidental selectors are referred to as ***superstitious behaviors***. Added reinforcement maintained superstitious behaviors are usually short-lived because the reinforcement is usually on a temporary or very sparse schedule—the behavior tends to extinguish. However, subtracted reinforcement maintained superstitious behaviors can persist, because effective avoidance protects the behavior against extinction trials.

We refer to a selector that influences behavior, and is not merely coincidental, but rather is actually generated by the behavior, as a "consequence". A ***consequence*** can be generated by the behavior in the sense that it changes the environment directly (e.g., you squeeze a cola can and the can becomes crushed), or it can be mediated by someone else (e.g., you say "crush that can," someone crushes the can and the can becomes crushed), as long as it occurs *contingently* upon occurrence of the behavior (e.g., you provide a treat to a dog each time he or she sits because he or she sits). Consequences generated directly by the behavior are referred to as ***intrinsic*** (or, ***direct***) consequences and consequences generated indirectly, mediated by another organism, are referred to as ***extrinsic*** (or, ***socially mediated***) consequences.

Figure 2 depicts relations among behaviors and consequences in a different format.

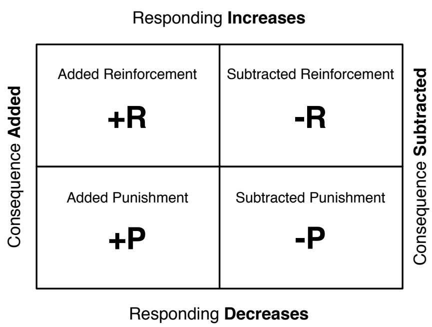

Figure 2. Table of Consequences.

Consequences can be divided into different types, depending on (a) whether the consequence *increases* or *decreases* the likelihood of the behavior, and (b) whether the stimulus was *added* or *subtracted* immediately following the behavior.

Four kinds of consequences are discussed here—two that decrease the relative frequency of behavior and two that increase the relative frequency of behavior. The two that increase the future likelihood of behavior are referred to as "reinforcement" and the two that decrease it, "punishment".

These first four principles involve changes to the postcedent environment that change the future likelihood of that behavior occurring.

A fifth conditioning process called extinction, involves the discontinuation of added reinforcement and a subsequent decrease in the likelihood of that behavior occurring. The diagram below depicts these relations.

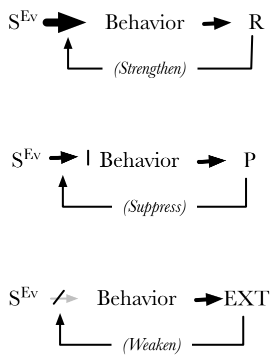

Figure 3. This diagram shows how each of the three kinds of consequences (reinforcement, punishment, and extinction) influences the evocative stimulus → behavior contingency. Reinforcement strengthens the relation (indicated by the enlarging of the functional relation arrow), punishment suppresses it (indicated by the barrier in front of the functional relation arrow, and extinction weakens it (indicated by the shrinking and fading functional relation arrow).

In reinforcement and punishment procedures, a stimulus can be added (i.e., presented or increased in magnitude) or subtracted (i.e., withdrawn or decreased in magnitude). This means you can have added reinforcement (+R), subtracted reinforcement (–R), added punishment (+P), and subtracted punishment (–P). Historically, scientists used the terms "positive" and "negative" to refer to the addition or subtraction of consequating stimuli, respectively. These terms have been confusing for many because positive and negative have an established connotation as "good" and "bad," respectively. The notions of negative punishment and negative reinforcement have been particularly confusing. Behaviorologists use the words "added" instead of "positive" and "subtracted" instead of "negative" to prevent confusion and ensure greater clarity. This change has the benefit of encompassing both the presentation of, or the increasing magnitude of, a stimulus accurately in the single word added, and representing the withdrawal of, or decreasing magnitude of, a stimulus accurately in the single word subtracted. Furthermore, the new terminology corresponds well with the + and – symbols used to represent these variables (see Ledoux, 2002). Use of the terms "positive" and "negative" as synonyms for "added" and "subtracted" respectively, is not incorrect per se and among behavior analysts and psychologists, these older terms are still active, but among behaviorologists, the newer terminology is well established.

Each of these types of consequence (i.e., +R, –R, +P, and –P) can be further categorized into unconditioned or conditioned forms, bringing the total number of types of consequences to eight. This means you can have unconditioned added reinforcement, conditioned added reinforcement, unconditioned subtracted reinforcement, conditioned subtracted reinforcement, unconditioned added punishment, conditioned added punishment, unconditioned subtracted punishment, and conditioned subtracted punishment. Each of these types of consequences is discussed individually in greater depth below. For now, take note that unconditioned consequences function as consequences without any previous conditioning to establish them as such. Common unconditioned reinforcers include food and water, while common unconditioned punishers include anything painful. Conditioned consequences, on the other hand, become effective only after a pairing procedure is utilized to condition them. Although we use capital letters by default when the status of the consequence as conditioned or unconditioned is unspecified, we can use capital letters to specify unconditioned consequences and lower case letters to represent conditioned consequences (i.e., +r, –r, +p, and –p) when contingencies require that level of specificity.

The four principles of added and subtracted reinforcement and added and subtracted punishment occupy the four quadrants of the table of consequences in Figure 2 because they involve changes to the postcedent environment. Extinction is a fifth basic principle of behavior and involves no functional postcedent change in the environment (compared to the antecedent environment) for a behavior with a history of reinforcement, therefore it is not a consequence in a sense, and that is why it is not contained in the table of consequences.

Reinforcement

Reinforcement is a behavior change process in which a change in stimulation, during or immediately following a response, results in an increase in the rate or relative frequency of response class members on subsequent occasions.[19] The behavior → reinforcer contingency results in a *strengthening* of the evocative stimulus → behavior contingency. On subsequent occasions of its occurrence, the evocative stimulus is *more* likely to evoke the operant. The consequence strengthens the relation between the behavior and whatever stimuli were present at the time. A valuable way to conceptualize reinforcement is by listing the necessary and sufficient conditions, as follows:

- **Behavior** occurs.
- Stimulus **change** during or immediately following response.
- Subsequent **increase** in likelihood of response class on subsequent occasions of exposure to the stimulus.

There are two basic types of reinforcement: added reinforcement and subtracted reinforcement.

Added Reinforcement

Added reinforcement (+R) is a behavior change process in which the addition of a stimulus during or immediately following a response, results in an increase in the rate or relative frequency of response class members on subsequent occasions. That is, the behavior → added reinforcer contingency results in a *strengthening* of the evocative stimulus → behavior contingency. On subsequent occasions of its occurrence, the evocative stimulus is *more* likely to evoke the behavior because of that history of added reinforcement. The necessary and sufficient conditions are:

- **Behavior** occurs.
- Stimulus is **added** during or immediately following response.

[19] The term "***contingencies of reinforcement***" is used to refer to contingencies of reinforcement, punishment, and extinction. We generally refer to them this way because all of the contingencies address behavior and reinforcement in some way. Reinforcement contingencies obviously involve the reinforcement of behavior. Punishment contingencies involve the suppression of previously reinforced behaviors, and extinction contingencies involve the elimination of previously reinforced behaviors.

- Subsequent **increase** in likelihood of response class on subsequent occasions of exposure to the stimulus.

We can divide added reinforcement into conditioned and unconditioned added reinforcement (i.e., there can be a conditioned added reinforcer or an unconditioned added reinforcer, depending on whether or not the reinforcer was effective without previous conditioning to establish it as a reinforcer before its use). Behaviorologists and behavior technologists use both unconditioned reinforcers (also referred to as "primary reinforcers") and conditioned reinforcers (also referred to as "secondary reinforcers") in training.

An ***unconditioned added reinforcer*** is an added reinforcer that is effective without any previous conditioning to establish it as such. The body is structurally arranged through biological evolution such that the stimulus simply *is* a reinforcer. These types of reinforcers commonly involve biologically significant stimuli such as food, air, water, or sex. Species have evolved in a manner such that certain stimuli function effectively as reinforcers without a need for conditioning to establish them as such.

However, unconditioned reinforcers such as these identified stimuli are not *always* reinforcing. In fact, they can even become aversive. The effectiveness of an unconditioned reinforcer is conditional upon the current motivating condition of the organism. If an organism is *satiated* with respect to the reinforcer, the body is so structured as to prevent that stimulus from acting effectively as a reinforcer at that time, and indeed, it may constitute an aversive stimulus until the satiation subsides. For example, the last thing that will function effective as a reinforcer after a large meal is food, though escape behaviors might be evoked, but that is an example of subtracted reinforcement, which is discussed next. On the other hand, if we *deprive* the organism with respect to the reinforcer, the stimulus should act effectively as a reinforcer.

Since we can rarely deliver unconditioned reinforcers during training with precise timing sufficient to reinforce fleeting behaviors and before other behaviors occur, we make use of conditioned reinforcers. A ***conditioned added reinforcer*** is an added reinforcer that is effective only because it has been previously paired with an unconditioned reinforcer or an already established conditioned reinforcer. Once a conditioned reinforcer (usually a click sound in animal training) is established, the conditioned reinforcer can be used to reinforce specific behaviors, particularly fleeting ones. The click is administered immediately following the behavior (ideally, right as the behavior is ending or about to end), followed within a second or two by the unconditioned reinforcer. The conditioned reinforcer is often characterized as "bridging the gap" between the behavior and the unconditioned reinforcer, and some trainers refer to the conditioned reinforcer as a "bridge." This allows for reinforcement of a precise behavior and sufficient time for the trainer to deliver the unconditioned reinforcer to the subject (recall that contingencies must be contiguous, within a couple/few seconds). To maintain the conditioning of a conditioned reinforcer, it must be followed regularly by the unconditioned reinforcer.

Subtracted Reinforcement

Subtracted reinforcement (–R) is a behavior change process in which the subtraction of a stimulus during or immediately following a response, results in an increase in the rate or relative frequency of response class members on subsequent occasions. That is, the behavior → subtracted reinforcement contingency results in a *strengthening* of the evocative stimulus → behavior contingency. On subsequent occasions of its occurrence, the evocative stimulus is *more* likely to evoke the operant, because of that previously subtracted stimulus. Subtracted reinforcement involves the strengthening of escape behavior. The necessary and sufficient conditions are:

- **Behavior** occurs.
- Ongoing stimulus is **subtracted** during or immediately following response.
- Subsequent **increase** in likelihood of response class on subsequent occasions of exposure to the stimulus.

We can further divide subtracted reinforcement into conditioned and unconditioned subtracted reinforcement (i.e., there can be a conditioned subtracted reinforcer or an unconditioned subtracted reinforcer, depending on whether or not the reinforcer was effective without previous conditioning to establish it as a reinforcer before its use). For example, if you squeeze a dog's ear and only let go when the dog sits, the release of pressure on the ear will likely function as an unconditioned subtracted reinforcer for sitting behavior. Such coercive training procedures are fraught with problematic side-effects, which is why added reinforcement based procedures are preferred, but the described procedure illustrates the principle of subtracted reinforcement.

Subtracted reinforcement is unique among the basic principles of behavior in that the consequence is usually (perhaps not always, as is often suggested) a subtracted (reduced or eliminated) version of the evocative stimulus. In a subtracted reinforcement contingency, the evocative stimulus is an aversive stimulus and the behavior functions to reduce or eliminate (i.e., subtract) contact with that stimulus.

Although subtracted reinforcement strengthens escape behavior, we usually refer to escape from an unconditioned subtracted reinforcer as ***escape*** and escape from a conditioned subtracted reinforcer is usually referred to as ***avoidance***. The unconditioned subtracted reinforcer is avoided, in a manner of speaking, but the contingency really involves escape from the conditioned subtracted reinforcer—it is escape in both instances.

Some Potentially Confusing Distinctions

All reinforcers strengthen behavior but there can be utility in making certain distinctions regarding the manner in which certain reinforcers occur. There are also a few common distinctions and terms that refer to the same thing that frequently cause confusion. In this section, a few common distinctions are explored, including some potentially confusing ones.

Under certain circumstances, it may become appropriate to make a distinction between whether reinforcement is generated directly by the behavior or mediated socially by someone else. In behaviorology, an ***intrinsic reinforcer*** is a reinforcer generated directly by the behavior—it is not arbitrarily selected and mediated by another organism. For instance, if you close your hand around a can and the crushing of the can reinforces your can-crushing behavior, the can becoming crushed is an intrinsic reinforcer in this contingency. The word "direct" may also appropriately come into use, particularly with certain functional diagnostic labels. If the behavior generates an *added* reinforcer intrinsically, this may be referred to as "direct access", and if the behavior generates a *subtracted* reinforcer intrinsically, this may be referred to as "direct escape."

An ***extrinsic reinforcer*** is a reinforcer contrived and mediated socially. For instance, if you give a treat to a dog after he or she sits and that increases the rate or relative frequency of sitting behavior, giving the dog the treat is an extrinsic reinforcer in that contingency. Extrinsic reinforcement may also be referred to as "socially-mediated," particularly with certain functional diagnostic labels. If the behavior generates an *added* reinforcer extrinsically, this may be referred to as "socially mediated access," and if the behavior generates a *subtracted* reinforcer extrinsically, this may be referred to as "socially mediated escape."

Further confusion arises when the term "intrinsic" is also used to refer to ***endoreinforcers*** (also known as ***endogenous reinforcers*** and ***automatic reinforcers***)—that is, reinforcers that are generated *solely within the body* of the subject, such as when a behavior causes the release of certain chemicals (e.g., adrenaline, corticosteroids, etc.) into the bloodstream. The opposite of this usage would involve the use of the term "extrinsic" reinforcers to mean ***ectoreinforcers*** (also known as ***exogenous reinforcers***), which refers to reinforcers that are generated *outside* of the subject's body. However, the proper use of the term intrinsic is in reference to a reinforcer generated directly by the behavior and extrinsic in reference to a reinforcer mediated socially.

Punishment

Punishment (P) is a behavior change process in which a change in stimulation, during or immediately following a response, results in a decrease in the rate or relative frequency of response class members on subsequent occasions. That is, the behavior → punishment contingency results in *suppression* of the evocative stimulus → behavior contingency. On subsequent occasions of its occurrence, the evocative stimulus is *less* likely to evoke the operant. The consequence suppresses the relation between the evocative stimulus and the behavior. Some clarity is in order here. You may read that reinforcement strengthens behavior whereas punishment weakens it. It is accurate to say that reinforcement *increases* the likelihood of behavior and punishment *decreases* it. However, this is not the same as strengthening versus weakening the evocative stimulus → behavior contingency or the evocative capacity of the evocative stimulus. A decrease in the likelihood of the behavior does *not* necessarily mean that the evocative stimulus → behavior relation is weakened. Reinforcement maintains behavior and punishment of behavior leaves the reinforced evocative stimulus → behavior contingency unaddressed. Thus, behavior is *suppressed* by punishment rather than weakened. Consequently, we say that reinforcement *strengthens* behavior, extinction *weakens* behavior, and punishment merely *suppresses* behavior. The necessary and sufficient conditions are:

- **Behavior** occurs.
- Stimulus **change** during or immediately following response.
- Subsequent **decrease** in likelihood of response class on subsequent occasions of exposure to the stimulus.

Added Punishment

Added punishment (+P) is a behavior change process in which the addition of a stimulus, during or immediately following a response, results in a decrease in the rate or relative frequency of response class members on subsequent occasions. That is, the behavior → added punishment contingency results in *suppression* of the evocative stimulus → behavior contingency. On subsequent occasions of its occurrence, the evocative stimulus is *less* likely to evoke the operant because of that previously added consequence. The necessary and sufficient conditions are:

- **Behavior** occurs.
- Stimulus is **added** during or immediately following response.
- Subsequent **decrease** in likelihood of response class on subsequent occasions of exposure to the stimulus.

We can further divide added punishment into conditioned and unconditioned added punishment (i.e., there can be a conditioned added punisher or an unconditioned added punisher, depending on whether or not the punisher was effective without previous conditioning to establish it as a punisher before its use). For example, being hit with a belt will often act as an unconditioned punisher and after some number of trials, the mere sight of the belt may become a conditioned punisher. Behavior under relatively strong punitive controls will often be temporarily suppressed. However, unlike with extinction, the evocative stimulus does not become a neutral stimulus. If the stimulus were neutral, the behavior would not reemerge at the pre-punishment rate as soon as we discontinue the punitive contingency, which it tends to do since the reinforcement contingency remains in effect.

Subtracted Punishment

Subtracted Punishment (–P) is a behavior change process in which the subtraction of a stimulus during or immediately following a response, results in a decrease in the rate or relative frequency of response class members on subsequent occasions. That is, the behavior → subtracted punishment contingency results in *suppression* of the evocative stimulus → behavior contingency. On subsequent occasions of its occurrence, the evocative stimulus is *less* likely to evoke the operant because of that subtracted consequence. The necessary and sufficient conditions are:

- **Behavior** occurs.
- Stimulus is **subtracted** during or immediately following response.
- Subsequent **decrease** in likelihood of response class on subsequent occasions of exposure to the stimulus.

We can further divide subtracted punishment into conditioned or unconditioned subtracted punishment (i.e., there can be a conditioned subtracted punisher or an unconditioned subtracted punisher, depending on whether or not the punisher was effective without previous conditioning to establish it as a punisher before its use).

For example, let us say you are training a dog to sit rather than jump up on people and social attention is an effective reinforcer in these contingencies. If the dog, in one trial, jumps up rather than sit, and you turn away and then stop interacting with them for a few seconds, the removed access to the social attention will likely act as an unconditioned subtracted punisher. The rate or relative frequency of jumping up will likely decrease through repeated trials.

Conditioned subtracted punishers are rarely used in animal training. In most cases, we use conditioned *added* punishers here. So, for example, we might say "Oops" right before turning away and subtracting attention. Note that the verbal utterance "Oops" is *added*, not subtracted. We might simply refer to this as a conditioned punisher or if we are under contingencies to specify the kind of conditioned punisher, we would have to classify this as a conditioned *added* punisher even though it has acquired its punitive capacity through it being paired with a subtracted punisher (in this case, subtracting social attention). It is a very common mistake to classify the "Oops" as a conditioned *subtracted* punisher. This mistake is made because the person making the mistake believes that because it was paired with a subtracted punisher, that stimulus must also be a subtracted punisher. However, the stimulus is defined not by what it was paired with but by whether it is actually added or subtracted. For extended discussion of this topic, see O'Heare (2017a). The emphasis should be on utilizing added reinforcement by setting the subject up for success.

An example of the use of a conditioned subtracted punisher might involve a dog making contact with your hand during training, you subtract eye contact, followed by retracting your hand and treats, making access to training treats unavailable for several seconds, which results in a reduction in the rate of contacting hands with teeth. After a number of trials, subtracted eye contact becomes a conditioned subtracted punisher.[20]

Extinction

Operants are a function of the reinforcer that maintains them. ***Extinction*** (EXT) is a behavior change process in which a response class form maintained by added reinforcement no longer generates a postcedent stimulus change (added reinforcement) and the response class form subsequently decreases in rate or relative frequency.

The word extinction can be used to describe the, *process* of the behavior changing, a *procedure* of withholding the reinforcer that has maintained a behavior, or to the *effect* that it generates—a decrease in responding.

Unlike reinforcement or punishment, which involve changes in the postcedent environment (i.e., adding or subtracting stimulation),

[20] Thank you, Rosa Roldán for this example.

extinction of a behavior that already has a history of reinforcement involves *no* postcedent change in the environment. In other words, nothing of significance is added to, or subtracted from, the environment when the behavior occurs. In extinction, the focus is on the reinforcer not occurring; the behavior fails to produce a change in the environment that it generated in the past.

Unlike punishment, extinction actually changes the contingency of reinforcement that was maintaining the behavior. It therefore *weakens* the effectiveness of the evocative stimulus to evoke the behavior rather than merely suppressing it through superimposing a punitive contingency over a reinforcing contingency. In the case of punishment, the evocative stimulus may remain evocative while the behavior is suppressed, but with extinction, the evocative stimulus becomes a neutral stimulus again. In other words, if a punishment contingency is discontinued after the behavior has reached a rate of zero, the behavior is likely to return to its pre-punishment rate, but if an extinction contingency is discontinued after the behavior reaches a rate of zero, the rate is likely to remain at zero. We can refer to the decrease in the rate of the behavior as the "extinction curve," in reference to the tracking of the rate of the behavior as a line on a graph. The necessary and sufficient conditions are:

- Previously reinforced **behavior** occurs.
- **Reinforcer does not occur**.
- Subsequent **decrease** in likelihood of response class on subsequent occasions of exposure to a stimulus.

Following instatement of an extinction procedure, the rate of the behavior may initially increase briefly. This spike in the graphed line is called an ***extinction burst***. There may be a series of extinction bursts during the extinction process, although they will become gradually less frequent and prominent. An extinguished behavior tends to be more readily reconditioned if a reinforcer is reintroduced at some point (presumably because some residual structures in the subject's nervous system remain susceptible to the contingency).

While the antecedent stimulus continues to evoke the behavior under an extinction procedure, it remains an evocative stimulus even through a declining rate. Once it no longer evokes the behavior at all, it becomes a neutral stimulus. Once a behavior has become extinct, the subject may occasionally exhibit instances of the behavior when exposed to the appropriate stimulus. This is sometimes called "spontaneous recovery," but there is nothing spontaneous about it and if under contingencies to verbalize about this phenomenon, the term "recovery" is adequate.

Following instatement of an extinction procedure, the form of the behavior becomes more variable. It is from the variations in form within the response class that shaping of the form can take place, refining the topography of the behavior—some variations are selected against and some selected for. Shaping can take place in a training project, but it can occur without being mediated socially as well simply through the environment's selection of more effective forms.

Variables Influencing Effectiveness of Reinforcement

For reinforcement to be effective, certain conditions must be present. Although there can be many such variables, a few of them are particularly important. These are described below.

Contiguity

Contiguity refers to the occurrence of two or more events in both close spatial and temporal proximity. In other words, the two events must occur at approximately the same time and also when they are physically close to one another. Of interest here, is contiguity with respect to an operant and the consequence it generates.

To be spatially contiguous means that the organism must be close enough to the consequence to detect and react to it. The smaller the interval of time between the operant and the reinforcer, the more effective the reinforcer will be. The longer the interval between the target behavior and reinforcer, accumulation of additional behaviors becomes more likely and it is less likely that the reinforcer will actually reinforce the target behavior. If more than a few seconds occurs between the behavior and the consequence, conditioning becomes unlikely.

Contingency

Contingency refers to a degree of correlation (i.e., a functional relation) between a behavior and antecedent or consequence. With respect to reinforcers, contingency refers to the degree to which a consequence is delivered after each occurrence of a response class. The higher the correlation between a behavior and the reinforcer, the stronger the conditioning will be.

Motivating Operations

Motivating operations are procedures that establish a function-altering condition within a body that temporarily influences how effective consequences will be and hence how strongly evocative the evocative stimulus will be. The motivating condition it establishes is the physiological condition or bodily state established within a body by a motivating operation, which influences behavior while the condition exists. A deprived body tends to exhibit behavior that contacts that reinforcer and a satiated body tends not to exhibit such behavior (Laraway, et al., 2003).

Variables Influencing the Effectiveness of Punishment

Much as with reinforcement, for punishment to be effective, certain conditions must be met. Generally, an *abrupt* and *intensely* aversive punisher, delivered *immediately* upon occurrence of the behavior, *consistently*, each time the behavior occurs will be more effective in suppressing behavior than a punishment procedure failing to achieve any of these criteria. It is important to note that meeting all of these criteria may mitigate how problematic some side-effects are, but side-effects are an inherent result of aversive stimulation.

Contiguity

For punishment to be effective, it must be contiguous with the behavior to be punished. The punishment should follow the behavior immediately, if not occurring as the behavior is occurring.

Contingency

For punishment to be effective, it must be contingent upon the behavior to be punished. It must occur every time the behavior occurs and not otherwise.

Intensity

For punishment to be effective, it must be intense enough to suppress the behavior, that is, to overcome the effects of competing reinforcers available for exhibiting that behavior. It is, however, important to avoid excessive aversive stimulation as this will result in serious problematic side-effects. Punishment intensity should not be ramped up over time as the subject will become accustomed to it.

A Note on the Rationale for Using Punishment Effectively

Of course, it would be more direct and efficient to address the reinforcement contingency maintaining a behavior, and if one is going to address the reinforcement contingency with extinction and one does so effectively, one might as well simply reinforce an alternative behavior rather than punish the problematic behavior. By addressing the reinforcement contingency, we instate extinction and therefore punishment should not be necessary. Furthermore, if the punishment-only procedure is successful, then it actually protects the behavior against extinction, because the behavior does not occur and therefore there is no opportunity to extinguish it. Meaning, if there are no trials of the behavior failing to generate the reinforcer, then extinction does not occur. Thus, the behavior is suppressed rather than eliminated and extinction of the behavior is traded for temporary suppression. Then, when the punishment contingency is lifted, the behavior returns to its pre-intervention rate. This is just one of the reasons why punishment is generally not the most productive approach to reducing behavior excesses (i.e., problematic behaviors).

Antecedent Principles, Processes, and Procedures

This major section is mainly related to principles and processes that influence behavior by directly affecting the postcedent environment. Principles, processes, and procedures that influence behavior by affecting the antecedent environment are described. This includes two major classes of antecedent stimuli, and some processes and procedures related to them. The first major class of antecedent stimuli are the evocative stimuli. These stimuli evoke the behavior. The second major class of antecedent stimuli are function-altering stimuli, the most important type of which is motivating operations. Motivating operations influence the effectiveness of reinforcers and hence the likelihood of the antecedent stimulus to evoke the behavior.

Stimulus Control

Stimulus control refers to a range of phenomena relating to antecedent control of behavior. Stimulus control refers to the functional control of a response class by some property of an antecedent stimulus. First, some basic terms and relations are addressed. This is followed by coverage of generalization and discrimination, as well as procedures for transferring stimulus control. Finally, prompting and its role in generating target behaviors is described.

Terms and Relations

Antecedent stimuli that do not evoke or otherwise influence behavior are referred to as ***neutral stimuli*** (S^N) with respect to the target behavior. That is, a neutral stimulus might occur before a behavior, even frequently, but it is not functionally related to the behavior. Furthermore, that stimulus may be evocative of some other behaviors and still be neutral with respect to the behavior in question.

Once we have confirmed that the stimulus evokes the behavior, we refer to that antecedent stimulus as the “evocative stimulus” (S^{Ev}). The older term, “discriminative stimulus” (S^D), is still used in behavior analysis. There are usually numerous stimulus features that share control over a target behavior, but we often simplify the analysis by identifying the stimulus that exerts the most control. A stimulus becomes evocative with respect to a behavior after a history of reinforcement following that $S^{Ev} \rightarrow$ behavior contingency. If an $S^{Ev} \rightarrow$ behavior contingency is no longer reinforced, it will become extinguished, and once it does, the evocative stimulus becomes a neutral stimulus once again—it is a specific kind of neutral stimulus referred to as an ***S-delta*** (S^{Δ}), which is sometimes referred to as an "***extinction stimulus***," however, this is not a universally accepted term.

If, on the other hand, the behavior is suppressed (even completely) by punishment, it is still referred to as the "evocative stimulus" because punishment merely suppresses the behavior and the stimulus remains evocative, given discontinuation of the punitive contingency. If it comes to also be extinguished, then the antecedent stimulus is referred to as a neutral stimulus because of extinction, not punishment.

Other classes of antecedent stimuli are explored in later sections, including various kinds of function-altering stimuli (i.e., stimuli that are not evocative but influence the likelihood of the evocative stimulus evoking the behavior).

Generalization and Discrimination Training

Generalization and discrimination are inversely related; they involve an increase or decrease, respectively, in the range of stimuli that evoke a behavior. As Moore (2008, p. 100) points out, generalization and discrimination are not things individuals "do," but rather a process that occurs or a function of a pattern of behaving. Hence, while it is appropriate to refer to a pattern of responding to stimuli as an instance of generalization or discrimination, it would be inappropriate to refer to a subject generaliz*ing* or discriminat*ing*.

Generalization

Stimulus generalization is the process by which the range of evocative stimulus features evoking an operant behavior is *increased*.[21] That is, additional antecedent stimuli also come to evoke the behavior in question

[21] Generalization is also applicable to respondent conditioning.

because they share stimulus features with the originally operative evocative stimulus. The reinforcement strengthens the functional relation between the response class in question and all antecedent stimulus features present. The more features other stimuli share with the original training, the more likely they too will be to evoke the behavior—this results in an increase in the number of stimuli or stimulus features that may evoke the behavior.

Generalization occurs without any specific actions on the part of a trainer but it can also be promoted by trainers. Since reinforcement increases the likelihood of all present evocative stimulus features, similar stimuli will come, through repeated trials, to take on stimulus control over the behavior in question.[22] The less similar a stimulus is—that is, the fewer shared salient properties the stimuli share—the less likely the stimulus is to take on stimulus control. For instance, if you train a subject to sit when cued with a vocal "sit," and the word "sip" also comes to evoke sitting, that is an indication that generalization has occurred. In this example, you are likely to find the word "down" does not evoke sitting because "down" and "sit" do not share enough properties to be strengthened by reinforcement along with the "sit" stimulus.

Setting generalization is the process by which a subject comes to exhibit a behavior in new settings (i.e., ones in which the behavior was not initially trained). For example, if you train a dog to sit in one setting (e.g., a living room), sitting may come to occur in other settings as well (e.g., outside), and when that occurs, it is said that setting generalization has occurred.

Response generalization is a process by which the range of *response class forms* that an antecedent stimulus evokes is increased. For example, if walking to access a reinforcer is effective, other response class forms such as skipping, crawling, and running may also become likely. This increase in the likelihood or rate of other response class forms is referred to as response generalization because the range of response class *forms* that are evoked increases. This may occur with no trainer participation, but it can also be promoted with extrinsic reinforcement of alternate response class forms.

[22] Just a reminder that conditioning makes changes to the nervous system of the subject, which in turn changes the receptivity of the subject to stimulation. The conditioning does not change the stimulus. Phrases such as these are verbal short cuts that help make discussion smoother but it is important to appreciate the mechanisms involved in the processes.

Discrimination

Discrimination is the process by which the range of evocative stimulus features evoking a response class *decreases*. Discrimination, also sometimes referred to as "evocation" in behaviorology, is the opposite of generalization in the sense that it *reduces,* rather than expands, the range of stimulus features that will evoke the target behavior.

Discrimination training is a differential reinforcement procedure in which responding to a specific narrow range of stimulus features is reinforced and responding to different but similar stimulus features is extinguished, resulting in a decrease in the range of stimulus features that will evoke a target behavior. The specific stimulus targeted in discrimination training is referred to as the "specified" or "target" evocative stimulus. Similar stimuli that might otherwise evoke the target response class form (due to generalization), but do not fall within the narrow property range of the target evocative stimulus, are targeted for extinction.

Let us say you train a dog to wave a paw when you say "wave" and you reinforce each instance of this. You might then carry out discrimination training in the traditional way by saying "waze" and failing to reinforce if the dog waves. You could present other similar stimuli and do the same thing, with trials of "wave" mixed in, which you *do* reinforce responding to. You will find that discrimination occurs. Instead of a wide range of similar stimuli evoking the behavior, only that narrowly defined stimulus evokes the waving behavior and other similar stimuli no longer do.

To take the above example a step further, and illustrate both generalization and traditional discrimination training, you might promote stimulus generalization by reinforcing when *any* person says "wave" (and setting generalization by reinforcing responding in different rooms) at the same time as you carry out discrimination training to restrict the evocative stimulus to the exact word "wave" and not similar-sounding words. Generalization and discrimination training are used to ensure that the "right" stimulus evokes a behavior and the "wrong" stimuli do not.

Notwithstanding the above description of the traditional approach to discrimination training, this trial-and-error approach results in numerous "errors" as mentioned above, meaning that many extinction target behaviors occur, which must then by extinguished. Extinction is aversive and results in disruptive behavioral side-effects.

Terrace (1963) devised a solution for avoiding the behavioral side-effects of aversive trials, achieving the discrimination training with few or no "errors" in the training. This procedure is called "errorless discrimination training." Errorless discrimination training is a training procedure in which the subject is not allowed to make mistakes, that is responding to the S^{Δ}, by starting with the S^{Ev} and S^{Δ} as dissimilar as possible, minimizing the likelihood of "errors," and gradually making them more similar through successive trials until discrimination occurs with few to no errors having occurred.

The errorless discrimination training protocol has much wider applications and implications than simple discrimination training of a new behavior. Utilizing a broad "***errorless conditioning***" approach with what we call a "***graded approach***" can help install replacement behaviors for problem behaviors with fewer "errors," allowing for a more added reinforcement emphasized approach. This is discussed in detail below.

Transferring Stimulus Control

The capability to evoke a behavior can be transferred from an established evocative stimulus to a neutral stimulus. This is important for engineering changes in behavior, because behaviorologists and behavior technologists are frequently under contingencies to transfer stimulus control from prompts that will generate a replacement behavior to the stimulus that once evoked the problem behavior. It is also common to transfer stimulus control from the hand motion used to lure (i.e., prompt) a behavior to a vocal cue in training.

Transferring stimulus control from a previously established cue to a new, currently neural, stimulus requires one of two procedures, each of which is more appropriate under different circumstances. Each is discussed in turn.

The ***prompt fading*** (or, simply fading) procedure involves gradually making the established stimulus seem more and more like the new stimulus through successive trials, until the new stimulus is capable of evoking the target behavior.[23] If each increment is small, the subject will continue to respond due to generalization and the reinforcer will strengthen the functional relation between the behavior and all stimulus features present at that time. Then, another small incremental change is made toward the ultimate target cue. For example, when transferring stimulus control from a luring motion to a hand motion cue, the old luring motion is gradually and incrementally changed to look a little more like the new hand motion in each trial until the new hand motion reliably evokes the behavior (i.e., takes on stimulus control)—on each successive trial, the motion is made to look just a little bit less like the lure motion and just a little bit more like the hand motion.

The ***prompt delay*** procedure involves pairing the established stimulus with the new stimulus through repeated trials until the new stimulus is capable of evoking the behavior. ***Pairing*** is a procedure in which a subject is exposed to more than one stimulus contiguously, resulting in the new stimulus coming to exert control over the behavior similar to that of the previously established stimulus it was paired with.[24] In this case, we use the following contingency sequence:

New stimulus → Old stimulus → Behavior → Reinforcer

A behavior → reinforcement contingency will strengthen not only the relation between the evocative stimulus and the behavior, but *all* antecedent relations. In this case, the new and old stimulus are both strengthened. Once the new stimulus is strengthened adequately to evoke the behavior itself, the old stimulus is faded (gradually made less prominent) or simply discontinued. For example, when transferring stimulus control from a hand motion to a vocal cue (e.g., "sit"), these are too different to use a prompt fading procedure—intermediate increments are not feasible. The following sequence is used: "sit" → hand motion → subject sits → reinforcement. This is repeated through several trials. One

[23] Note that I used the word "seem" rather than "look." With visual stimuli, we gradually change the look of the stimulus but we may also change aural stimuli and in this case, it would be sound that gradually changes. Other sensory modalities may be used as well.

[24] Notice we refer to the pairing procedure and the biological pairing process and not to the subject "associating" two stimuli. The word "associating" is agential, implying a behavior that is chosen by the subject and is best avoided, in favor of the less problematic proper technical term "pairing."

can test the strength of conditioning by *delaying* presentation of the old stimulus and observing whether the behavior occurs or not.

In both the prompt fading and the prompt delay procedures, the range of stimuli that will evoke the target behavior increases, and hence, this is an instance of generalization. The generalization process can be encouraged by allowing or ensuring reinforcement of behavior evoked by similar, but not identical, stimuli. Alternatively, it can be discouraged through discrimination training.

Prompting

A ***prompt*** is any antecedent stimulus, other than the designated primary stimulus, that contributes to evoking the target behavior. To reinforce a behavior and bring it under stimulus control, it must occur and this applies as readily to installing replacement behaviors to displace aggressive behaviors as to training new behaviors in simple training projects. Prompts help generate the behavior so that it may be reinforced. Once the behavior occurs reliably, stimulus control can be transferred to the primary stimulus and the prompts faded.

Prompts may be evocative of the behavior in question itself or they may be evocative of a different behavior (usually approach or contact-enhancing behaviors) that results in incidental occurrence of the behavior in question. For example, high-pitched noises may be moderately evocative of approach behaviors in puppies, which allows you to generate the behavior in question (e.g., coming when called) as in the example above. On the other hand, you may hold a treat over a dog's head, which actually evokes attempts to smell and/or eat the treat, which incidentally results in generating a sit to make that happen. In either case, although the prompt generates or merely helps generate the behavior in question, it is not the antecedent stimulus that you ultimately want to evoke the behavior.

Once the primary stimulus takes on stimulus control over the behavior, the prompts are dropped or gradually faded (i.e., gradually made less and less prominent through repeated trials until the prompt is absent), leaving the primary stimulus effective in evoking the behavior on its own. This gradual elimination of the prompt is called "prompt fading", or simply "fading". Fading the prompt as soon as practicable is important because with each trial, it too, along with the primary stimulus, takes on a higher degree of stimulus control over the behavior. If the prompt becomes too well conditioned, it will become an established necessary component of the antecedent package resulting in the behavior becoming prompt dependent. Prompt dependence refers to an antecedent → behavior functional relation in which the prompt becomes a necessary component of the antecedent package evoking a behavior. In other words, the prompt was not faded soon enough and now the behavior cannot be evoked without the prompt being present. If a behavior becomes prompt dependent, it requires more extensive extinction and discrimination training to fix. Therefore, it is important to drop or fade the prompt as soon as the primary stimulus becomes an evocative stimulus.

For convenience, we can categorize prompts by the sensory system that they impinge upon. Olfactory prompts involve the transfer of energy from the stimulus to the organism through the olfactory system (smell). Tactile prompts contact the touch sensitive nerves (touch). Visual prompts impact upon the optic nerve in the eye (sight). Aural prompts impact upon the nerves attached to the eardrum (hearing).

Sometimes physical manipulation is mistaken for prompting. A tactile prompt might involve a touch but it does not *force* a behavior. It is better to refer to the so-called "physical prompt"—such as pushing on a dog's hips to generate a sit, a "physical manipulation". A prompt adds a supplemental *evocative* stimulus, but physical force or manipulation is not evocative of the behavior in question—it is just force. Physical manipulation superimposes another contingency into the training, one that may be distracting or even aversive. Physical manipulation can therefore be disruptive and may even generate problematic emotional behaviors and counter-controlling behaviors.

Many dog trainers verbalize about prompting or evoking a behavior versus "capturing" it. All operants are evoked. One might verbalize coherently about trainer-mediated prompts and cues—ones mediated directly by a trainer, versus behaviors that are evoked by some other stimulus in the environment—but they are all evoked by stimuli in the environment. If you "capture" a behavior, it just means that some event not mediated by you evoked the behavior.

Function-Altering Stimuli

The other major class of antecedent stimulation besides the evocative stimulus is function-altering stimulation (S^{FA}). A ***function-altering stimulus*** is an antecedent stimulus, the occurrence of which causes a bodily condition, which alters the function of other stimuli. The function-altering stimulus does not itself evoke the behavior but rather causes changes in the organism that changes its receptivity to evocative stimuli.

Many scholars and practitioners, at various times, have addressed the issue of non-evocative antecedent stimulation and as such there have been various terms used to describe them, some with broader focus than others. These terms include "enabling stimulus," "establishing operation," and "setting event" but "function-altering stimulation" is the broadest term for describing antecedent stimulation that is not evocative and includes such stimulation categories as the above, as well as motivating operations, sensitization, habituation, potentiation, and other context setting events (Fraley, 2008, p. 513). One of the most important kinds of function-altering stimulation is the motivating operation.

You may recognize instances of function-altering stimulation by the evocation of the phrase "only if" when describing the relation between the behavior and antecedent stimulation. The evocative stimulus evokes the behavior *only if* this other stimulus event is present. This applies to motivating operations and other kinds of function-altering stimulation.

Motivating Operations

Terms, Processes, and Distinctions

Biological evolution has resulted in bodies that are structured in such a manner that certain forms of stimulation (i.e., unconditioned reinforcers) will reinforce behaviors that function to generate it without any previous conditioning to establish them as reinforcers. The effectiveness of unconditioned reinforcers is conditional upon motivating conditions within the body that are caused by motivating operations. The unconditioned reinforcer may, depending on the occurrence of motivating operations, be completely ineffective as a reinforcer, be highly effective as a reinforcer, or be somewhere in between. Indeed, the stimulus may even act as an aversive stimulus under certain motivating operations.

Motivating operations (MO) are stimulus events that cause conditions within the body that temporarily alter (a) the effectiveness of a stimulus as a reinforcer, and (b) the current rate of all behaviors that have been reinforced by that stimulus (Michael, 2007, p. 375).

As the definition describes, the motivating operation has two key effects. The alteration of the effectiveness of a stimulus as a reinforcer is referred to as the "***value-altering effect***" and the change in current rate of all behaviors which have been reinforced by that stimulus is referred to as the ***behavior-altering effect***.[25] A value-altering effect might involve (a) an *increase* in the effectiveness of a stimulus as a reinforcer, called an "establishing operation," or (b) a *decrease* in the effectiveness of a stimulus as a reinforcer, called an "abolishing operation." A behavior-altering effect might involve (a) an *increase* in the current rate of behaviors that have been reinforced by that stimulus, called the "evocative effect", or (b) a *decrease* in the current rate of behaviors that have been reinforced by that stimulus, called the "abative effect".

In distinguishing the evocative stimulus from the motivating operation, note that whereas the evocative stimulus establishes the *availability* of an outcome, the motivating operation establishes or abolishes the *effectiveness* of the outcome as a reinforcer.

Establishing operations (EOs) are stimulus events that temporarily establish (increase) the effectiveness of a stimulus as a reinforcer. Deprivation with respect to reinforcers, acts as an establishing operation, generating the relevant value-altering effects and behavior-altering effects. ***Deprivation*** is a physiological condition (operationally defined by the amount of time during which the body has not contacted a particular reinforcer and the amount of contact), which results in an increase in the effectiveness of the

[25] The word "value" tends to connote a preference or other covert evaluative behavior. Although the word value is used in the (behavior analytic) literature on this topic, it is be less agential and more scientifically valid to refer to it as the "reinforcer effectiveness-altering effect." Effectiveness is directly confirmable, whereas "value" is somewhat speculative. Where the technical term "value-altering effect" is required, I defer to that terminology, but otherwise, I refer to the effectiveness of a stimulus as a reinforcer. Do not be confused by the different phrasing.

reinforcer and hence an increase in the current rate of behaviors that serve that function.

Abolishing operations (AOs) are stimulus events that temporarily abolish (decrease) the effectiveness of a stimulus as a reinforcer. Satiation with respect to a reinforcer acts as an abolishing operation, generating the relevant value-altering effects and behavior altering effects. ***Satiation*** is a physiological condition defined by a reinforcer being temporarily rendered ineffective (evidenced by a reduction in the current rate or relative frequency of the behavior) due to recent contact with that reinforcer.

A deprived body tends to exhibit behavior that contacts that reinforcer and a satiated body tends not to exhibit such behavior. The process of satiating a body is an abolishing operation for behaviors that function to contact that reinforcer. For example, depriving an organism of food is an establishing operation for behaviors that function to access food, and satiating the organism with respect to food (i.e., food consumption), is an abolishing operation for behaviors that function to contact food. As another example, depriving organisms for which social contact is reinforcing of social contact is an establishing operation for behaviors that function to access social contact and satiating the organism with respect to social contact (being with others sufficiently) is an abolishing operation for behaviors that function to access social contact (Cipani & Schock, 2001, p. 13).

Regarding the previous two examples, eating too much and being with someone too much may become aversive, not only abolishing the effectiveness of these stimuli as reinforcers and decreasing the likelihood of access-generating behaviors, but also establishing the effectiveness of outcomes that reduce contact with (escape) them, increasing the likelihood of these escape behaviors.

Aversive stimulation can generate value-altering and behavior-altering effects as well. Recall that ***aversive stimulation*** is any event that functions (a) to evoke behavior that has reduced or terminated it in the past, (b) as a punisher if presented immediately following a behavior, or (c) as a reinforcer when withdrawn immediately after a behavior (Cooper et al., 2007). In terms of aversive stimulation in the context of motivating operations, aversive stimulation:

- *establishes* the effectiveness of reduced/subtracted aversive stimulation (value-altering effect: increases the value of escape) and *increases* the current rate or relative frequency of escape behaviors that achieve that (behavior-altering effect: evocative of escape behaviors); and
- *abolishes* aversion-contacting or maintaining behaviors (value-altering effect: decreases the value of approaching or maintaining contact) and *decreases* the current rate or relative frequency of behaviors that lead to aversive stimulation (behavior-altering effect: abative of approach-related behaviors).

As you can see and as discussed below in greater detail, the evocative stimulus and the motivating operation are integrally related. Both the *availability* of an outcome and the *effectiveness* of that outcome as a reinforcer are required for behavior to occur. The inclusion of motivating operations in a contingency analysis increases the completeness and precision of that analysis and provides another important variable that may be manipulated in order to change the behavior. However, motivating operations can change as quickly as satiation and deprivation conditions can change or as quickly as something aversive occurring and so one must be careful, when specifying a motivating operation, not to assume that the organism will always be under the specified motivating operation. Instead, it serves to identify *when* the evocative stimulus will be evocative.

It must also be emphasized that motivating operations are *not* the same as the colloquial terms "motivation," "drive," "desire," and "want." The word "motivation" is a term that is among several colloquial terms that have been used within psychology to refer to forces of, or in, the "mind" that cause behavior. From a behaviorological perspective, the word "motivation" is sometimes verbalized in situations in which the reinforcer for a behavior is present and/or considered before the behavior occurs and it participates verbally in the various contingencies under which the subject behaves, often making the behavior more likely. However, the verbalization of the word by lay persons and psychologists usually implies some mystical inner force or fictional thing inside a so-called "mind" is at work.

Motivating operations, by contrast with these colloquial terms, are quantifiable and verifiable changes in the organism's environment that influence the effectiveness of stimuli as reinforcers (Cipani & Schock, 2001, p. 13). Motivating operations are *not* to be confused with a force, drive, or an intervening variable between evocative stimulus and behavior. The motivating operation is a procedure or an event (i.e., a real stimulus) that establishes a temporary bodily condition that influences the effectiveness of stimuli as reinforcers. Any time a common language term is used in science, especially if it has also been used in a pseudoscience, there is a risk of that term carrying forward its nonscientific baggage (Chiesa, 1994). Within behaviorology, the word "motivation" is avoided for these reasons. Some behaviorologists refuse to accept the term "motivating operation" for these reasons, but the concept is far too useful to eschew, even if it is allowed for under the rubric of the function-altering stimulus.

Other antecedent events that act as function-altering stimulation include sensitization, potentiation, and habituation, which are discussed in the section on respondent conditioning. These temporary respondent conditions alter the effectiveness of the evocative stimuli. The conditions described in this paragraph might best be interpreted as motivating operations since they alter the *effectiveness* of stimuli as reinforcers.

Differentiating Between Motivating Operations and Evocative Stimuli

Differentiating between motivating operations and evocative stimuli is not always obvious. This is particularly true in cases where the motivating operation and the evocative stimulus coincide in time. Cipani and Schock (2001, p. 21) provide two questions, alluded to above, that will resolve any uncertainly. In the presence of this stimulus, is a particular stimulus event more or less *effective* as a reinforcer? If the answer is *yes*, the stimulus is a motivating operation. In the presence of this stimulus, is a particular stimulus event more or less *available*? If the answer is *yes*, the stimulus is an evocative stimulus (or a non-motivating operation function-altering stimulus).

Differentiating Between Motivating Operations and Other Function-Altering Stimuli

Differentiating between motivating operations and other forms of function-altering stimuli is also not always obvious. The same questions as above apply to differentiating these forms of antecedent stimulation. Motivating operations change the *effectiveness* of a stimulus as a reinforcer whereas other kinds of function-altering stimulation, as described below, change the *availability*, but not the effectiveness of the reinforcer.

Elicitation of Emotional Arousal as Motivating Operations

We all, putatively, appreciate that emotions occur and play a role in operant contingencies. In this section, we explore the role of emotional behaviors in operant contingencies in detail and consider the most productive and scientifically sound way to represent them in our analyses of operant contingencies.

Emotional reactions are real behaviors. They constitute the release of chemicals by glands into the bloodstream and certain neural processes, and they often result in awareness behaviors as an after-effect, something we call "***feelings***." Emotions and feelings are separate, though closely related, behaviors. It is important to note that words such as "fear" and "anger" etc., are verbal utterances (behaviors, themselves) evoked by feelings or operants for which verbalization of such terms has been reinforced in the past. Though emotional behaviors participate in operant contingencies, they are normally excluded from operant contingency analyses as part of the general practice of externalizing the contingency.

On the one hand, emotional behaviors are real behaviors that participate in operant contingencies in ways that, when appreciated, bring a stronger accounting for contingencies than would be the case without considering them (so do other physiological and anatomical explanations and evolutionary explanations too, but we emphasize a scale of analysis appropriate to the purview and goals of a natural science of behavior.)

However, emotional behaviors are private behaviors, which makes them difficult to manipulate, and they are also intervening variables, something we typically bypass in analyses of behavior with the practice called "externalizing the contingency." That is, we trace the cause of a behavior back through a chain of causes to a publicly accessible and manipulable stimulus, because that is what we can most productively change in order to change the behavior of concern. In other words, consideration of emotional reactions is not particularly practical, so we look to the external stimuli involved in the contingency.

An appreciation for why we tend to emphasize the operant processes and bypass emotional behaviors in our analyses provides a fuller understanding of the topic.

Consider the three positions in an operant contingency analysis in which emotional behaviors can occur and how we address them in operant contingency analyses.

First, emotional behaviors can be elicited by the evocative stimulus, occurring simultaneously and also sometimes immediately before the operant behavior of concern. Second, they can be elicited by the occurrence of the behavior itself, participating as the consequence for the operant of concern. Third, they can occur prior to the evocation of the operant of concern, constituting an emotionally aroused condition that influences the evocation of the behavior of concern.

When an emotional behavior occurs simultaneously with, or between, the evocative stimulus and the operant of concern, it is considered an intervening variable and is bypassed in depictions of the contingency since the emotional behavior and the operant share a cause—the evocative stimulus (or, eliciting stimulus in the case of the respondent). By identifying the evocative stimulus and the operant, the shared cause (i.e., the antecedent stimulus) is identified. The emotional behavior, in such cases occurs and is recognized as real, but it constitutes a part of the physiological process that we refer to as the "mediation" of the behavior. That is, the emotional behavior in such cases is part of how the operant behavior occurs, a part of the cascade of neural and physiological processes culminating in the occurrence of the operant. Therefore, we tend to leave out reference to emotional behaviors under these conditions on the basis that it does not contribute anything useful to the contingency analysis.

When an emotional behavior is elicited by the occurrence of the behavior itself, the emotional behavior is a part of the consequence and is identified as such when identifying the consequence. For example, if the consequence is a reinforcer, then we may also infer certain kinds of emotional arousal versus if the stimulus is a punisher, assuming we are under contingencies to speculate about the emotional behaviors as well. We might also specify whether the reinforcer is an endostimulus or ectostimulus to identify whether stimulation from outside the body is involved. In these cases, the behavior causes other body parts (i.e., the nervous and endocrine systems) to react in a way that functions as reinforcement for the operant. Though feelings do not always accompany emotional behaviors, many times they do. In these cases, the behavior itself "feels good" (or "bad"), so to speak, but identifying the stimulus as a reinforcer or punisher is more productive and verifiable. Therefore, the emphasis in the contingency analysis is placed on the operant behavior and the consequence as opposed to the physiology that constitutes the consequence and any feelings that might also result. The function is more important than the physiology of its triggering and emotional behaviors and feelings, though real, contribute little if anything relevant in such contingency analyses.

Neither of the two roles of emotional behaviors discussed above constitute function-altering stimulation, because they occur after the evocative stimulus. They are provided to set the stage for the elicitation of emotional behaviors as components of function-altering stimulation. The third role of emotional behavior discussed next participates in contingencies as function-altering stimulation.

In certain kinds of contingencies, the emotional behavior is elicited before an evocative stimulus triggers an operant, which causes a temporary physiological state called "arousal." During this period of time, the subject is more or less receptive to certain stimuli and certain operants become more or less likely to be evoked. In other words, the subject exhibits an emotional reaction and the arousal caused by this emotional behavior influences how effective certain stimuli will be as reinforcers, which makes certain behaviors more or less likely to occur. As such, the stimuli that elicit the emotional behaviors fit within the conceptual framework of motivating operations. Broadly, ***appetitive*** (i.e., literally, attractive) emotional arousal establishes the effectiveness of the stimulus eliciting that emotional arousal as a reinforcer and makes behaviors that tend to *access* it more likely, whereas ***aversive emotional arousal*** establishes the effectiveness of the stimulus eliciting that emotional arousal as a reinforcer and makes behaviors that tend to *escape* it more likely.

Michael (2007, p. 375) characterized motivating operations colloquially as "…what people do at any particular moment is at least partly a function of what they want at that moment." Organisms "want" added reinforcers (appetitive stimuli) and "want" to escape subtracted reinforcers (aversive stimuli). The physiological arousal that emotional behaviors and feelings generate determines whether an organism will "want" to access or to escape that thing. It is in this context that we say that stimuli that elicit emotional behaviors function as motivating operations. Note that colloquial use of the term "want" is best avoided in favor of reference to the effectiveness of reinforcers or the occurrence or nonoccurrence of behaviors that contact certain behaviors. Not only does "want" refer to something nebulous at best, and fictitious as worst, it may not always be the case that a subject exhibits a "want" type behavior. Wanting, as a behavior, suggests or implies awareness but awareness is not necessary for operant conditioning to occur. A subject may exhibit certain behaviors but not be aware of "wanting" per se.[26]

Should such instances of emotional behavior be identified in operant contingencies as motivating operations? The emotional behavior is private, and as such, the general approach of externalizing the contingency comes into play again. In the case of contingencies in which the subject experiences an emotional behavior before an operant of concern is evoked, where that operant likely would not have occurred if not for the emotional arousal occurring at the time it was evoked, one may look to the eliciting stimulus (tracing the cause back to a manipulable stimulus) as the function-altering stimulus, the presentation of that stimulus being the motivating operation.

In all cases, then, one may bypass inclusion of emotional behaviors in operant contingency analyses. This practice is common but it is uncommon to see an explanation for the practice. We recognize that emotional behaviors are real behaviors that play an important role in setting the occasion for or mediating behaviors. But, the emphasis is placed on the external stimuli that cause the operant and the operant behavior of concern itself. This does not mean that emotional behaviors, nor their role in operant contingencies is ignored.

[26] Such colloquial and less than scientifically careful language is common within behavior analysis and not within behaviorology.

Other Function-altering Stimuli

Not all function-altering stimuli fall into the category of motivating operation so neatly. In some cases, an antecedent stimulus that is not the evocative stimulus contributes to establishing availability (but not the effectiveness of the stimulus as a reinforcer) and therefore we would not identify this stimulation as a motivating operation.

An example of a function-altering stimulus that does not readily fit within the motivating operation rubric is the phenomenon of ***prompt dependence***. This might involve a situation in which a dog sits when one vocalizes the word “sit,” but only if treats are obviously present (a function-altering stimulus). The vocal cue evokes the behavior reliably, but *only if* the treats are present. The vocal stimulus is the evocative stimulus, and the presence of the treats is the function-altering stimulus because it functions to alter the effectiveness of the evocative stimulus to evoke the behavior. Note again, the presence of treats does not establish or abolish the effectiveness of the reinforcer, as would be the case in motivating operations, but rather the availability along with the evocative stimulus in an “only if” manner.

Depicting Function-altering Stimuli in Contingency Analyses

In the case of motivating operations, when the motivating operation occurs, the *effectiveness* of the reinforcer is established or abolished, making the evocative stimulus more or less likely to evoke the behavior. That may be depicted as below:

$$\text{MO} \rightarrow \text{S}^{\text{Ev}} \rightarrow \text{Behavior} \rightarrow \text{Consequence}$$

If the motivating operation is an establishing operation, EO would be used, and if it an abolishing operation, AO would be used in specific contingency notations.

In the case of non-motivating operation function-altering stimulation, if the function-altering stimulus occurs, establishing the *availability* of the reinforcer under certain circumstances, then the evocative stimulus, if it occurs, becomes more likely to evoke the behavior. That may be depicted as below:

$S^{FA} \rightarrow S^{Ev} \rightarrow$ Behavior $\rightarrow$ Consequence

Schedules of Added Reinforcement

A ***schedule of added reinforcement*** sets the rule that determines which responses, among a series of responses, will be or have been reinforced. Notice that a schedule of reinforcement may describe a schedule rule that a trainer follows or it may describe a non-trainer mediated schedule of reinforcement. Different schedules of reinforcement are used under different circumstances because each schedule generates a characteristic effect on the rate of the behavior. Each of the most useful schedules of reinforcement are reviewed below.

Simple Schedules of Added Reinforcement

A simple schedule of added reinforcement is one that is based on a single rule and principle of behavior. This is in contrast with compound schedules of added reinforcement which are described after the simple schedules.

Continuous Reinforcement

Continuous reinforcement (CRF) sets the rule that a reinforcer is added after each occurrence of the behavior. Continuous reinforcement produces a steady and reliable increase in the rate of responding. It also generates two other notable schedule effects. First, behaviors maintained on continuous reinforcement are highly susceptible to extinction. An operant maintained on continuous reinforcement that is then put on an extinction schedule will tend to extinguish very quickly. As an example, vending machines operate on a continuous reinforcement schedule. Every time money is inserted, the machine dispenses the appropriate product. If a vending machine is broken and money-inserting behaviors are placed on an extinction schedule, the rate of money-inserting behaviors will decrease quickly, often immediately. Second, behaviors maintained on continuous reinforcement tend to become topographically stereotypical. Without topographic variability, there is little opportunity to fine tune the form of (i.e., shape) the behavior.

Given these schedule effects, and the fact the satiation occurs more quickly during continuous reinforcement, due to the provision of a greater number of the unconditioned reinforcer, continuous reinforcement is mainly useful in the initial acquisition stage of training. It becomes detrimental in most common applications once the behavior reaches steady-state (i.e., the rate stabilizes). To promote persistence and variability, it is best to transition to an intermittent schedule of added reinforcement as soon as the newly acquired operant becomes stable.

Extinction

As well as being a conditioning process and the product of that conditioning, extinction can also refer to the schedule of added reinforcement relevant to that conditioning. An ***extinction*** (EXT) schedule sets the rule that *no* responses within a series of responses will be reinforced. Extinction is the opposite of continuous reinforcement, and predictably, it has the opposite effect on responding. Extinction generates a decrease in responding, the course of that decrease determined largely by the kind of schedule of added reinforcement the behavior was on before extinction was instated. A behavior previously maintained on continuous reinforcement will tend to extinguish quickly and steadily. A behavior previously maintained on a sparse intermittent schedule of added reinforcement will be less susceptible to extinction and the course of the decrease will more gradual. The sparser the intermittent schedule, the longer it will generally take to extinguish the behavior. A behavior placed on an extinction schedule (particularly if it was on a variable intermittent schedule) will tend to initially increase in variability and may briefly increase in rate. This brief increase in responding is referred to as an ***extinction burst***. More than one extinction burst may occur but they will become less frequent and be of lesser magnitude as the operant extinguishes.

Occasionally, after extinction occurs, the subject may exhibit a ***probe response*** in the appropriate antecedent context, but these will become less likely if extinction is maintained. For example, if after some time the broken vending machine along with a food deprivation motivating operation again evokes a probe behavior of money inserting behavior and again the vending machine fails to mediate the added reinforcer, it is then *far* less likely that the subject will attempt another probe again.

Intermittent Reinforcement

An ***intermittent schedule of reinforcement*** is any of several specific schedules that share the general rule that added reinforcers follow some, but not all, occurrences of the behavior. Behavior on an intermittent schedule is less susceptible to extinction and the form is more variable than behaviors maintained with continuous reinforcement. Six basic intermittent schedules, three fixed and three variable, are discussed below.

Fixed Ratio Schedule of Added Reinforcement

A ***fixed ratio*** (FR) schedule sets the rule that reinforcement will be added following the final response after a fixed number of responses have occurred. A number is included in the description of the schedule to identify the number of responses that generate the reinforcement. Therefore, reinforcing after four responses would be FR-4. On an FR schedule, the subject usually responds at a high rate, but responding wanes after each delivery of reinforcement, an effect referred to as a "post reinforcement pause." The FR schedule is rarely use in training, because of this post reinforcement pause.

When ***thinning*** (i.e., ***stretching***) a ratio schedule, it is important to avoid resetting to a higher ratio until the rate of the behavior has stabilized at the current ratio. Conditioning is a physical process within the body and it takes a certain amount of time for the body to change structurally in reaction to stimulation. If the schedule of reinforcement is thinned before the body has had a chance to complete the change at the current ratio, the schedule may actually become strained, and the behavior may fail to stabilize at all, and in some cases, may extinguish.

Variable Ratio Schedule of Added Reinforcement

A ***variable ratio*** (VR) schedule sets the rule that reinforcement will be added following the final response after a variable number of responses around a specific mean average number of responses has occurred. "Variable" means that reinforcement is delivered in a seemingly random manner around the mean specified in the schedule notation. It is important to avoiding getting too far away from the mean.

The schedule effects associated with the VR schedule are very important for behavior engineering. Responding under a VR schedule usually occurs at a high rate and with less of a post reinforcement pause than under an FR schedule. In addition, behaviors on VR schedules are highly resistant to extinction, all the more so the higher the ratio. This can be useful when training a behavior that one wants to be resistant to extinction, but it can be a real problem when trying to extinguish a problem behavior that was on a sparse variable ratio schedule of reinforcement.

Mechanical engineers (utilizing the natural science of behavior and thereby also engaging in behavior engineering) design slot machines to operate on a VR schedule because this schedule maintains the highest rate of responding in relation to the number of reinforcers provided. Unlike the vending machine, the slot machine delivers its reinforcers on a seemingly random schedule, which is in fact a VR schedule. As you would expect, subjects on VR schedules may exhibit the target behavior vast numbers of times before reinforcement is delivered (persistence), assuming the ratio is thinned gradually enough.[27] The ratio of reinforced to unreinforced behaviors can be stretched gradually, but if it is stretched too far, too quickly, the ratio may become strained. ***Ratio strain*** is the deterioration of the rate of responding that occurs when a ratio schedule is thinned (i.e., the ratio is stretched) too quickly or by too large of an increment. Extinction (i.e., failure to reinforce a behavior) tends to initially increase the rate and magnitude of responding, as well as the topographic variability of the responses (referred to as an "extinction burst"). This can be useful in shaping behaviors and with a gradual and

[27] "Thinning the schedule" is the same thing as "stretching the ratio" of reinforced to unreinforced behaviors.

relatively slow thinning process, causes little or no problem. However, eventually, failure to reinforce a behavior leads to actual extinction. That is, the behavior ceases occurring, which is usually accompanied by frustration and the typical side-effects of aversive stimulation. If one thins a schedule too quickly, the subject “gives up” in an agential manner of speaking, before the next reinforcement trial occurs, and rather suddenly, no instances of the behavior occur to be reinforced. This deterioration of the behavior resulting from thinning the schedule of reinforcement too quickly is ratio strain.

Due to these schedule effects, a VR schedule is the most useful basic schedule of reinforcement to transition to after continuous reinforcement. As with FR schedules, and indeed all schedules, ensure that the subject’s body has adjusted to the current change, as evidenced by stabilization of the rate of the behavior, before thinning the schedule and then, do not thin it too quickly.

Fixed Interval Schedule of Added Reinforcement

A ***fixed interval*** (FI) schedule sets the rule that reinforcement is delivered immediately following the first response exhibited *after* a specific interval of time has passed. It is important to note the two necessary conditions for interval schedules: the specified interval must pass, and then, and only then, the *next* response to occur is reinforced. A number and unit of time are included in the schedule description to identify the time interval involved. For example, reinforcing for the first response after two minutes would be depicted FI-2min.

Increases in the rate of responding are moderate under FI schedules and the responding declines briefly after each reinforcer is delivered in what is generally called “scalloping.” As a result of this scalloping schedule effect and only moderate responding, it is rarely used in training.

Variable Interval Schedule of Added Reinforcement

A ***variable interval*** (VI) schedule sets the rule that the first occurrence of the behavior after a variable interval of time around a specific mean average has passed will be reinforced. As with the FI schedule, the interval must pass, and only after that do we reinforce the next response, but with VI, the interval is seemingly random around a mean average interval. Again, a number and unit of time are included in the schedule description for specific instances. For example, a VI-30sec. would indicate a variable interval schedule of 30 seconds.

Increases in rate of responding are moderate but steady under VI schedules. VI schedules lack the scalloping observed with the FI schedules, but the rate remains merely moderate, compared with behavior under a ratio schedule.

Fixed Duration Schedule of Added Reinforcement

A ***fixed duration*** (FD) schedule sets the rule that the target behavior must be exhibited continuously for a specified period of time, at which point reinforcement is delivered. A number and unit of measure are included in the schedule description to identify the duration. For example, a behavior maintained on a fixed duration schedule of 30 seconds would be depicted FD-30sec.

Variable Duration Schedule of Added Reinforcement

A ***variable duration*** (VD) schedule sets the rule that if the behavior is exhibited continuously for a variable amount of time around a specific mean average, reinforcement is delivered. Again, a number and unit of measure are included in the schedule description for specific instances of the behavior, such as VD-30sec. In this example, the behavior is reinforced only if it occurs continuously for a seemingly random duration around a mean average of 30 seconds.

Schedule Extensions

A schedule extension is not a schedule of added reinforcement per se, but rather a rule added onto the schedules of added reinforcement that specifies further criteria to be met or exceptions to the schedule in effect.

Limited Hold

There is some disagreement with respect to what limited hold is or ought to be. Ferster and Skinner (1957, p. 729) originally defined ***limited hold*** (LH) as, “a short period during which a reinforcement arranged by an interval schedule is held available.” This is still how many sources continue to define it (e.g., Ledoux, 2014; Cooper et al. 2007; Pierce and Cheney, 2013). However, some sources (Burch & Bailey, 1999, pp. 41–42; Catania, 2013) define it such that the reinforcer is only available for a specified period of time after the evocative stimulus occurs. In Skinner’s original use, *once the behavior has been exhibited*, then the reinforcer is available only for a specified interval of time. If the subject does not collect the reinforcer within that interval, that reinforcer is no longer available until it becomes available again according to whatever schedule is being used. This use of limited hold might be referred to as the traditional usage.

Burch and Bailey (1999) and Catania (2013), on the other hand, define ***limited hold*** as a latency reduction schedule extension setting the rule that the reinforcer is available only for a specified period of time *after the cue is delivered*, and if the behavior is not exhibited in that time, reinforcer availability is terminated.

The concept of limited hold as a latency reduction schedule extension is particularly useful and unless otherwise stated, where the term is used in this book, it refers to this latency reduction schedule extension. In other words, once the behavior is cued, the behavior must then be exhibited within a specified period of time for it to generate reinforcement. If the behavior is not exhibited within the specified time period, an occurrence after that interval is not reinforced. For instance, if an FR-5, LH-8sec.

schedule is set, this means that every fifth response will be reinforced if it occurs within eight seconds of the evocative stimulus. Similarly, if an FI-1min., LH-10sec. schedule is set, this means that the first criterion response to occur after one minute, is reinforced, but only if the behavior occurs within 10 seconds after the evocative stimulus was presented.[28]

We might refer to this use of the limited hold extension, to differentiate it from the more traditional usage, as the latency reduction usage. Since this is not the traditional use of this term, take note that the term may be used in different ways.

Compound Schedules of Reinforcement

Traditionally, continuous reinforcement, extinction, and the intermittent schedules of added reinforcement covered above are treated as simple schedules, meaning they involve a single discrete schedule rule. ***Compound schedules*** of reinforcement utilize at least two simple schedules of reinforcement. Of most importance for our purposes are the compound schedule-based procedures referred to as "differential reinforcement."

Differential Reinforcement

Differential reinforcement is a compound procedure in which response class members that meet a specific property criterion along some dimension are targeted for added reinforcement and other members of that response class are targeted for extinction. Notice that not just any behavior or class of responses is reinforced while some other behavior or class of responses is extinguished. Differential reinforcement describes a procedure that involves targeting certain response class members or a response class form for reinforcement and *other members of that same response class* for

[28] The duration of other responses in the sequence are sometimes held to the same standard. In other words, if every fifth response is scheduled for reinforcement and there is a limited hold of eight seconds for that fifth response, trainers may require eight seconds of reinforcer availability for each response in order for it to be counted as a criterion-meeting response. Therefore, if five responses occurred in the sequence but one of them occurred after eight seconds, that response is identified as a non-criterion response and there were only four criterion responses counted. In using a limited hold schedule extension, one must be clear on whether all responses must meet the criterion or just the one to be reinforced.

extinction. Recall that members of the same response class may differ topographically, but they share the same effect on the environment.

Not all procedures that are commonly considered to be differential reinforcement are, in fact, differential reinforcement according to the traditional definition. If a particular reinforcer is deemed inappropriate for use in a differential reinforcement program for instance, the behavior used to replace the target behavior will be of a different response class, by definition, since a different reinforcer is used. In that case, simply because a different reinforcer is used, the procedure cannot be considered differential reinforcement. If the functional reinforcer (the reinforcer operative in the problem contingency) is a subtracted reinforcer and the trainer wishes to avoid using aversive stimulation to support the replacement behavior and so uses an added reinforcer instead, that too would not be a true differential reinforcement procedure. In these cases, the reinforcer maintaining the problem behavior is often problematic, because it is harmful in one way or another or else the trainer wishes to avoid using escape from aversive stimulation as a reinforcer because that would mean repeated exposures to aversive stimulation. In these cases, the procedure might be called a "differential reinforcement-like" procedure though this is not a technical term (Stephen Ledoux, personal communication, July 2015). Though technically erroneous, all of these procedures are commonly referred to as "differential reinforcement procedures" among trainers. In the chapter on contingency management procedures, I present the broader view that differential reinforcement can include replacement of response class forms *and response classes* to avoid the awkwardness of differentiating between differential reinforcement procedures and differential reinforcement-like procedures.

Differential reinforcement is used extensively in resolving problematic companion animal behavior. Typically, it is used either to replace specific problem target behavior, or to train a new specific behavior in place of other, non-criterion, behaviors that the subject might otherwise exhibit.[29] There are several variations of differential reinforcement, each of which may be appropriate under different circumstances. These variants are defined by the relation between the target behavior and the extinguished non-criterion behaviors.

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[29] Differential reinforcement is also used in discrimination training.

The following three differential reinforcement procedures: differential reinforcement of incompatible behavior; differential reinforcement of alternative behavior; and differential reinforcement of other behavior, involve differentially reinforcing one set of response class members or response class form to the exclusion of a *different* set of response class members or response class form within the same response class.

Differential Reinforcement of Incompatible Behavior

Differential reinforcement of incompatible behavior (DRI) is a differential reinforcement procedure in which the reinforcement-targeted response class members or response class form is mutually exclusive with respect to the extinction-targeted response class members. For example, a DRI procedure is used when a dog is trained to sit to greet people rather than jumping up on them, by reinforcing sitting and failing to reinforce jumping up. Both response class forms are within the same response class in this example because they share an effect on the environment—enhanced social contact. If the subject cannot exhibit the extinction-targeted behavior at the same time as the reinforcement-targeted behavior, the procedure is DRI.

Differential Reinforcement of Alternative Behavior

Differential reinforcement of alternative behavior (DRA) is a differential reinforcement procedure in which the reinforcement-targeted response class members or response class form, while compatible with the extinction-targeted response class members, is a *specific* and *different* response class form or set of response class members. DRA is used when the response class to be trained is not mutually exclusive with respect to other members of the response class that are likely to compete with it.

Differential Reinforcement of Other Behavior

Differential reinforcement of other behavior (DRO) is a differential reinforcement procedure in which *any* response class member other than the extinction-targeted response class members or response class forms is targeted for reinforcement.[30] DRO is often erroneously referred to as

[30] The primary use for DRO schedules are in contingency management plans instated to resolve problem behaviors that are affected by strong aversive emotional behaviors, the after-effect of which would be referred to as fear, panic, or anxiety. In these cases, the DRO-like procedure allows for a very high rate of added reinforcement, which is thought to achieve respondent counterconditioning as a

"differential reinforcement of zero responding." This is an error because it implies reinforcement of no responding; one can only reinforce behaviors—one cannot reinforce the *absence* of behavior.

Differential Reinforcement of Successive Approximations of a Terminal Behavior (Shaping)

"Shaping" refers to a differential reinforcement procedure in which successive approximations toward a terminal response topography are reinforced. Differential reinforcement procedures change the rate of a behavior but multiple differential procedures can be organized in sequence in a way that gradually shifts the form of the behavior. A plan is devised that identifies the terminal behavior and each of the small incremental form approximations between them. Then, for each approximation, a separate differential reinforcement procedure is implemented.

The topography within a response class is variable from response to response. That is, not every response in a response class, or even a response class form, is the exact same as others even when the form seems very similar. This variability in different properties of a behavior from one occurrence to another allows for selection and reinforcement of some variations over others. The initial approximation is set, such that it will occur frequently enough to be reinforced or that it can be readily prompted. Once that behavior has a history of reinforcement, it will occur more frequently, to the exclusion of other and previous variants. Then, that behavior is put on extinction, a common byproduct of which is increased behavioral variability. The second approximation is set such that it will fall within the range of variants caused by the extinction process. In other words, the next approximation cannot be too different from the one just established or it simply will not occur. That approximation is then targeted for reinforcement and its rate is increased. This process of reinforcing, extinguishing, and selecting for a closer approximation to the terminal response class from the variants exhibited is shaping. The shaping process continues until the terminal behavior is exhibited reliably.

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byproduct of the operant conditioning taking place. In other words, as you reinforce operant behaviors in the presence of a feared stimulus, for instance, the added reinforcers are paired with that stimulus and the problem stimulus comes to elicit emotional reactions similar to those elicited by the treats or whatever other added reinforcer was used.

Respondent Conditioning

Terms, Principles, and Processes

Respondents are a class of responses insensitive to consequential stimulation. Respondent contingencies involve a two-term contingency of the stimulus–response form. This is in contrast to the operant three-term contingency of the stimulus–response–stimulus form.

The body is structured such that when the appropriate antecedent stimulus occurs, the stream of energy from the environment causes the body to mediate a very specific unconditioned reaction. This reaction is controlled by a neural pathway that activates spinal motor neurons without the delay associated with routing neurological signals through the brain, allowing the reaction to occur relatively quickly (and without "second guessing," so to speak).

The stimulus that elicits this reaction is referred to as an ***unconditioned stimulus*** (US), and the reaction it elicits, an ***unconditioned response*** (UR). In other words, no conditioning is required for that response to occur. Since these relations exist because of biological evolution acting on the genes within a population across generations, they are related to biological imperatives. Examples include salivating in response to food in the mouth and blinking when something touches the eyeball. Unconditioned responses can also include the release of certain chemicals into the bloodstream when an animal is startled.

Respondent conditioning is the process whereby a ***neutral stimulus*** (NS), which does not elicit the response in question, comes to elicit a response after it has been paired with an unconditioned stimulus (or an established conditioned stimulus). An example of a neutral stimulus is the sound of a clicker before it has been conditioned to elicit a response that functions as reinforcement. The neutral stimulus becomes a ***conditioned stimulus*** (CS) once it elicits the ***conditioned response*** (CR).[31] The conditioned response is usually similar to the unconditioned response. In this example, a piece of

[31] Confusingly, the NS is sometimes called a CS right from the beginning of the conditioning procedure, the idea being that after even the very first pairing, some conditioning has occurred, even if it is not enough for the stimulus to reliably elicit the response.

food may elicit certain emotional reactions (chemicals released into the bloodstream and certain neural processes) and after pairing the food with a "click" sound, the click comes to also elicit this same emotional reaction. The statement, "the neutral stimulus and the unconditioned stimulus are paired," refers to the streams of energy from each of the stimuli contiguously impinging upon the subject's nervous system. The nervous system is then changed in such a way that the body will mediate the response when exposed to the neutral stimulus (now a conditioned stimulus), assuming it is at least occasionally paired with the unconditioned stimulus. These processes are illustrated in Figure 5, making it much easier to conceptualize.

Before Conditioning — US → UR

NS → No response

Respondent Conditioning — NS then US → UR

After Conditioning — US → UR

CS → CR

Figure 5. Diagram illustrating the processes of respondent conditioning.

The two most effective respondent conditioning (i.e., pairing) procedures are delayed conditioning and trace conditioning. In ***delayed conditioning***, the conditioned stimulus is presented before the unconditioned stimulus and then ends after the unconditioned stimulus starts (but generally stops before the unconditioned stimulus stops; see Figure 6). In ***trace conditioning***, the conditioned stimulus is presented and then removed, followed shortly by the presentation of the unconditioned stimulus. Establishing a clicker as a conditioned added reinforcer uses trace conditioning. For effective conditioning, the unconditioned stimulus should follow the conditioned stimulus within a few seconds to achieve satisfactory contiguity. ***Simultaneous conditioning***, in which the conditioned stimulus and unconditioned stimulus are presented at the same time, and ***backward conditioning***, in which the unconditioned stimulus is presented before the conditioned stimulus, are less effective and best avoided. Figure 6 illustrates these procedures.

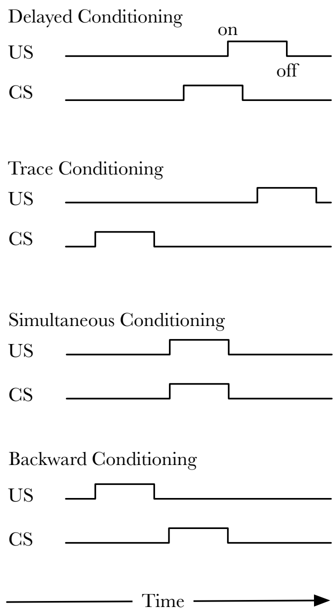

Figure 6. Respondent conditioning procedures.

Other Respondent Processes

A conditioned response can be maintained if the conditioned stimulus is at least occasionally paired with the unconditioned stimulus. Conditioned responses can be decreased or eliminated via respondent extinction. ***Respondent extinction*** involves presenting the conditioned stimulus without the unconditioned stimulus repeatedly until the conditioned stimulus again becomes a neutral stimulus.

Other processes can also affect the likelihood or magnitude of respondent behaviors. Repeatedly presenting an unconditioned stimulus generates a gradual and temporary reduction in the magnitude of the unconditioned response, a process referred to as ***habituation*** (Pierce & Cheney, 2008). In respondent extinction, the conditioned response is affected by repeatedly presenting the conditioned stimulus without the unconditioned stimulus, whereas in habituation, the unconditioned response is affected merely by repeated presentation of the unconditioned stimulus. Habituation relates to unconditioned and not to conditioned responses. Habituation is temporary, whereas respondent extinction is much more durable, if not permanent. However, less conditioning is required to reestablish the conditioned response after extinction.

If a stimulus elicits a particularly aversive response, repeated presentation may result in an increase, rather than decrease, in responding, a process referred to as ***potentiation*** (Fraley, 2008, p. 677; Catania, 1998). Finally, startling emotional arousal can briefly increase the magnitude of responding to *other* stimuli, a process called ***sensitization*** (Catania, 1998).[32]

These respondent processes can act as function-altering stimuli in operant contingencies, influencing the likelihood of the relevant operant behaviors. For example, a subject that is sensitized is rendered more likely to startle in reaction to other stimuli and during that state of sensitization, the running away behaviors (which are operant) become more likely, the increased distance between the subject and the starting stimulus becoming more reinforcing, a motivating operation in that operant contingency. The sensitization is, at the same time, a respondent process and the motivating operation for certain escape operants.

The Importance of Respondent Conditioning

Appreciating the basic respondent conditioning process is important for at least two reasons.

First, respondent conditioning is how conditioned reinforcers are established and maintained. This can often be a source of confusion. Be careful not to conflate the operant and respondent processes that occur during this kind of conditioning event. Pairing a click sound with a treat, for instance, will bring about the elicitation of the same kind of response to the click as occurs to the treat. This appetitive emotional response is respondent and how it was conditioned to occur in reaction to the click is

[32] The word "sensitization" is commonly used, mistakenly, to refer to potentiation. Sensitization relates to responsiveness to *other* stimuli.

respondent. This appetitive emotional response is maintained by at least occasional pairing with the treat and this too is respondent. The click sound can now function as a reinforcer just as the treat does but reinforcement is an operant process. The fact that it was achieved with respondent conditioning and involves a respondent emotional reaction does not make its use as a reinforcer respondent in that context. The fact that it is used as a reinforcer does not change the fact that the conditioning to achieve its effectiveness as a reinforcer was not achieved by respondent processes. When used as a reinforcer and described in that context, indeed the reaction it elicits is emotional and respondent, but its role, as a reinforcer, is operant—that is, it follows an operant and increases the rate or relative frequency of that operant on subsequent occasions.

Second, emotional responses, as discussed above, are respondents, involving the secretion of various chemicals into the bloodstream and certain neural processes. We refer to the neural awareness-related after-effect behaviors, of this emotional arousal, as "feelings". Words such as fear, panic, anxiety, happiness, anger, joy, and so on, are simply the labels applied to describe feelings.[33] Emotional arousal can influence operant contingencies by temporarily structuring the body to make that body more or less reactive to certain stimuli in evoking operant behaviors, or to make certain reinforcers and punishers more effective. Emotional arousal can render operant behaviors exhibited during that aroused state more energetic in many cases. As such, emotional arousal is part of the antecedent condition in operant contingencies. Emotional arousal can even act postcedently as an endoreinforcer itself. However, take note that these are covert behaviors, and while they contribute to a fuller appreciation and accounting of behavior, in practical cases, it is usually best to externalize the contingency, relying on stimuli and reactions that can be observed and verified by others.

[33] Many people refer to emotions as fear, panic, joy, and so on, but this is not accurate. We may characterize and label feelings, which are our awareness and experience of emotional behaviors and a distinct set of behaviors, but emotional behaviors per se are simply the release of chemicals into the bloodstream. The chemical release is a behavior, the awareness reaction is a separate behavior and the verbal label (e.g., "fear") is yet another separate behavior.

CHAPTER 3. MEASURING BEHAVIOR

It is not always necessary to track behavior quantitatively in dog training, particularly with simple basic training project objectives. However, in some more complex projects, it can be very useful. Indeed, a basic familiarity with formal methods of measuring behavior can benefit trainers, even when they are only informally tracking behaviors.

Informal versus Formal Measurement

A hallmark of a natural science approach is that it is precise, objective, verifiable, and accountable. Most trainers exhibit a belief that their methods are successful but few can prove it. Measurement allows us to prove (or refute) just that. Measuring and tracking changes in behavior across time increases precision in describing the behavior and its changes, provides a finer scaled determination as to what the training is achieving, increases accountability, and avoids bias or self-deception behaviors. Assigning numbers and units to specific features of the target behavior allows us to determine objectively "how much" of the behavior is occurring. By tracking the behavior across time, the trainer can determine how the strength of the behavior changes, particularly in response to training. This can provide data about whether you need to adjust the training plan, and eventually, whether or not you achieve the specific behavior objectives.

Tracking behavior quantitatively involves significant response effort, and under most simple training conditions, trainers respond effectively and sufficiently to training situations without using elaborate quantification methods. Trainers exhibit informal quantification of the features of behavior that control their training behaviors and usually do so to an adequate level in basic training. It is generally only when an unusually high degree of precision and accountability are required (such as when undertaking research, training extremely complex behaviors, or resolving complex problem behaviors) that quantification becomes sufficiently reinforcing to overcome the punitive effects of high response effort. While behavior technologists who are working to resolve complex problematic behaviors are commonly exposed to contingencies to measure and track behavior quantitatively, trainers engaged in bringing relatively simple behaviors under appropriate controls usually do not require formal measurement practices. Given that this book does not address the resolution of complex problem behaviors, the coverage of measuring behavior is described at an introductory level. This level of coverage provides an expanded repertoire adequate to improving informal quantification and a basis from which to continue studies on quantification of behavior, if the discussion evokes interest in doing so.

Measures of Behavior

Behavior manifests as various properties or along various dimensions, and it is frequently useful to track a behavior by one or more of these specific properties. The following are the most common measures of behavior.

Count

A ***count*** is the simplest measure of behavior and simply involves counting the number of times the behavior occurs. This alone is not usually very useful. For example, saying that a behavior occurred six times may mean it occurred a lot of times if it occurred, say, within 10 seconds, or very few times if it occurred within two weeks. However, some computational measures based on counts can be quite useful.

Rate

The ***rate of responding***, or just ***rate*** for short, is the number of responses per unit of time.[34] The rate of responding is calculated by dividing the count by the number of units of time across which responding was recorded. For example, if you observe a subject's behavior for 2 hours and in that time, the criterion response occurs 5 times, the rate of responding is 2.5 responses per hour.

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[34] Rate is commonly referred to as "rate of response," "rate of responding" "response rate," or "operant rate." Some sources consider rate and frequency to be interchangeable, where other sources consider rate and frequency related but different measures. The word "frequency" on its own should not be confused with "relative frequency" either. It is obviously not helpful to have such wide variation in the use of these technical terms, especially ones so basic to the science.

Although it is common to generate an average rate of responding as in the 2.5 responses per hour example above, it is usually important to also note the total interval in which the behavior is observed. For example, if you report a rate of responding of "2.5 responses per hour," it is often informative to also state the total time observed. As in the running example, one might present the rate of responding as "2.5 responses per hour through 2 hours of observation." One reason this can often be useful is because the same rate number might be deceiving if you are comparing two different rates, one recorded over a very short period and the other over a much longer period. For example, if I ran at a rate of 18 km/hour and a friend ran at a rate of 12 km/hour, it might be informative to consider that I ran for 1 kilometer in total and my friend ran for 40 kilometers in total.

Rate of responding is particularly useful for tracking free operants. ***Free operants*** are behaviors that (a) have distinct start and finish points, (b) require minimal displacement of the body through space, (c) can be exhibited almost any time, and (d) are fleeting (i.e., they occur quickly) (Cooper et al. 2007, p. 77). For example, a rat in an experimental chamber with a lever that, when pressed releases a bit of food into a hopper represents a free operant arrangement.

Rate of responding would be inappropriate, on the other hand, for behaviors that occur within so-called "discrete trials." ***Discrete trials***, as contrasted with free operants, occur only when the opportunity to exhibit the behavior becomes available, rather than being available all of the time (Cooper et al. 2007, p. 77).

Relative Frequency

The ***relative frequency*** of responding is the quotient resulting from the number of fulfilled opportunities to respond divided by the total number of opportunities the subject had to respond (Fraley, 2008).[35] Relative

[35] Note that, as explained in a previous footnote, while the word "frequency" is found in the phrase "relative frequency," they do not refer to the same thing. In fact, relative frequency is sometimes considered to be a variation on rate, going by such alternative terms as "rate correct rate incorrect," or "percentage of opportunities," or even "fluency." This furthers the discussion of inconsistent use of such technical terms raised in the body of the text and in the last footnote. Facing these terms in

frequency is a contributing indicator of fluency. If, for example, a subject is provided 10 opportunities to exhibit the behavior in question and they exhibit it in three of those instances, the relative frequency is 0.3 (3 divided by 10) or 30% (a derivative measure that clients may more readily appreciate).

As mentioned above, rate is inappropriate in discrete trial arrangements. Let's say that a subject exhibits a behavior 30 times in 2 hours. We could calculate the rate of responding as 30 responses per 2 hours, or 15 responses per hour across 2 hours of observation. However, let's say that the behavior does not represent a free operant arrangement and instead occurs in a discrete trial arrangement. If the subject was provided 5 opportunities within that 2 hours to exhibit the behavior, and it occurred 5 times, that represents something quite different than if that subject had instead been provided 10 opportunities to exhibit that behavior. In the former case, the behavior occurred every time it was cued (100%) and in the latter, it occurred only half of the time it was cued (50%). In discrete trial arrangements, or where an indication of fluency is sought, relative frequency is a more suitable choice of measurement.

Duration

Duration refers to the total amount of time the behavior occurs from beginning to end. Duration is measured when the amount of time the subject engages in the behavior is important, meaning it occurs for too long or too short a duration. Duration can be measured for the duration of an occurrence or the total duration per session or unit of time (Cooper et al. 2007, p. 79). Duration is sometimes used as a secondary measure in aggressive behavior cases.

Duration is appropriate for behaviors that are engaged in for excessive or deficient durations and for behaviors that occur at very high rates or are maintained (e.g., sitting).

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different sources should evoke exploratory behaviors to determine the use as intended in the material in question, an unfortunate and confusing state of affairs to be sure.

Latency and Inter-response Time

It will not usually be your main concern but frequently, at some point within a training project, you will be exposed to contingencies to reduce the latency or inter-response time. ***Latency*** refers to the amount of time between presentation of the opportunity to exhibit the behavior and the occurrence of the behavior. ***Inter-response time*** refers to the time between consecutive responses (Fraley, 2008, pp. 249–250).

Topography and Extensity

Less common, although sometimes useful, are measures of topography, and extensity. ***Topography*** refers to measuring the form of a movement. ***Extensity*** refers to the distance over which the movement occurs, either linear or angular.

Choosing Among Measures of Behavior

Whether you choose to measure the rate, relative frequency, duration, and/or other properties of the behavior depends on which property is most relevant to the behavior in question (i.e., choose the measure that most reflects your objective for the behavior). There are some things to consider when deciding among these properties. What is the most appropriate/informative property of the behavior? What does the measure really indicate? When it changes, does it indicate how well you are doing with the training? Does it provide data regarding whether you are achieving or failing to achieve your objectives? If you identify exactly what you want to achieve, deciding on a measure will be easier, and there will be more validity in the measure accurately reflecting what you portray it to measure.

Tracking the Target Behavior through Time

Whether you track behaviors through time precisely or not depends on your objectives. If you require more precision, as is common in some complex training projects, this level of precision is appropriate. For simple behaviors trained mainly as "good manners" behaviors, we often estimate progress as training proceeds, but without graphing the results. That said, the behavior objective should always include quantitative criteria and you should always measure the behavior sufficiently, so that you will know when you have achieved the objectives. It is also a good idea to become familiar with quantitative tracking methods in case you are required to provide accountability that is more precise.

Under certain circumstances, such as when you take over a training project that is already well under way (e.g., when you adopt a new dog or a client brings their dog to you), you may begin by establishing a ***baseline*** for the target behavior. This simply means that you present the supposed cue through a few or several trials to determine the rate at which the subject currently exhibits the behavior before training. This can help you refine the behavior objective. In other cases, where there is no reason to believe there would be a rate above zero because there has been no previous conditioning, you will assume a rate of zero and begin training without a baseline measure.

Tracking the behavior quantitatively tells you the level, trend, and variance of the behavior. The ***level*** is the measure discussed here; it tells you just "how much" of the behavior the subject exhibits. The ***trend*** is the angle of the line in the graph. It indicates whether the behavior is stable or is generally increasing or decreasing, as well as the magnitude of the increase or decrease. A horizontal or flat line on the graph represents a stable trend of the behavior. The steeper up the line is going, the more quickly the behavior is increasing; the steeper down the line is going, the greater the downward (decreasing) trend of the behavior. The ***variance*** refers to the "bounce" of the line, or how widely the strength of the behavior swings up and down (i.e., indicated by how jagged the line is). A high degree of variance usually indicates that you have not clearly/accurately established the evocative stimulus; when you cue the behavior, you are sometimes evoking it and other times not.

Behavior measurement graphs have two dimensions:

- Horizontal axis
- Vertical axis

The horizontal axis usually represents time, either continuous or the number of the session or trial. We usually represent time in equal intervals, in units of minutes or seconds. If you use time, you might set the interval at 1 minute per unit (or 5, or 10, or whatever works best given the time frames involved). Start the intervals at zero and continue through, past where you will be plotting.

The vertical axis usually represents values for rate, relative frequency, duration, or latency. The intervals will usually be equal units and usually start at zero. Ensure that they continue high enough to allow for any measure possible or that is reasonably likely to occur.

In order to record data on the graph, place a dot inside the graph plane where the time or trial number meets the measure. So, let us say you are recording the rate of a behavior every minute. In the first minute, if the behavior occurs three times, place the dot over the one–minute point on the horizontal axis and level with the three marking on the vertical axis. Then, in the next minute, record how many times the behavior occurred again, this time above the two–minute mark and at the level of the number of times that the behavior was exhibited.

For contrast, this time, let us say you are recording the relative frequency (rather than rate) of a behavior through each session (rather than every minute). Your horizontal axis will be sessions rather than minutes in this case. If, in the first session, the behavior occurs five times through 10 opportunities to exhibit the behavior, then you place a dot above session one at 0.5 (remember, relative frequency would be five divided by 10 here) and continue on to session two. Notice that your vertical axis with a relative frequency measure will go from zero to one.

If, on the other hand, you measure relative frequency per session, then in your first session your dot will be above the first point on the horizontal axis at one, and at the level of the measure for that behavior in session one. Then, proceed to record the data through each session (or time interval if you use that rather than sessions. Connect the dots as you enter the data, to form a line from dot to dot. Figure 11 provides a stylized graph showing the elements discussed.

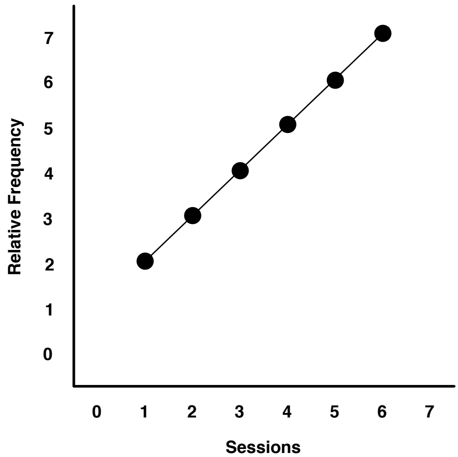

Figure 11. Stylized graph of behavior data, demonstrating the relationship between training sessions and the rate of the behavior.

If you established a baseline, draw a vertical line from the baseline to the time or session point where the change occurred, to clearly mark when the independent variable was changed. You will not need this line if you start training without a baseline. You should note any changes with the independent variable you make throughout data collection in the graph so that later you can see where the changes occurred and how the line on the graph illustrates the behavior changes. Include vertical lines with labels when you change any component of training that might influence the behavior (i.e., when any change to the independent variable is made). This can include changing a schedule of reinforcement, increasing or decreasing criteria requirements for duration, distance or distraction etc. If anything else changes in the environment that you did not control for, insert a vertical line for it as well. If the trajectory of the line recording the behavior changes, you will be able to ascertain what change in stimulation likely resulted in that change in behavior. If it is in response to a change as indicated above, then you can determine visually whether it is a brief adjustment blip or whether it is affecting the training in a more detrimental manner that requires changing your procedure or criteria. The line on the graph depicting the strength of the behavior represents your dependent variable and the vertical lines you make with labels or notes represent the independent variables. The combination of lines on the graph provide precise feedback (consequences) regarding your training behaviors and hence bring your training behaviors under controls that are more effective.

There are different approaches to indicating the various components in graphs. I describe one easy method below and provides a few important features in graphing techniques. Each training project requires its own graph format since there are different units of time and measures of the behavior appropriate to each project. For more information about graphical depiction of training, see Fraley (2008), Bailey and Burch (2002) or Cooper and colleagues (2007).

Examine the stylized graph in Figure 12 below. This graph depicts a 13–session training project and demonstrates a slightly different way to record data. At the end of each session, the dog is presented with 10 opportunities to exhibit the target behavior with the controls in place at each respective point of data recording. Notice that the vertical axis units reflect relative frequency and so they go from 0 to 1 (or you may use 0% to 100%). Much training will use relative frequency as the measure. The first session was used to establish a baseline and in this case, the target behavior was exhibited zero times indicating it has not undergone any training thus far. Data points of zero are not conventionally recorded in the graph. After the baseline phase comes the training phase, and in this phase, we implement the training procedures, working through the thinning of the schedule of reinforcement; the 3 D-parameters; and the speed, latency, and form of the behavior. Notice how vertical lines are also used to indicate when training began after a baseline phase, when the condition is changed in some way. If you track continuously throughout training, there will be far more horizontal units and you will likely want to include finer-grained vertical dotted lines, one for each change within the changes identified in this graph. An errorless approach is used and as such, you expect to see few, if any, errors. In this example, in a couple of instances, only nine of the 10 cues resulted in evocation of the target behavior. At week 10, the fluency stage procedures had been complete and the objective was considered met, with no need to revisit previous training, as each test resulted in the evocation of 10 out of 10 target responses under the conditions that were trained for at that level. Throughout the maintenance phase, the tests are repeated to ensure that the training results are durable.

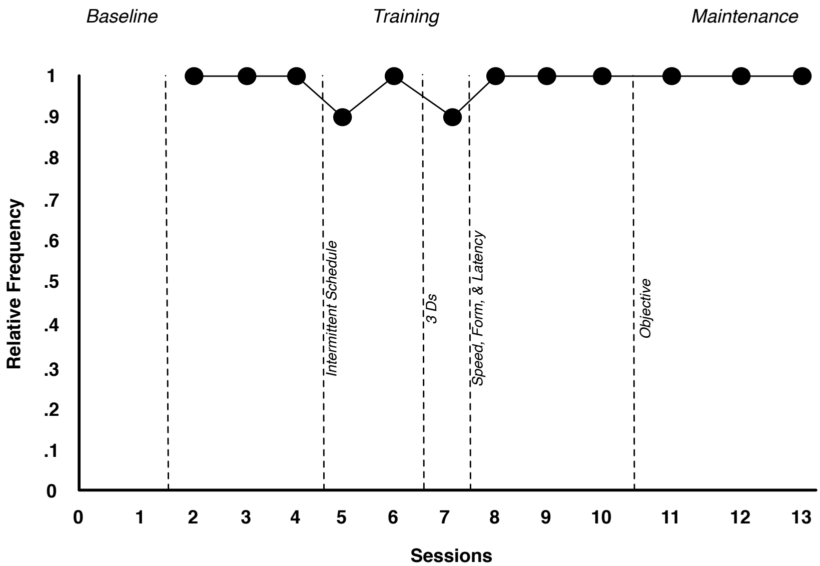

Figure 12. Stylized graph depicting a training project with 13 sessions in which the dog is provided 10 opportunities each to exhibit the criterion behavior. The graph depicts baseline, training and maintenance phases and the behavior objective. Milestone criteria changes are indicated by vertical dashed lines.

This process will provide you with empirical feedback on exactly how the behavior is changing. It will indicate whether it is increasing or not and how the strength of the behavior is responding to your training (or not). This kind of objective accountability is a cornerstone of the behaviorological approach.

Continuing Education

Ledoux (2014 & 2017) provides an excellent introduction to behaviorology and the principles and laws of behavior.

Fraley (2008) provides a massive and comprehensive treatment of a number of foundational and advanced areas of interest in behaviorology. Though not as current as Ledoux (2014 & 2017), it is a tome of a 1600–page book.

Both of the above books are worth their weight in gold and deserve a Nobel Prize, in my opinion.

Courses provided through The Companion Animal Sciences Institute at www.CASInstitute.com provide a professional technologist level of education in behaviorology.

CHAPTER 4. THE CASE AGAINST AVERSIVE STIMULATION

Behavioral Objectives

The objective of this chapter is to measurably expand the reader's repertoire of behaviors in relation to describing and relating the principles of behavior. Upon successfully integrating the concepts outlined in this chapter, the reader, where under contingencies to do so, will accurately:

- describe the problematic features of using aversive stimulation;
- explain why punishment might work in a narrow sense, but not in the long-term; and
- describe general alternatives to the use of aversive stimulation in training.

Introduction

In this chapter, I discuss the use of aversive stimulation in training, including why these procedures occur, the problematic effects associated with their occurrence, and briefly summarize alternative strategies.

Why is the Occurrence of Aversive Stimulation so Pervasive?

As is the case with all operants, the *use* of aversive training procedures is maintained by reinforcement. Punishment administered with sufficient intensity, contingently (consistently), and contiguously (immediately), with regard to a target behavior, will often result in a rapid suppression of the target behavior, assuming the net punitive effect overcomes the net reinforcing effect. Although aversive stimulation may result in robust and resilient long-term problems, the immediate effect is usually effective escape from the aversive stimulation that sets the occasion for the application of aversive stimulation on the part of the trainer. It is likely that most of those who use intensely aversive procedures are not aware of

(a) the long-term problematic effects they generate, and/or (b) less problematic alternative methods.

Problematic Effects of Aversive Stimulation

An ***aversive stimulus*** (S^{AVE}) is any event that functions (a) to evoke behavior that has subtracted it in the past, (b) as a punisher if presented immediately following a behavior, or (c) as a reinforcer when subtracted immediately after a behavior. Some authors use the term "aversive" synonymously with the term "punisher" (Miltenberger, 2008) or "subtracted reinforcer" (Vargas, 2013; Chance, 2009), but these are just more concise definitions of the term. Any stimulus that will function as a punisher will also function to reinforce behavior when subtracted contingent upon occurrence of the behavior. Subtracted reinforcement, added punishment, and subtracted punishment all involve aversive stimulation. Extinction is also aversive in the sense that the subject behaves (the extinction burst and increased behavioral variability) to access the now absent reinforcement, escaping the frustration (aversive emotional arousal) associated with obstructed access to previously available reinforcement. Added reinforcement is the only basic conditioning process that does not involve aversive stimulation.

Although using intensely aversive procedures may generate effective escape from aversive conditions for the person using these methods, it is also extremely risky (Ledoux, 2014, p. 358; Sidman, 2001). Intensely punitive methods tend to generate extremely robust and longer-term problems. The risk of adverse side-effects makes the use of intensely aversive stimulation an ill-advised choice unless no better option is available and the objective is vital enough to justify the use of aversive procedures. It is important to note that expert application of intensely aversive procedures can minimize the magnitude of some of the problematic side-effects, but side-effects are not just an indication of improper application—they are an inherent result of intensely aversive stimulation, and are common, even when specifically mitigated against.

It is also important to note that some procedures are more intensely aversive than others. Indeed, some aversive stimuli are so innocuous that they do not even elicit concomitant awareness behaviors. For example, when walking, falling forward is aversive, and bringing the back foot forward to prevent that fall is maintained by subtracted reinforcement, and this aversive stimulation serves us well without problematic side-effects—in fact, it prevents us from falling on our faces in this example. Extinction and even subtracted punishment are not usually as likely to generate as seriously problematic side-effects as added punishment and subtracted reinforcement, but this is not necessarily always the case. An irritating beeping sound that ends only when you put on a seatbelt is likely to be less intensely aversive than a shock to the neck in the same circumstance. Some milder aversive stimuli are merely distractions. However, how aversive a stimulus will be is determined by the effect it has on behavior. What is not particularly aversive for one individual may be intensely aversive for another individual. A specific aversive stimulus may even be more aversive under some circumstances than others for an individual. As aversive stimulation and the problematic side-effects associated with it are discussed, we are really examining *intensely* aversive stimulation—stimulation of such a magnitude that it causes problematic changes in behavior.

Below is a brief overview of some of the problematic side-effects commonly associated with intensely aversive stimulation. We can divide the problematic effects into respondent effects and operant effects, although these categories inevitably interact.

Respondent Side-effects: Aversive Emotional Arousal and Conditioning

Aversive stimulation can elicit emotional behaviors that are detected in ways commonly referred to as “fear,” “anxiety,” or “panic.” These aversive emotional behaviors function physiologically to energize and exaggerate escape behaviors (operants). Other stimuli present at the same time as the aversive stimulus tend to become conditioned aversive stimuli, which thereafter elicit the same aversive emotional behaviors as the unconditioned aversive stimulus. These responses can generalize and a wider range of stimuli can come to elicit the emotional behavior. This can quickly become a robust, resilient, and ever widening problem. The incipient preparation behavior associated with the initial conditioning (colloquially, "just thinking about doing something" or "just beginning to do it") can also come to elicit the aversive emotional behaviors, meaning, that preparing to exhibit a behavior that has resulted in aversive consequences will also generate the same emotional reactions.

Part of the problem with emotional behaviors is that they are robust, resistant, and challenging to change. Eliminating aversive emotional behaviors is a very long and involved process. A few moments of punishment can generate extremely aversive emotional reactions and conditioning that can take years to resolve, if they are ever resolved. Part of the problem is that the individual's reaction at the time the aversive stimulation is delivered may seem innocuous or temporary when in fact it is not. Excellent resources on this topic are Fraley (2008, pp. 909–921), and Sidman (2001).

Operant Side-effects: Escape Behavior

The escape and avoidance behavior generated by the application of aversive stimulation is often itself problematic, quite aside from the problematic behaviors that prompted the initial use of the punitive procedures. Escape behaviors are often aggressive in nature. A strong history of research has demonstrated that subjects exposed to aversive stimulation may counter-coerce, and/or lash out and attack those inflicting the punishment, others present in the subject's environment, or even others who merely share similar features with the person causing them pain. As discussed above, aversive stimulation generates aversive emotional arousal that may generalize and also come to be elicited by other stimuli, which can energize and exaggerate the escape behavior. Other escape behaviors might involve flight from aversive stimuli or avoidance of them, which can also become quite problematic.

Escape behavior that some might characterize as "abnormal" is also possible. Behaviors characterized by some as "displacement" might seem out of place and strange. These behaviors often function to escape or avoid sensory contact with certain stimuli as a form of self-distraction or countercontrol of others. Self-mutilation and stereotypical behaviors are common. They function to distract and can generate certain kinds of physiological processes that mask or counter aversive feelings. In dogs, paw licking or biting commonly occur.

Aversive stimulation may also result in a reduction in creativity, resilience, and industriousness, as well as in general response depression, particularly if the aversive stimulation is inescapable, unpredictable, or long lasting.

Clarifying Punishment and its Role in Changing Behavior

Punishment is Less Efficient than Extinction

Operants are maintained by reinforcement. If a behavior is occurring, that means it is being maintained by reinforcement. One major inefficiency with punishment is that it merely superimposes an aversive contingency over the existing reinforcement contingency. The rate of the behavior will be the net result of the effectiveness of the reinforcement and punishment contingencies; the two processes compete against each other. Of course, one may also discontinue reinforcement of the target behavior but then the punishment procedure would no longer be needed Indeed, if the behavior is punished effectively, the behavior does not occur in order to be extinguished. Punishment protects the behavior against extinction. Furthermore, while extinction is aversive, replacement behaviors are quickly installed and the total aversiveness is usually minimal compared to punishment, which must be intense to be effective.

Extinction is used as a secondary schedule in the compound schedule procedure of differential reinforcement, wherein the problematic target behavior is replaced with an acceptable behavior. The new acceptable behavior generates the reinforcer, while the target behavior no longer does. The extinction contingency remains in effect permanently, but the behavior is rare, if it ever occurs at all. By comparison, in a punishment procedure, the target behavior is punished. In some cases, a replacement behavior is prompted and reinforced to fill the void established by effective punishment. The punishment contingency must also remain permanently in effect. Now, if the reinforcement contingency remains unaddressed, the behavior will tend to occur at some rate and must be suppressed on an ongoing basis with punishment. If the reinforcement contingency is eliminated, that means extinction is instated, which evokes the question of why punishment would be required at all in that case.

"Not only does extinction yield a more lasting method of behavior reduction than temporary suppression under punishment, an extinction procedure is also less likely than punishment to produce troublesome aversive emotional side-effects" (Fraley, 2008, p. 397). This is particularly true when extinction is used as part of a differential reinforcement procedure rather than alone. In his classic work, Estes (1944) elaborated on this point:

> [A] response cannot be eliminated from the animal's repertoire more rapidly with the aid of punishment than without it. In fact, severe punishment may have precisely the opposite effect. A response can be permanently weakened only by a sufficient number of unreinforced [evocations] and this process of extinction cannot proceed while a response is suppressed as a result of punishment. The punished response continues to exist in the animal's repertoire with most of its original latent strength. While it is suppressed, the response is not only protected from extinction, but it may become a source of conflict. An emotional state, such as "anxiety" or "dread", which has become conditioned to the incipient movements of making the response, will be aroused by any stimuli which formerly acted as occasions for the occurrence of the response.

For these reasons, extinction is usually much more effective and efficient than punishment in the long term, and it requires less intense aversive stimulation.

Some Problems with Effective Punishment

Punishment can be effective in suppressing behavior but this "effectiveness" requires elaboration. Intensely aversive stimulation may suppress behavior immediately to a rate of zero. Punishment may create a behavioral void that other behaviors may fill and displace the punished behavior. If one behavior is punished, other behaviors will emerge for as long as the reinforcement contingency remains in effect. These other behaviors may involve social behaviors. This countercontrol is often interpreted as the subject being "manipulative" or "dominant." Acceptable behaviors may be installed but they could more easily have been installed with extinction than punishment and with less risk.

Another way in which a punishment procedure might result in long-term suppression of a behavior is if the emotional arousal generated by the stimulation is so intensely aversive that it causes an extreme aversion to the evocative stimulus that controls the problem behavior. Some would call this level of aversion "phobic" or "post-traumatic." The evocative stimulus becomes a conditioned punisher and this can generalize to other similar stimuli and even incipient components of the problem behavior itself. This kind of emotional reaction and escape/avoidance behavior might be so strongly aversive that the rate of the behavior decreases to zero and it takes an extended period for the behavior to return to the pre-punishment rate even if the punishment schedule is discontinued. This kind of suppression would be extremely unpleasant of course and is likely to lead to significant problematic side-effects. Consider, in this regard, all of the side-effects of extremely aversive stimulation that many people refer to "Post Traumatic Stress Disorder" (PTSD).

Does Punishment "Work"?

Whether punishment "works" really depends on what you mean by "works." In a narrow sense, punishment works. It is a truism since if it did not "work" in a very specific sense, it would not have been punishment. If the stimulation resulted in a decrease in the rate or relative frequency of the target behavior, it is punishment and it was successful—it "worked." However, caution must be exercised in declaring "punishment works" within this precise definition since the audience may assume more than this. Hearing punishment works, might lead someone to believe that it is effective and efficient in changing behavior and that it does so with very few problems. With consideration to these unstated assumptions, it is much less clear that punishment "works." In the wider context of the wellbeing of the subject and in the context of comparing punishment with less intensely aversive alternatives, it becomes unclear whether punishment "works."

Research has shown that the use of aversive stimulation is not more effective than added reinforcement-emphasized methods, and in fact, the use of aversive stimulation is fraught with problematic secondary effects (see Sidman's classic work, 2001). In this sense, it is difficult to convincingly argue that aversive stimulation "works" in the real world in a long-term, putative sense. Many studies have shown that harsh aversive stimulation suppresses behavior (see Lerman & Vorndran, 2002). However, many of these studies considered only the temporary suppression of a single behavior, rather than the total effects of the procedure on the subject in the short or long-term. This failure to consider other variables beyond the rate of the discrete behavior in question may provide an inappropriate picture of the advisability of punitive methods.

In a particularly interesting study, Balaban, Rhodes, and Neuringer (1990) hypothesized that as aversiveness of a punisher increases, its consequences generate what they call a "defensive response," which competes with the "orienting response" and subsequently diminishes the effect of a punishment contingency. Orienting responses involve a set of both respondent and operant reactions to attend to a stimulus, which increase sensitivity to external stimulation. A defensive reaction, on the other hand, stimulates the so called "fight-or-flight response," which reduces receptivity and limits the effects of external stimulation. Balaban and his colleagues hypothesized that the defensive reaction competes and interferes with the orienting response, and hence should negatively affect conditioning. To examine this, they assigned human subjects to two groups: the "informational punishment" (IP) group and the "aversive punishment" (AP) group. All subjects were given moderately challenging tests, which would ensure errors. When members of the IP group made an error, it was immediately followed by a brief tone sound. When the AP group members made an error, they were exposed to the same tone, but 20% of the time the tone was followed by a mild electrical shock. The researchers compared the two groups in terms of skin conductance responses, interbeat heart rate intervals, state-trait anxiety levels, skin temperature, and task exhibition. Surprisingly, they did not find a statistically significant difference between the two groups in global sympathetic arousal. What they did find was that the IP group did significantly better in their tests than the AP group! The tone in the IP group was found to elicit an orienting response. For the AP group, the tone became a conditioned stimulus eliciting a defensive response. The AP group did show higher skin conductance and cardiac acceleration than the IP group. Not only did the IP group behave more effectively, but also, as the test continued, they continued to improve. These findings are consistent with the notion that the defensive response interferes with the orienting response, and the result is less effective conditioning. The activation of emotional arousal generated by aversive stimulation generates a set of physiological processes that is simply not conducive to conditioning.

A study carried out by Hiby, Rooney, and Bradshaw (2004), comparing the behavior of dogs trained with punishment-based methods on the one hand, and added reinforcement-emphasized methods and "miscellaneous" methods (i.e., not obviously either punishment- or reinforcement-emphasized) on the other hand, found that dogs reported to be trained with added reinforcement-emphasized methods scored highest on obedience scores. Those who were trained using punishment ranked lowest, and those who were trained using both ranked in the middle. In none of the obedience tasks, were punishment-emphasized techniques most effective. Dogs reported to be trained with added reinforcement-emphasized methods were also found to have the fewest current behavior problems, whereas dogs reported to be trained with punishment, or punishment together with added reinforcement, were found to have the most current behavior problems. While this was a correlational study rather than an experimental one, and no causal relationships can be assumed nor confirmed, the results are consistent with many other studies on the topic, adding to replication in the field and increasing confidence in the results. What is also interesting about this study is its high degree of ecological validity—these were dogs living and trained in the real, dynamic, and complex world, rather than in a laboratory, and the dependent variables were real-world concerns.

CHAPTER 3. MINIMALLY AVERSIVE TRAINING

Behavioral Objectives

The objective of this chapter is to measurably expand the reader's repertoire of behaviors in relation to describing and relating the principles of behavior. Upon successfully integrating the concepts outlined in this chapter, the reader, where under contingencies to do so, will accurately:

- explain why ethics are important, particularly with regard to decisions regarding the use of aversive stimulation;
- identify ways of efficiently and effectively training without resorting to aversive stimulation; and
- determine when increased levels of aversiveness are justified.

Introduction

The previous chapter highlighted the importance of avoiding the use of aversive stimulation in training. This chapter will provide guidance on how to plan for and implement contingency management plans that emphasize added reinforcement-based methods. This strategy emphasizes diligence in finding added reinforcement-emphasized approaches to resolving problematic behavior. You can find the most current version of this strategy online through the Association of Animal Behavior Professionals, linked to throughout the Professional Practices Guidelines.[36]

Avoiding Extremism and Dogmatism

It is important to avoid dogmatism, exaggeration, or excessive simplification in this analysis because it results in a narrowed perspective that may not always be in the best interest of the subject and client in

[36] www.associationofanimalbehaviorprofessionals.com/guidelines.html

question. Arguments such as that "all forms of aversive stimulation are always sure to cause irreparable harm" or that "aversive stimulation is necessary to succeed in training" leads to such dogmatic positions. This is best avoided in favor of a careful consideration of the circumstances and dedication to utilize the least aversive methods possible with an eye to acting in the best long-term interest of the subject.

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

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

Some forms of aversive stimuli can, however, generate strong emotional arousal and even pain. We might fail to pay attention waiting at a red light and evoke a beeping behavior from impatient drivers behind us. This might elicit emotional behavior that we might experience and label embarrassment, which results in our resolving to pay closer attention next time. Depending on our conditioning history, this could be a particularly aversive experience that results in not only the adaptive paying-more-attention behaviors but also rather unpleasant emotional behaviors, which may then generalize to driving in general or even to interacting with other people in general—fallout! One might stick a fork into a toaster to dislodge a stuck piece of toast only to be shocked, resulting in injury and a general aversion to toasters or even all electrical appliances. One might contradict a spouse or employer, only to have them lash out at us vocally or even physically, resulting in numerous problematic side-effects.

Although challenging to operationalize and measure quantitatively, predicting *how* intensely aversive a stimulus will be, is more or less reliable as well. Failing to reinforce non-criterion responses or withdrawing ongoing reinforcement is aversive, but it is generally not as problematically aversive as harsh punitive stimulation such as striking or shocking an individual. Non-contingent aversive stimulation is much more problematic than contingently applied aversive stimulation, and readily escapable and eventually avoidable aversive stimulation is much less problematic than inescapable and unavoidable aversive stimulation.

Furthermore, some forms of aversive stimulation are productive, causing the expansion of adaptive repertoires of behavior, whereas other forms are not productive and only result in the expansion of maladaptive behaviors. Two forms of aversive stimulation might be equally aversive with the only difference being that one is productive while the other is not. Extinction of a problematic behavior may result in momentary emotional arousal but it may then also result in a decline in the ineffective behavior and perhaps an increase in some more effective (and acceptable) behavior, which may generate more total added reinforcement in the long run. The relief from stepping forward, and not falling on our faces when walking, results in proper (and effective) walking behaviors. Alternatively, rubbing a dog's nose in feces as a supposed "punishment" for voiding in the house is unlikely to result in the expansion of adaptive behaviors and *is* likely to result in secretive voiding and numerous other problematic side-effects, both operant and respondent.

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

In some cases, the aversive stimulation is a direct outcome of the behavior, and in others, the stimulation is mediated socially. For stimulation that is contacted directly, some forms are useful and minimally aversive or problematic and others might be particularly aversive and problematic. In this latter case, if we can reasonably foresee and prevent the aversive and problematic stimulation in favor of a less aversive solution, this is preferable (avoidance). In cases where we mediate the stimulation, some forms may be minimally aversive, productive, and necessary, with others particularly aversive and problematic, unproductive, and unnecessary. For instance, extinguishing a problem behavior is often necessary, productive, and minimally aversive, although an errorless approach may be used to minimize extinction trials and a replacement behavior is installed that serves the same function. Rubbing a dog's nose in feces, on the other hand, is a different matter. That would be intensely aversive, problematic in terms of side-effects, unproductive in terms of solving the problem, and unnecessary in that other, better solutions, exist. This is why the topic of aversive stimulation is not as simple as whether the stimulus is aversive not. Aversive stimulation per se, is not the primary problem; the problem is aversive stimulation that is unnecessarily intense and/or is unproductive.

In the examples of putting your back foot forward to walk and avoid falling, turning the steering wheel when reaching a curve in the road to avoid crashing the car, or putting on a seatbelt to escape the aversive buzzing sound, the reader might have been thinking, "these are not the kinds of things I am opposed to" and that is exactly the point being made here. Railing against "aversive stimulation" is not the most productive solution as it misidentifies the problem. The problem is aversive stimulation that is intense or harsh where it does not need to be and/or is unproductive where more productive solutions exist. For example, pinching a dog's ear to generate a sit that can then be subtractively reinforced with release of the ear is completely unnecessary. It is harshly aversive and highly likely to generate serious and intractable side-effects. There are much more productive and less aversive ("best practice") methods available. Even if there were no less aversive "solutions" to generating a sitting behavior, it is unlikely that such methods could be justified simply on the basis of training a dog to sit on cue; the solution is more of a threat to the dog's behavioral well-being than the problem of not sitting on cue.

As we explore the topic of aversive stimulation that we participate in mediating or allow to happen directly where we could have prevented it, continue to think about the (a) necessity, (b) intensity, and (c) productivity of the stimulation. If such stimulation is not necessary in the sense that a less aversive solution exists or the risks outweigh the benefits, then the stimulation is *not* justified. If such stimulation is not productive, then it too is *not* justified. Rarely is intensely aversive stimulation, the kind that is likely to cause problematic side-effects, justified—this would represent an extreme scenario that is usually avoidable with added reinforcement-emphasized methods.

Aversiveness-Ratcheting Strategies

There are several algorithms, flow charts, and models available to provide guidance to trainers on how and/or when to implement more intensely aversive methods in their training plans.[37] They commonly recommend minimally aversive added reinforcement-emphasized methods to start, and when the changes in behavior are inadequate, the algorithm justifies an incremental increase in the intensity of aversive stimulation in the contingency management plan, followed again by the solution of greater levels of aversiveness if the trainer fails again. The solution justifies a ratcheting up of levels of aversiveness.

Although it is appropriate to limit increases in aversiveness, and indeed, at some point, a slight increase in aversiveness may be required in some

[37] This includes models I have previously published (O'Heare, 2009).

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

Where the actual problematic variables are ignored in such models, if one fails to achieve their objectives with an added reinforcement-emphasized plan, the aversiveness-ratcheting strategy provides the choice between failure on the one hand and increased aversiveness on the other. That is what leads to the implication that a lack of aversiveness is actually the problem. Of course, then, it stands to reason that the best solution to a lack of aversiveness, assuming that is the problem, is an incremental increase in aversiveness.

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

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

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

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

Emphasizing Constructional Added Reinforcement-Based Methods

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

Why Implement the Constructional Added Reinforcement-Emphasized Behavior Change Strategy?

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

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

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

The Strategy

The strategy presented here emphasizes three primary systems:

- objectivity and accountability through proper measurement;
- emphasis on constructional approach; and
- reaction to failure of identification and resolution of problematic variable.

First, the strategy emphasizes objectivity and accountability through establishing precise quantitative behavior objectives and careful quantitative tracking of the behavior throughout the process.

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

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

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

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

The flow chart in Figure 13 depicts this process.

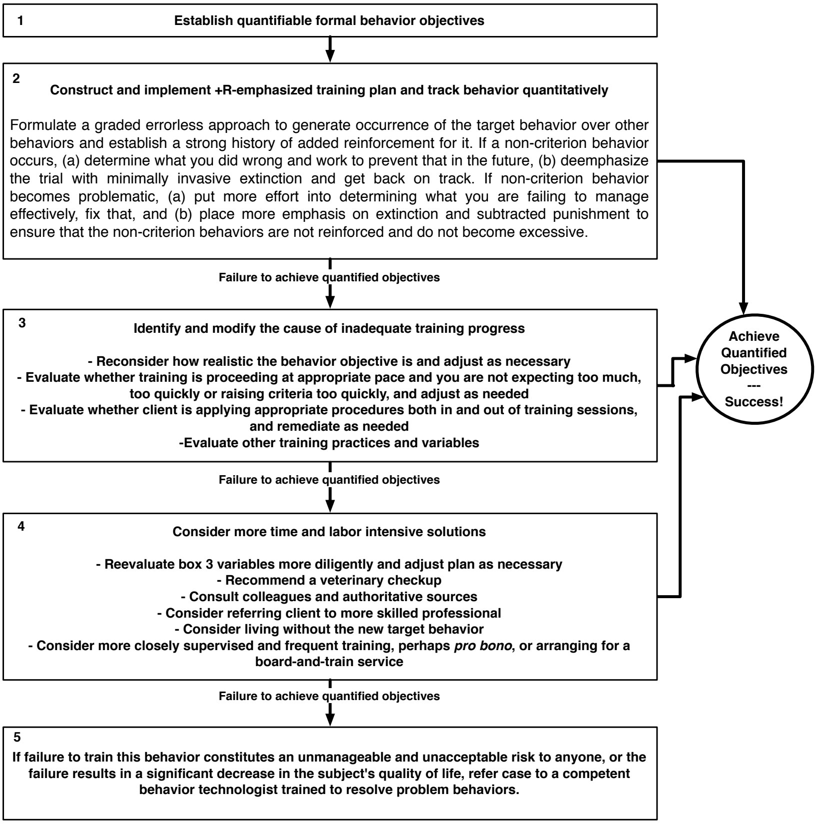

Figure 13. This algorithm provides guidance on how to identify problems in training plans and make adjustments to help achieve success in achieving behavior objectives.

Box 1. The first step in the strategy is to identify and operationalize specific target behaviors and quantifiable behavior objectives. Without clarity, specificity and objective accountability, success will be less likely. Operationalize the target behavior by describing it in a manner that is directly observable and quantifiable/measurable, not vague or speculative.

Box 2. In this phase of the project, you construct the training plan. The plan includes the objectives for the program, the basic strategy, and procedures that you will implement, and the means to achieve the acquisition, fluency, and maintenance of the new environment–behavior relation. The training plan is not a hodge-podge of anecdotally supported intuitions or "hit or miss" "tricks of the trade," the result of trying just another "tool" from a "tool box" full of different things that can be tried until one works. The training plan is an evidence-based application of strategies and procedures well supported in the natural science literature. Utilizing a natural science-based approach makes it far less likely that one will meet with failure and hence a supposed need to formulate a more aversive approach. Once you implement the systematically constructed training plan, you will track the target behavior in more complex cases.

At this stage, training plans emphasize added reinforcement. Set the subject and yourself up for success, utilizing a graded errorless approach, breaking the project down into manageable steps and arranging the antecedent environment to make occurrence of the target behavior highly likely. Get the behavior every time, and reinforce it. The graded approach should minimize non-criterion responses. Where a rare non-criterion behavior occurs, (a) determine what you failed to manage effectively and work to prevent that from happening again, and (b) deemphasize the trial with minimally aversive extinction and get back on track.

Deemphasizing the trial means adding as little extra stimulation as possible to the postcedent event and getting back to achieving and reinforcing the criterion behavior. This is what Vargas (2013, p. 202) refers to as "good shaping." In a non-criterion behavior occurs, simply fail to react to it and continue on. If this occurs in the acquisition stage (which it usually would), you will be utilizing continuous reinforcement. In this case, the absence of reinforcement on that trial will shape criterion responding. If it occurs when you have transitioned to intermittent reinforcement, shaping will still occur but you will need to emphasize getting back on track with an errorless approach to avoid the non-criterion behavior from becoming problematic. This should be sufficient to get back on track in most cases. If the non-criterion behavior occurs more than once or twice, put more effort into identify why and how to avoid it, but also consider switching back to continuous reinforcement and re-thinning the schedule to ensure a stronger shaping of the criterion behavior. Take note of why the behavior did not occur in that trial. What variable did you expect too much of too quickly? Was there too much distraction? Control it. Was the subject becoming satiated? Take a break. Was something aversive occurring? Eliminate it. Then, get back on track. This is usually something you can handle on the fly as you train, as the reason for the non-criterion behavior is usually obvious. There is a reason that non-criterion behavior is occurring; identify why and manage it!

If, despite efforts to shaping criterion responding and avoid non-criterion responding with an errorless approach, non-criterion behaviors continue to occur, reevaluate the above advice but consider placing a bit more emphasis on the failure to reinforce these behaviors as well. There are many events occurring postcedently, some of which are function and some are not. Meaning, there is the reinforcer that has been maintaining the criterion behavior (e.g., usually food treats), but there are other potential reinforcers occurring (e.g., social contact). To place more emphasis on ensuring that the non-criterion behavior does not get reinforced, instate subtracted punishment and a conditioned punishment stimulus.

In the *de*emphasized extinction trial, you ignored the non-criterion behavior and got right back to training, perhaps with added prompts to ensure generation of the criterion behavior. To increase an emphasis on ensuring that the non-criterion behavior is not reinforced, maintain the extinction, but also ensure that no other reinforcers occur. Adding subtracted punishment to the procedure involves subtracting the opportunity to access function and non-functional added reinforcement for a specified interval of time. This means adding a conditioned punisher, the moment the non-criterion behavior occurs, and subtracting the opportunity to access any added reinforcers, be they functional or not, for some period of time. For example, you might say “Oops,” the moment the non-criterion behavior occurs, fail to add the treat, but also, turn away subtracting social attention for a few seconds. Then, you turn back and try again, perhaps this time with an added prompt, or go back to a previous level of expectation for the behavior and working back up. This is relatively minimally aversive, but it is also more aversive than a quick extinction trial in the deemphasized approach.

Box 3. A well-constructed and well-implemented training plan designed to achieve realistic goals ought to be successful, but there are so many variables involved in training, some of which occur outside of the presence of the trainer when the client carries out their “homework.” Problems can occur and it is not always easy to identify and modify them. Is the failure due to unrealistic expectations? Are you requiring too much of a change in behavior too quickly? Are you jumping to new criteria levels before you have conditioned the previous levels fully? Are you failing to maintain minimal distraction, duration, and distance to start or combining these variables too quickly? Is the problem just a matter of needing more time in order to ensure that you are working at the subject’s pace and within the client's capabilities? Make the necessary adjustments to the plan, including controlling the variables that are causing difficulties. Set the subject and client up for success!

Make sure that if the client is engaging in any unsupervised training between consultations that they are carrying out the procedures appropriately. Have them demonstrate the training they have been implementing and remediate where necessary. Ensure that they are not engaging in appropriate training procedures during "training sessions" but then inadvertently counterconditioning that training in "everyday life." This is common, for instance, in loose leash walking. You may need to also reevaluate what the client can effectively carry out by him or herself. Take whatever actions are necessary to ensure that the client is implementing the proper training at all times.

Finally, evaluate other training related practices and variables. This evaluation process is not a cursory "technicality" in which you recognize only obvious mistakes. If everything is being done right, then you *should* be achieving success. If you are not meeting your objectives, there is a problem with what you and/or the client has done so far. This is your opportunity to identify that problem and fix it, rather than resort to more aversive methods and tools. Aversive methods will not identify and fix the problem.

Consider the possibility that you may have misidentified the effectiveness of the reinforcers used for the target behavior or that there are competing contingencies interfering with training. Did you select procedures to address the target behavior appropriate for the situation? Have you adequately addressed the antecedent conditions? Many trainers focus on consequences and fail to appreciate the importance of antecedent conditions. Is the dog hyperactive? Would training at a different time work better? How about generally increasing the amount of exercise the dog gets each day? Is the dog exhibiting a non-criterion behavior that is also being trained separately at that time? Consider training just one behavior at a time.

You need to look at all of the fine details, including: deliverability of the reinforcer; contingency and contiguity of delivery of the reinforcer; size of approximations; fluency of prerequisite skills; response effort and competing contingencies; and the schedule of reinforcement and the point at which the schedule is 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 effectiveness of each reinforcer is such that the subject will exhibit the target behavior rather than alternative behaviors.

Training can be complex in the real world, largely because of the dynamic nature of the environment and the variables that influence conditioning. When a well-constructed plan fails, this is largely where it does so. It can be a challenge to identify the application-related problems. If you have achieved some success, analyze why this success occurred. What differs in that situation as opposed to when the non-criterion behavior occurs? Often, video recording the training can help you analyze the problem and your approach. Consulting a colleague can also be helpful, as well as provide a fresh perspective on the training plan and its implementation.

Box 4. If you do not achieve your objectives, reconsider how diligent you were with previous steps, reevaluate the plan and be more creative. Refer to authoritative sources or consult a colleague with specific proficiencies that may help you succeed. Often, a fresh perspective is called for to identify problem areas and ways to circumvent them. Another option is to seek supervision for the case. This option has the added benefit of helping you develop your own formal proficiencies. It is also an excellent way to meet your training objectives, promote your professional development, and broaden your skill sets. 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 and 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 (AABP)[38] is a useful resource, particularly as certified members are behaviorologically oriented and specifically dedicated to using added reinforcement-emphasized methods. The International Association of Animal Behavior Consultants (IAABC)[39] is another option, as is the Certification Council

[38] http://www.associationofanimalbehaviorprofessionals.com
[39] http://iaabc.org

for Professional Dog Trainers (CCPDT)[40]. It is not a moral failing to lack proficiency in certain skill sets; recognizing and acknowledging a lack in specific proficiencies is laudable when you follow it up with a referral to a professional with the required skills.

Once more, increasing the aversiveness of the procedures will not identify and effectively manage the training errors that have resulted in failure. It is much more productive to focus on finding and correcting the problem, rather than adding aversive stimulation on top of your mistakes. Consistently finding it "necessary" to resort to increased aversiveness in training is an indication that the trainer is the one who needs more effective training.

If you have diligently reevaluated the case and researched authoritative sources; if consultation, supervision, or referral are ineffective or not viable options; and the plan is still not sufficiently effective, you should consider finding a different kind of solution (e.g., train a completely different behavior that still achieves what you need). Consider just how important the objective is—perhaps it is worth simply living without this behavior.

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

[40] http://www.ccpdt.org

behavior problem as a situation requiring simple training, as opposed to a serious contingency management plan.

Box 5. Does failure to train this behavior constitute a significant risk to anyone or cause a dramatic hardship or reduction in quality of life for the subject? If so, it is time to recognize that the case does not require simple training but rather a full contingency management plan constructed and implemented by a competent animal behavior technologist. Refer the client to a qualified professional, ideally certified by the AABP or IAABC!

No allowances are made for more aversive strategies that might include subtracted reinforcement of criterion behaviors or added punishment for non-criterion behaviors, because these methods are simply not justified in simple training projects and would cause more harm than good. This might evoke surprise in some readers. However, there simply is no need for training components more aversive than those described above. The problem is not a lack of highly aversive methods; it is the skill of the trainer involved. Aversive methods do not solve that problem.

CHAPTER 4. EQUIPMENT

Behavioral Objectives

The objective of this chapter is to measurably expand the reader's repertoire of behaviors in relation to describing and relating the principles of behavior. Upon successfully integrating the concepts outlined in this chapter, the reader, where under contingencies to do so, will accurately:

- select appropriate equipment to aid in training; and
- identify equipment that operates on principles of behavior that involve aversive stimulation versus equipment that does not.

Clicker and Treat Pouch

You will need a clicker. These are the training devices that mark exactly when the criterion behavior is exhibited and will act as your conditioned reinforcer, "bridging the gap," between the occurrence of the behavior and delivery of the primary reinforcer. There are several kinds available, including the simple small box with a hole in which a metal plate is found. These work well, and can be found at any pet shop. These days, most clickers have a protruding button instead of just the hole, which is easier to use for most people. The i-Click Jewel[41] is particularly comfortable, and if you plan on doing a lot of training, you should invest in a good clicker (several in fact).

You can usually get stretchy wristbands to go with your clicker so that you can let go of the clicker when necessary and it will stay put. You should also get a treat pouch. These pouches look like the pouches used by rock climbers to hold their chalk. A good treat pouch holds itself open, easily facilitating quick treat retrieval. Most clip onto a belt or waistband and many have edging to help prevent treats from bouncing out of the pouch.

[41] www.clickertraining.com

Distance Training Device

For longer distance training, such as training the dog to go to a specific spot (e.g., a mat), or working distance into certain other behaviors, a remote treat dispenser is often useful. Developed by Dr. Sophia Yin, the MannersMinder® treat dispenser is perfect for this and can be found through Premier.[42]

Restraints

Standard buckle collars that go around the dog's neck are popular, but perhaps their best use is just to hold dog tags. The standard neck collar, if used for walking on leash, will tighten around the dog's neck occasionally, even if they do not habitually pull against the leash. This might generate stress, which could be counter-productive in training. Some dogs with small or tapered heads (e.g., Greyhounds) can also slip out of buckle collars, even if they are tight on the dog's neck.

A standard, unrestrictive body harness takes that pressure off of the neck, distributing it to the upper torso. A good standard body harness will not tighten or apply pressure under the armpits or pull the front legs together, and it will have a leash clip in the front, on the chest. Harnesses with the leash clip positioned on the back are also good, but many most trainers prefer the chest-positioned leash clip as it allows for more control when necessary. It should be remembered that tools are just tools and using them to avoid training should generally be eschewed. Training in general is superior to restriction and forcing a dog's movements because it allows each party (i.e., the trainer and the dog) to behave under added reinforcement-based contingencies, as opposed to simply having fewer added reinforcement-based options or even aversive contingencies.

The body harness must not be too tight, as excessive tightness can prevent breathing, but it should not so loose that the dog can wiggle out of it if they move backwards away from the trainer. Some harnesses have extensive padding, while others are not. Some are made of just straps

[42] www.premier.com

while others utilize more fabric which distributes the pressure even more. If the dog has very short fur, consider a padded model.

Some dogs have such narrow shoulders that they can wiggle out of even tightly fitted harnesses and some experimentation might be required to find a design that is escape-proof. In some such cases, a standard neck collar may be necessary.

There are harnesses designed to apply pressure, sometimes under the armpits and sometimes pinning the upper legs together, when the dog pulls. But in general, it is best to avoid any tool that applies aversive stimulation. Instead, focus on equipment that simply prevents the dog from running off and that facilitates the relevant training. There are several kinds of anti-pull harnesses that operating on various principles. Not all of them tighten to create pressure.

Generally, a standard body harness is best, but if you are evaluating “anti-pull” harnesses for special circumstances (e.g., a tiny handler/guardian and huge rambunctious dog combination) then identify the mechanism of operation and the principle it operates on and choose one that guides rather than tightens (e.g., a front-attached standard harness as opposed to a tightening “anti-pull” harness).

Use a standard 1.8–meter nylon leash for close in work and where more space is required, use a longer leash or line, the length of which is dependent upon the activity/goal (e.g., 3 to 12 meters).

What Not to Use

Choke chains should *not* be used on dogs. *Period*. These are chains that form a noose and tighten around the dog’s neck if the dog pulls or if the handler yanks on the leash. These are used as added punishers for behavior they follow and as subtracted reinforcers for behaviors, if loosened contingent on their occurrence. Prong collars have prongs or spikes that pinch or dig into the dog’s neck. Again, do *not* use these devices, because they are based on aversive principles of behavior, and will cause more harm than good, as is common with all aversive methods and tools. There is no excuse for such inhumane tools. Nor should you use collars that either shock or spray noxious substances into the dog's face when triggered by barking, moving outside of a specific range, or by a button controlled by the handler. These devices exist, but there are no humane uses for them.

Head halters (e.g., the Gentle Leader®, Snoot Loop®, and Halti® halters) attach around the dog's head rather than their neck or body and are similar to the head halters used with horses (without the "bit"). A band typically goes around the back of the head and one goes over the muzzle. Commonly, the leash attaches under the chin although some attach at the back of the head, pulling the muzzle downward when tightened. They are used so that the trainer can direct the orientation of the head, and therefore the direction the dog moves. Head halters can be uncomfortable and aversive (i.e., unpleasant) for dogs. While some dogs may become accustomed to them, it is generally advisable to avoid equipment that requires desensitization, as it will disrupt your training, at least at first. Many dogs do not become sufficiently comfortable with head halters and will continue to fight them. Under no circumstances should one use a head halter with an extendible/retractable leash (i.e., a "flexi-leash"). The risk of the dog hitting the end too quickly and injuring its neck is simply too great as is the danger to humans holding the leash of a runaway dog.

CHAPTER 5. TRAINING STRATEGY AND PROJECT PLANNING

Behavioral Objectives

The objective of this chapter is to measurably expand the reader's repertoire of behaviors in relation to applying fundamental strategies and science based procedures to actual training objectives. Upon successfully integrating the concepts outlined in this chapter, the reader, where exposed to contingencies to do so, will accurately:

- describe the constructional and graded errorless approaches versus the eliminative and trial-and-error approaches;
- describe an efficient and effective general strategy for training dogs based on nonaversive methods including how to establish specific quantifiable behavior objectives;
- describe how to plan a training project prior to training, in order to make training the most effective and efficient it can be;
- describe how to arrange the environment to make the target behavior more likely, and how to administer reinforcement for the behavior to promote acquisition of the behavior;
- describe how to transition a training project from acquisition to training for fluency, undertaking generalization and discrimination training, bringing the behavior under stimulus control, and beginning to thin the schedule of reinforcement, as well as proofing behaviors against increasing distraction, distance, and duration;
- describe how to transition fluent behaviors to maintenance, transitioning to non-trainer-mediated reinforcers, finding a suitable long-term schedule of reinforcement, and refreshing training when required; and
- systematically prepare a training plan, ensuring that it includes all necessary information to proceed with implementation.

This chapter starts with a description of the graded errorless approach to training, which underpins everything else in this chapter and indeed the rest of the book.

Graded Errorless Training

The last 100 years have seen a dramatic paradigm shift within the behaviorological orientation regarding how behaviors are trained. In this section, the early trial-and-error approach to training is described, as well as some key developments since then that have resulted in a shift away from the trial-and-error paradigm toward the errorless training paradigm that represents best practice today.

Thorndike's Trial-and-Error Approach

In 1898, E. L. Thorndike conducted seminal experiments on non-human animals designed to elucidate their "intelligence." Thorndike summarized the method of his experiments in this way:

> I chose for my general method… merely to put animals when hungry in enclosures from which they could escape by some simple act, such as pulling at a loop of cord, pressing a lever, or stepping on a platform. … [F]ood was left outside in sight, and his actions observed. Besides recording his general behavior, special notice was taken of how he succeeded in doing the necessary act (in case he did succeed), and a record was kept of the time that he was in the box before performing the successful pull, or clawing, or bite. This was repeated until the animal had formed a perfect association between the sense-impression of the interior of that box and the impulse leading to the successful movement. When the association was thus perfect, the time taken to escape was, of course, practically constant and very short.

This experiment was an early and quintessential example of the trial-and-error approach to conditioning, what Thorndike referred to as "accidental success." It can still be said that the subject's repertoire was shaped via selection by consequences. Ineffective behaviors were extinguished, and, assuming effective behaviors eventually occurred, they were reinforced. This is not now, nor was it then, seen as the only way to train/teach someone to exhibit a behavior, but it was popular as a means of explaining the behavior of non-human animals in particular.

There are two major problems with the trial-and-error paradigm as applied to training animals (be they human or otherwise). First, trial-and-error training is highly inefficient. The number of potential non-criterion behaviors that could occur prior to the criterion behavior being stumbled upon can be very high. In some cases, the criterion behavior may never occur. With so many potential non-criterion behaviors, the criterion behavior becomes rather unlikely. The subject is trained "what *not* to do," but as we sometimes colloquially say, there is an almost infinite number of behaviors not to "do" when only one response class form meets the reinforcement criterion. Second, a great many non-criterion behaviors (i.e., "errors") are exhibited in trial-and-error training, leading to a great many extinction trials, surely resulting in frustration and other well-known side-effects associated with aversive stimulation, including aggressive behaviors (see Sidman, 2001).

A More Robust Perspective on Shaping

Since Thorndike presented his research and the trial-and-error approach became a popular explanation for the evolution of repertoires of behavior and an approach to changing behavior, a number of important events have accumulated, causing a shift away from this paradigm. Individual response class forms and repertoires of behavior can be shaped in the way Thorndike described and many behaviors are shaped through a trial-and-error process. However, Skinner (1953, pp. 91–106) recognized another manner of shaping behavior that could be used when teaching/training others. As opposed to merely selecting for (i.e., reinforcing) criterion behaviors in their final form and selecting against, that is extinguishing, non-criterion behaviors in their final form, Skinner described the shaping of response class forms by differentially reinforcing successive approximations of the criterion behavior. In other words, Skinner proposed identifying an incipient response class form, one that already occurs quite readily, and reinforcing it, making it more likely and hence making an even closer approximation occur more readily as well. The approximations are then reinforced in an incremental manner until the criterion (or terminal) response class form occurs. Rather than extinguishing all final-form responses except the criterion response class form, which may or may not occur at all, let alone quickly, Skinner described how one may begin reinforcing right from the beginning.

Prompts and Other Antecedent Control

Importantly, Skinner (1968) discussed the importance of prompts and other antecedent manipulations in generating target behaviors in general (pp. 222–223). Skinner (1953, p. 213) wrote of "supplementary stimulation," including prompts as a means of raising the probability of a response class. Thorndike's approach provided the *opportunity* for the behavior to occur, but otherwise did not manipulate the environment in ways that made the criterion behavior *more likely* than other behaviors until after it occurred and could be reinforced. Skinner's approach to shaping in the broadest sense and teaching/training more specifically, allowed for arranging the environment in ways that made the criterion behavior more likely and hence other behaviors less likely to occur.

This can be achieved through prompts—stimuli other than the intended primary evocative stimulus that contribute to generating the criterion behavior so that the to-be evocative stimulus may take on greater stimulus control as the behavior is reinforced in its presence. Preclusion of alternatives is another method of generating the criterion behavior.

Indeed, any antecedent manipulation that increases the likelihood of the criterion behavior or an approximation of it is deemed useful in the shaping of specific response class forms and repertoires of behavior in general.

Terrace's Errorless Discrimination Procedure

Another major milestone in that shift occurred when Terrace (1963) devised and tested an errorless procedure for discrimination training. This procedure illustrates well the difference between trial-and-error and errorless approaches to training. An example of traditional discrimination training (referred to as "evocation training" by many behaviorologists) that corresponds to Terrace's experimental arrangement is described here. In traditional discrimination training, a chicken is placed in an experimental chamber in which a keypad is installed on the wall.[43, 44] When the keypad is illuminated red, pecking the keypad is additively

[43] See Ferster and Skinner (1957, chapter 3) for a detailed elaboration of the experimental chamber.
[44] Please note that I do not condone experimentation on non-human animals that requires any kind of exploitation, which includes keeping them in captivity, regardless of whether the experiment causes physical or behavioral harm as well and regardless of how "valuable" anyone believes the results to be. Non-human animals cannot provide informed consent. As a rule of thumb, if an experiment and everything that conducting it requires would not be acceptably carried out on young children (with or without parental consent), then it would be no more acceptable to carry it out on a non-human.

reinforced with food and when the keypad is illuminated green, pecking the key is extinguished. Through repeated trials, responding stabilizes with a high rate of responding in the presence of the red illuminated key (the evocative stimulus, or, S^{Ev}), and no responding in the presence of the green illuminated key (the extinction stimulus, S-Delta, or S^{Δ}). The extinction curve under such contingencies tends to be moderate, meaning that quite a few extinction trials occur before responding stabilizes.

Terrace introduced a set of procedures called "errorless discrimination" that reduced or eliminated the unnecessary extinction trials. First, the chickens were placed in the experimental chamber and the keypad was always illuminated red and pecking the red illuminated key was additively reinforced on a variable interval schedule (though a continuous schedule could be used as well, particularly during the acquisition phase). Second, once conditioning had been achieved (i.e., responding to the S^{Ev} was stable), the S^{Δ} was introduced in a fading in procedure along intensity (i.e., brightness), duration, and wavelength (i.e., color) dimensions. The green illumination started off brief and dark so as to draw less attention. Gradually, the dimensions of the green key illumination were manipulated until they were equal to that of the red key. What Terrace found was that chickens trained using the traditional discrimination procedure exhibited vastly greater number of "errors" compared to those training with the errorless discrimination procedure. The only chickens in the experiments that exhibited "emotional" responses in the presence of the S^{Δ} were those trained under the more traditional approach, which allowed for vast numbers of extinction trials.

Goldiamond's Constructional Orientation

In 1974, Israel Goldiamond wrote an extensive and seminal paper, calling into question the pathology orientation that was common at the time. The pathology orientation views problematic behaviors as abnormal, leading to an emphasis on the eliminating or "curing" of such behaviors. The pathology orientation married well with the medical model of categorically labeling problematic behaviors, usually by topographic features. The pathology orientation tended to support an eliminative approach to resolving these problematic behaviors. Behavior reduction procedures such as punishment and extinction, along with problematic antecedent control procedures such as severe deprivation were common and the behavioral approach to changing behavior, what was then called "behavior modification," came to be seen as unethical and even illegal in some cases.

Goldiamond, proposed a change from the pathology orientation to what he called a constructional orientation. The ***constructional orientation*** emphasized the *building* of more adaptive repertoires as opposed to the *eradication* of repertoires via the eliminative approach. The emphasis was placed on added reinforcement and new, more adaptive, behaviors that would displace the problematic behaviors. In doing so, Goldiamond set the stage for the behavior replacement model and the idea of displacing problematic behaviors with more acceptable behaviors, which allowed for an emphasis on added reinforcement-based procedures.

Though the constructional orientation does not rule out eliminative procedures, this paradigm shift further supported the general strategic approach of resolving problematic behaviors with as little need for aversive stimulation as possible.

Note that reference to problematic behaviors need not refer only to behaviors such as aggressive behaviors or separation related behaviors etc. It can refer to any non-criterion behavior that occurs during training (i.e., other than the criterion behavior).

Shifting Paradigms and the Shaping of the Errorless Training Approach

The landmark contributions to science by Skinner in the area of the shaping of response class forms and repertoires of behavior and the utilization of prompts and other antecedent control measures, by Goldiamond in the area of constructional over pathological orientations to behavior, and by Terrace in the area of errorless discrimination training led to the more general approach to training that is now called "errorless training."

It was within the above described cultural milieu that the ***errorless training*** approach was shaped. In applied settings, behaviorologists, behavior analysts, and behavior technologists began to view problematic behaviors as normal reactions to specific sets of contingencies and that changes in the behavior could be achieved by arranging new contingencies that would support more adaptive behaviors that would displace the problematic behavior. Repertoire building with added reinforcement came to replace aversive behavior reduction procedures. The emphasis on arranging the antecedent environment in such a way that makes the problematic behavior (i.e., "errors") unlikely, and establishes a strong history of reinforcement for less problematic and more adaptive behavior, are becoming the best practice standard.

Application of the Errorless Training Approach

The target behavior to be trained may represent a behavioral excess or a behavioral deficit. In a behavioral deficit case (which is of interest to us in this book) a behavior that the subject currently does not engage in or engages in but not in reaction to the target evocative stimulus is involved. In these cases, non-criterion behaviors would comprise all response classes and response class forms that the training environment might otherwise evoke.

In all such cases, the trainer plans how to manipulate motivating operations, other function-altering stimuli, and evocative stimuli requirements, which can be faded in the maintenance phase.

Errorless training can be applied in a wide variety of circumstances and under various training objectives. In many cases, non-criterion behaviors can be rendered impossible or highly unlikely, while simultaneously, the criterion behavior can be made highly likely. Under some circumstances, fewer of these tactics may be available and errors can occur. Extinction of non-criterion behaviors is still consistent with the errorless approach but extinction trials are minimized to the greatest extent possible.

The "Graded Errorless Approach"

The ***errorless approach*** may be summarized as follows: (a) manipulate the environment such that the criterion behavior is as likely to occur as possible and non-criterion behaviors are unlikely to occur; and (b) establish a strong history of reinforcement for the criterion behavior until it displaces the non-criterion behavior.

A ***graded approach*** (sometimes called a "***prompt and fade***" or "***fading in***" approach) refers to (a) breaking projects down into smaller more manageable steps or subprojects that can be worked separately and in an appropriate order, and (b) breaking problematic stimuli into component parts and/or arranging exposure along dimensions such as distance, duration, orientation, animation, presence of other distracting stimuli and so on, in a graded manner from least provocative to most, at a pace that allows for installing replacement behaviors.

Used in conjunction, a "***graded errorless approach***," as I will call it, is a powerful paradigm in changing behavior and this strategy underlies good dog training.

General Systematic Training Process

Training involves bringing specific behaviors under specific antecedent controls. This involves manipulating the antecedent environment in order to generate the target behavior, and manipulating the postcedent environment in order to reinforce the target behavior to the exclusion of other behaviors. More specifically, one prompts the target behavior in the presence of an antecedent stimulus and follows that with a reinforcer. Through repetition of this experience, the primary antecedent stimulus takes on stimulus control over the behavior (i.e., it becomes more likely to evoke the target behavior). Each new experience with the contingency increases the likelihood of the antecedent stimulus to evoke the target behavior and the prompts are faded. Discrimination and stimulus generalization training fine-tune exactly what stimulus will evoke the behavior, and use setting generalization training to ensure that the behavior is reliable in appropriate settings.

There are several different basic strategies from which to choose in training dogs. For example, it is possible to punish any behavior other than the desired one, until the subject reliably exhibits the target behavior. That is one strategy. The trainer could also arrange for aversive stimulation to be present until a target behavior occurs, and cease the aversive stimulation contingent upon exhibition of the desired behavior, thereby subtractively reinforcing it. That is another strategy. However, these strategies are fraught with problems, in terms of effectiveness and efficiency, as well as ethics.

A more efficient and effective strategy is to encourage occurrence of the target behavior, provide added reinforcement contingent upon it, gradually and incrementally increasing the level of difficulty of the task, helping to ensure success for the subject and trainer. One might use other, more eliminative principles of behavior, such as punishment, or extinction to discourage non-criterion behaviors, but it is best to avoid these where possible, in favor of a graded approach.

For example, if the goal was to train a dog to sit under high levels of distraction, the trainer would arrange a hierarchy of distraction intensity as part of the graded errorless approach and start by training under the least distracting circumstances. Once the dog reliably sits in an environment with very few distractions, the trainer would introduce slightly more distracting elements, and repeat the training process through environments with successively higher levels of distractions until the dog exhibits the behavior reliably under highly distracting circumstances. In most cases, training will not be successful if attempted in a highly distracting environment from the beginning.

Added reinforcement-emphasized methods, favoring a graded errorless approach and a systematic series of steps should be used in most, if not all, training projects.

Becoming familiar with this general process facilitates the ability to design and implement training projects for novel behaviors with minimal or no need for aversive stimulation. Training should not be haphazard and mysterious. It should not be restricted to those who just seem to “get it.” The approach here makes the process principle-based, empirically supported and systematic. Training is composed of behaviors, and as such, you can analyze and condition it.

Training new behaviors involves the following general steps:

- Phase 1. Preliminaries
  - Planning and preparation
  - Identifying and defining the target behavior
  - Assessing the subject's current proficiency
  - Preparing a formal behavior objective
  - Identifying reinforcers and establishing the conditioned reinforcer
- Phase 2. Acquisition
  - Determine and implement antecedent tactics
  - Determine and implement postcedent tactics
- Phase 3. Fluency
  - Begin fading prompts
  - Begin thinning the schedule of reinforcement
  - Refine form, latency, and speed parameters
  - Bring behavior under stimulus control
  - Proof against three D-parameters (distraction, distance, duration,)
  - Discrimination training
  - Introduce release stimulus
- Phase 4. Maintenance
  - Work toward maintenance of fluency

Each step is discussed below, along with some training tips.

Phase 1. Preliminaries

Planning and Preparation

Every training project should begin with a ***training plan***—a formal written presentation of the key elements that you will use to identify and achieve the objectives that the training requires. How elaborate the plan is will depend largely on the complexity of the project and the experience level of the trainer, as well as the level of accountability required of the trainer. A very simple training project, such as for example, to train a dog to give a paw, might include only a statement of the behavior objective and perhaps a statement indicating the procedure that you will use. If the project involves complex procedures, a more elaborate written plan is required. If you are training someone else's dog, for or with them, you will likely want a more elaborate plan as well, in order to increase accountability and confidence in the training, which may be more than you need if you are training your own dog alone. I will describe all of the vital aspects of a formal training plan that might be called for in the most complex of plans. You can truncate the planning process for very simple training projects. A sample training plan is provided at the end of this section.

Identifying and Defining the Target Behavior

The Target Behavior

An effective training project begins with identification of a ***target behavior***.[45] The definition of the target behavior should describe a single response class or response class form in functional and operational terms. Your ultimate goal might include more than one target behavior or a complex behavior that will require a graded approach and multiple steps. It may involve a behavior that the subject does not currently exhibit and you cannot readily prompt in its final form, and it may involve a series of

[45] When constructing a contingency management plan to resolve a problem behavior (behavior excess case), the problem behavior is referred to as the target behavior and the behavior installed in its place is referred to as a ***replacement behavior***. When addressing behavior deficit cases (i.e., training), the behavior to be trained is the target behavior. In each case, the target behavior is the primary behavior of concern but it can cause confusion unless you understand the differing used of the term target behavior.

behaviors with one single cue that evokes the entire series of behaviors. Where complexity is involved, the plan should have a definition and formal behavior objective for each distinct behavior in the project. If your ultimate objective requires that you chain behaviors together or are otherwise implemented together, your final training project will involve the chaining or combining of the behaviors.

In resolving a ***behavioral deficit*** (simply training a new behavior), the primary target behavior is the behavior that you aim to train and bring under stimulus control. The "problem" behavior, if referred to as such, is simply whatever behaviors might be evoked in the presence of the evocative stimulus or general training context before training occurs. Behavior is continuous and so there will always be some kind of behavior occurring. The new target behavior replaces this "problem" behavior. In most behavior deficit cases, the focus is simply on the target behavior you aim to train. If the current behavior in that situation is problematic in a practical sense, treat it as a ***behavioral excess*** case.

Clients commonly poorly define the behavior under consideration, reporting that the dog is "going crazy," being "dominant," is "rude," or "stubborn," or that they want the dog to "be polite." Trainers need to operationalize these descriptions, as none of them constitutes actual behaviors, and they violate all of the requirements described herein. Your plan should not involve interpretations of the behavior, or assumptions or speculation about what it implies experientially, etc. However, the formal behavior objective that you establish should be clear, complete, specific, functional, and operational; it should contain all of the necessary and sufficient conditions that will validly allow for accurate identification of when the behavior has, and has not, occurred. It should include any boundary identifiers (e.g., whether it must be exhibited within a specific amount of time, ruling out non-instances of the behavior, etc.). Vague definitions are sloppy, even for simple behaviors, and do not instill confidence by those with a stake in the project, such as clients, shelter managers, certification boards looking at case studies, or journal editors looking at a case report. As a test of its reliability, you should be able to produce a written definition for your target behavior, and without further coaching or input, independent observers would all produce the same measures with regard to when that behavior was, and was not, exhibited.

For example, a slightly vague definition of "stand" for a dog might simply be to have all four feet, and only all four feet, on the ground. This is necessary but is it sufficient? A better operational definition rules out unintended behaviors (e.g., crouching) by requiring the extension of all four legs. In the first instance, you would click as soon as all four feet are on the ground and in the latter instance, you will require the subject to stand with all four legs fully extended before you click. Furthermore, let us say you go with this improved definition and provide it to five different observers who will separately observe a dog engaged in behaviors including standing. What if you cue the dog to stand and the dog finally does so after 30 seconds? Some observers may identify this as an instance of the behavior and others might decide it is not an instance of the behavior because it seemed unrelated to the cue. Leaving the observers to guess on these matters will reduce reliability of the measure. The same thing could occur if, without being released, the dog barely stands before lying right back down. Most observers will identify the stand but some might decide that, because the trainer did not release the dog, it was not an instance of the target behavior. Do not assume that everyone will simply know (via "common sense") what does and does not constitute occurrence of the behavior. If you leave it unspecified, you have some chance of agreement between observers as to whether or not the behavior occurred, but it is much better to be accurate and precise. This attention to detail helps ensure a clear and unambiguous target behavior definition.

As another example, let us identify the target behavior as "sitting." Once you identify the behavior, you can identify factors such as the latency, speed, duration, specific forms of distraction that it must occur through, distance between the subject and the person delivering the cue, for instance. These specific criteria are not all necessary in all instances, but where appropriate, they provide a more precise behavior definition. For example, every trainer knows what an obvious instance of a dog sitting looks like and all would likely agree, reliably, when this behavior occurs in this obvious manner. However, what if the front feet are planted well forward of the dog for some reason, the elbows not touching the ground but still at an angle that might lead some observers to identify this as an instance of sitting and others not? Is this really what you want? What if the trainer delivered the cue and the dog does not begin moving for eight seconds, at which point, the dog slowly begins to sit? Is this really what you want? What if the dog favors one hip when sitting, as in the "lazy puppy sit?" Being precise with respect to what you want or what you mean when you tact the name of a behavior makes for clarity, and contributes to greater efficiency and effectiveness in the behavior change project.[46]

Obviously, there can be a point of diminishing returns. It is not necessary to include every possible topographic variation by going into excruciating detail. However, it is important, to consider likely variations or features of the occurrence of the behavior and stimulate concisely and precisely what is and is not to constitute instances of the target behavior. Certain contexts require extremely detailed and careful definition, while others do not.

Preparing a Formal Behavior Objective

Assessing the Dog's Current Proficiency

Once you have defined your target behavior (or target behaviors, if breaking the plan down into steps or preparing a chaining plan) with appropriate criteria, you should assess the dog's current proficiency with respect to the behavior(s). Can the dog currently exhibit the behavior in its final form? If they cannot, what approximation of the behavior does the dog currently exhibit? If they do exhibit the behavior, is it within the criterion latency? Are there other criteria that the behavior currently meet? Are there any other criteria that the behavior does not meet? Can you evoke the behavior with a different cue than the one you have planned for it? What is the stimulus or prompt that currently evokes the behavior? Appreciating the dog's current proficiency in mediating the behavior, and which criteria are currently met and not met, will inform your behavior objectives, particularly in terms of what time-frame it might require to train the behavior fully to meet all of the criteria. This will also inform what procedures you might require or where in the process you will need to begin. Prepare a statement identifying the proficiency of the subject in exhibiting the target behavior as part of the training plan.

[46] A "tact" is a verbal behavior, the controlling variable for which is a non-verbal stimulus, such as an object or event, or it is a property of an object or event. It is similar to the phrase "refer to."

Formal Behavior Objective Components

Now that you have defined the target behavior that you want to achieve with training and you have assessed the dog's current proficiency in exhibiting that behavior, you are ready to define the formal behavior objective. The ***behavior objective*** is the statement of exactly what you want to achieve from your training project. A formal behavior objective should include:

- the evocative stimulus;
- the target behavior it is to evoke, in operational terms (including a suitable measure for it, and other criteria); and
- the reinforcer you plan to use to train the behavior.

Thus, the behavior objective takes the target behavior definition you prepared and stipulates the evocative stimulus and reinforcer to be used in bringing the target behavior under appropriate stimulus control. Write down your formal behavior objective.

Functional Behavioral Assessment

A ***functional behavioral assessment*** is a process by which the trainer determines the functional relations involved in the occurrence of a response class. Functional behavioral assessment for behavioral deficit cases (as opposed to behavioral excess cases) is usually straightforward. If the behavior to be trained is currently evoked by stimuli other than the one to be installed, identify the current contingency. This will set the occasion for transferring stimulus control where possible. If the behavior does not currently occur readily, this will provide the foundation on which to make decisions about prompts or shaping the behavior. It is useful to make note of the contingencies that will be used in training and, if different, the contingency as it will be after training. For instance, if you will use treats to train a dog to sit, it is useful to make note of this contingency and if you ultimately want the behavior to be evoked by a vocal cue, then it can be useful to identify this contingency as well, in the functional behavioral assessment.

Functional behavioral assessments are more complicated in behavioral excess cases, in which the problem contingencies are identified. In such cases, the problem behavior is replaced/displaced by an alternative behavior to be trained. Thus, there is a "problem behavior" and a "replacement behavior." In behavior deficit cases, for which this book is targeted, the problem behavior, if such a notion is appropriate, would be whatever behavior is currently evoked by the evocative stimulus that is desired for the control of the new behavior.

In all cases, a functional behavioral assessment identifies the contingencies relevant to the project. If the target behavior is evoked by some other stimulus, then identify that contingency. If there are concurrent contingencies, particularly of a competing kind, they should also be identified. For example, if any aspect of the contingencies also evokes escape behaviors, they should be identified so they can be resolved or avoided. Again, identify the training and ultimate goal contingencies and if the new evocative stimulus currently evokes any other behavior, identify this as well, so that a different evocative stimulus can be chosen or discrimination training can be planned to replace the old behavior with the new behavior. In other words, identify any and all relevant contingencies to the case in the functional behavioral assessment process.

Below, an example of a formal behavior objective will be provided that contains all the required information. This is a simple training project. The vocal cue does not currently evoke a behavior (and there are no particularly important problem behaviors to replace), so the contingency analysis is straightforward. As you can see, this includes the evocative stimulus, the behavior, and the time point to be established. The behavior is described in detail. This is not usually necessary for very simple behavior, particularly if you are training your own dog. If, however, the behavior is more complex or you will be coaching a client to train their dog, this level of detail may be necessary to ensure precision and clarity.

Behavior Objective

S^{Ev}: Vocal "sit."

Behavior: The subject will contact their rear end to the ground (or as close as is physically possible) with front legs straight at ≈80–90° angle to the ground (back at ≈45° angle) and with front paws on ground.

Consequence: Treats and continued social contact.

Criteria: Latency: 2 seconds; duration: until released, minimum. 1 minute; relative frequency: 100% through 10 trials; distance: minimum. 5 meters; distraction: various.

Training new behaviors is all about getting the target behavior to occur and then bringing that behavior under stimulus control. This formal behavior objective presents a definition for the target behavior that is likely to be highly reliable, and it provides adequate boundary data to ensure that you identify criterion, and non-criterion responses accurately, but it is also concise. The boundaries and the measures are clear and the relative frequency is established. This allows you to devise a means for tracking the relative frequency of the behavior, if you are exposed to contingencies to track the progress quantitatively. You might do this with a simple chart or graph in this instance. The take-home message here is that if you include all of the necessary information concisely in a single place, you are well-prepared to settle on a strategy and plan for how you will achieve that objective, as well as to track progress so that your training is accountable and precise.

If you will be constructing a behavior chain, each component behavior will represent a training project of its own. If you are shaping a behavior, you do not need a separate training project for each approximation. The behavior objective will identify the target terminal behavior, but you will need to prepare a list of behavior objectives.

Final Word on Formal Behavior Objectives

Although the text provides a rather involved process of preparing a formal behavior objective, most experienced trainers are able to effectively truncate this process. They have trained hundreds, if not thousands, of sits (and other simple common behaviors) and they know all of the criteria for the behavior very well. This is not sloppy—it is just a matter of the trainer responding appropriately and proficiently to the contingencies without rewriting it each time. Trainers expand their repertoire of effective training behaviors by taking elaborate preparation measures. As their repertoire expands, they are able to begin training effectively with fewer and fewer elaborate stages. This does not mean that one should aim to avoid planning. Precision, clarity, and accountability are always necessary.

When working with a client and their companion animal, many experienced trainers will have handouts ready so they do not need to rewrite the formal behavior objective each time. With an early foundation of going through the process of preparing proper formal behavior objectives, one can safely truncate that process later on. Without this early foundation in precision and clarity, some experienced trainers end up just “flying by the seat of their pants.” If you are a very experienced trainer, you might have been thinking that “this is just all too much” and it is when it has become unnecessary, but before that happens, the foundation in precision, clarity, and accountability conditions one to exhibit the verbalization that “this is just all too much.” Furthermore, experienced trainers will rather quickly find themselves in a position to truncate the simpler training projects, but establishing a formal behavior objective remains a useful skill when dealing with training objectives that are more complex, particularly when there are problem behaviors to resolve and complex behavior chains to train. Do not be too quick to forgo preparation of formal behavior objectives. A little extra preparation at first will go a long way in preparing you for truncating the process later when you have sufficient experience to do so. This extra preparation also provides the precision and clarity necessary for achieving success with highly complex training projects.

Identify Reinforcers and Establish the Conditioned Reinforcer

The next step is to identify the most effective ***unconditioned reinforcers***. An informal approach of merely observing and noting what the subject currently expends significant energy accessing (ideally, in the specific context in which you want the target behavior exhibited) is sufficient; clients are usually quite familiar with what works most effectively as well. You will probably want to rely on ***generalized reinforcers*** later in the process (i.e., using more than one unconditioned reinforcer and including fewer trainer-mediated reinforcers). Initially, an easily implemented unconditioned reinforcer is necessary. In most cases, small treats work best, while in other cases, praise, and play, or contact with a specific toy will effectively strengthen behavior.

Identify what kind of ***conditioned reinforcer*** you will use. I recommend clickers, as they produce a sharp, distinct, and salient sound that will not be rendered ineffective by daily non-training exposure. For sensitive dogs, many of the button-style clickers are softer sounding than the older box shaped, hole-style clickers. You can wrap fabric around a standard clicker or keep it in your pocket to dampen the sound.

Some trainers find it challenging to master the physical skills/behaviors necessary to operate a clicker along with handling treats and leashes. In these cases, a tongue "*click*" can do instead. However, the clicker makes the exact same sound each time, making it more precise, and if your ambitions involve training at more advanced levels, you should consider expanding your clicker multitasking repertoire (or at least try to exhibit the tongue click sound the same each time).

Conditioning a conditioned reinforcer is straightforward, and one of the first things you will do in training the dog, if you have not previously done so. In order to establish the conditioned reinforcer, you simply repeat the sequence *Click!* → *Treat* several times. Follow the click with delivery of the treat within a second or two. Repeat this sequence several times with several seconds between each trial. Carry out several trials of this sequence, and ensure you avoid clicking after any particular behaviors many times and also that you do so in different locations to ensure that a single location does not become paired with the click. Avoid clicking without providing the treat, as a rule, to ensure a high degree of contingency, and a strong conditioned response.

Phase 2. Acquisition Stage Training

Once you have decided on a target behavior, have assessed the subject's current proficiency with it, and established a formal behavior objective, you can begin training. There are several decisions for you to make regarding how you will carry out the training. For planning purposes, it is useful to consider antecedent and postcedent tactics separately, even though they are integrally related. They will all come together as a unified strategy.

Antecedent Tactics

Behavior must occur in order to be reinforced and brought under stimulus control. Sometimes you can simply allow an uncontrived or unaugmented environment to evoke the behavior, and merely take the opportunity to reinforce it.[47] More often, it is most expedient for trainers to contrive circumstances to get the behavior to occur in its final form—this requires prompts. Once you have increased the rate of the behavior, you may fade the prompt. There are other operations that can contribute to generating behavior, quite distinct from prompting, including motivating operations that create a deprived body, which is more likely to exhibit the behavior when exposed to the evocative stimulus. Occasionally, a behavior is not readily promptable in its final form, and for those times, an approximation can be reinforced and the terminal behavior shaped.

Prompting

Prompting was discussed in the section on antecedent tactics in a previous chapter. Where you cannot readily cue a behavior, you can use prompts to help generate the behavior, so that you can reinforce the behavior and strengthen other antecedent stimuli. The prompt is then faded, leaving only the now strengthened evocative stimulus. Aversive prompts are distracting and disruptive, so the prompts should be minimally aversive. Contrived trainer-mediated prompts might include pointing, luring, making sounds, or even touching the subject. However, as physical contact can be distracting and disruptive, it is better to avoid such contact, if possible.

Motivating Operations

Motivating operations resulting in satiation and deprivation were discussed in the section on antecedent tactics in a previous chapter. Establishing and abolishing operations act as function-altering conditions

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[47] This is often referred to as "capturing" and is sometimes contrasted with reinforcing behavior that is evoked or prompted. Take note that behavior is *always* evoked. This distinction more appropriately refers to the evocative stimulus being mediated by the trainer versus something unrelated to the trainer's behavior.

and change the function of existing antecedent stimuli. It is always useful to be aware of the current condition of the subject's body, with regard to satiation and deprivation of the reinforcers in question. When necessary, you may need to train during times of deprivation rather than satiation.

Postcedent Tactics

Reinforcement

This section provides a review of some principles of behavior related to reinforcement and clarifies a few common controversies or differing perspectives used in dog training.

In most cases, you will use both a conditioned reinforcer (e.g., a clicker) as well as an unconditioned reinforcer (e.g., food treats) to increase or maintain the rate of a behavior throughout the acquisition phase of training and well into the fluency phase. We use the conditioned reinforcer to more precisely administer reinforcement. This is most useful when training new components or parameters of behaviors. The clicker is used in the initial acquisition phase and also into the fluency stage when new features such as working on improving form, latency, or speed of the behavior or introducing new levels of challenge with respect to distraction, distance, or duration. Once there are no new features to introduce, you can discontinue the clicker and you can use just the unconditioned reinforcer, which will be on an intermittent schedule at that point. You should deliver the reinforcer either during or immediately following the behavior that you intend to reinforce. The unconditioned reinforcer should follow the conditioned reinforcer, ideally within a second or two but certainly within three seconds—the quicker the better. To maintain the strength of the conditioned reinforcer, it is best to follow every instance of the conditioned reinforcer with the unconditioned reinforcer. This is a general rule. You will still maintain the conditioned reinforcer if it is even just occasionally followed by the unconditioned reinforcer, but to maintain the conditioning as strongly as possible, most trainers make it a rule to follow the click every single time with the treat. The exception to this rule is that if a potentially problematic behavior occurs and you accidentally click, in which case, you should not follow the click with a treat (or any other stimulation for a few seconds).

The conditioned reinforcer is a postcedent term in the contingency of which it is a component. The behavior has occurred and the conditioned reinforcer and then unconditioned reinforcer represent the end of that trial through the contingency. This is why there is a general rule in dog training that "the click ends the trial." Once you click, you do not require the subject to be engaging in any further ongoing behavior as part of *that* trial. If the subject was sitting, you click, and the subject gets up, that is okay. That trial is over. The consequence has occurred, you have reinforced the behavior, and that is that.

That is the general rule in dog training. However, behavior is more complex than this. Let us explore the topic in a bit more advanced depth, as doing so will reveal further advice beyond the basic rule that may improve training. The interval between the presentation of the conditioned and then unconditioned reinforcer is important in some cases. If the subject regularly engages in a specific behavior during this interval, it can become chained to the previous behavior that was reinforced. For instance, if you train a dog to touch a target with their nose and after you click, you drop the treat to the ground, you may find, when you put the behavior on an intermittent schedule of reinforcement, that the dog touches the target and then dips their head down. This dip was chained to the target touch and the click has taken on stimulus control over it. So, placement of the treat, and more generally, any behaviors occurring between the conditioned and unconditioned reinforcer can actually be reinforced (or even evoked by the clicker), requiring care with respect to how treats are delivered, following the click.

Some trainers use the clicker both as a conditioned reinforcer and as an evocative stimulus to continue exhibiting the behavior. This is commonly referred to as the "keep going signal" although the word "signal" is inappropriate because it is a psychology term and better would be "***keep going stimulus***." Some argue that the clicker should be used only as a conditioned reinforcer and that the strength of the conditioned reinforcer is maintained by following up with presenting the conditioned reinforcer again and in many cases, more times until ultimately the unconditioned reinforcer is presented. It is said that the clicker is not used as an evocative stimulus at all, but rather a means by which the behavior can be reinforced without having to end the trial. It is said that each click is simply an added postcedent term in the contingency. The click functions as a conditioned reinforcer and is tied to other conditioned reinforcers in a chain, capped off with the unconditioned reinforcer at the end, when the trial is complete. According to this explanation, it is unclear why the conditioned reinforcer is required midway through the duration of a behavior. One might argue that trainers should extend duration gradually with a single conditioned reinforcer followed by a single unconditioned reinforcer at the end of the criterion duration. If extended gradually in this way, there is no need for repeated conditioned reinforcers (e.g., click, click, click, treat).

It is also often said that the keep going stimulus is used to "encourage" continued behavior, to keep the subject going. Trainers must be clear here. Encouragement is an antecedent process, not a postcedent process. Encouragement means the "keep going" stimulus is being used as a prompt or evocative stimulus. There is no reason why a stimulus cannot function as a conditioned reinforcer and as an evocative stimulus. For instance, when a series of discrete behaviors is chained together, completion of one behavior functions as a conditioned reinforcer for that behavior and also as the evocative stimulus for the next behavior in the chain. The conditioned reinforcers are maintained by the eventual pairing with the unconditioned reinforcer. Again, however, the need for encouragement (prompting and cueing continued behaving) is unclear, when one may simply gradually increase the duration of the behavior without the use of a series of conditioned reinforcers or interjected cues or prompts. If a longer duration behavior is degrading, this does not necessarily argue for including "keep going" stimuli while the behavior is occurring in order to ensure the subject keeps going. Rather, it is an indication that the trainer is moving too quickly in extending the duration.

Identify the Required Procedure

Although flexibility is important, and the subject's progress should inform adjustments to the plan as appropriate, it is still important to plan your postcedent strategies for reinforcing the behavior.

Is the behavior a single discrete behavior that you can readily prompt in its final form? If so, you can simply differentially reinforce the behavior. If not, a more advanced procedure is required. If you cannot readily prompt the target behavior in its final form, you can use a ***shaping*** procedure. Is the target behavior a series of discrete behaviors that you are going to train with a single evocative stimulus at the beginning of the sequence?[48] If so, identify ***chaining*** as the procedure you will use. You will treat each component behavior separately, which means deciding between differential reinforcement or shaping. Prepare a statement identifying the procedure or procedures that you will use to train the behaviors.

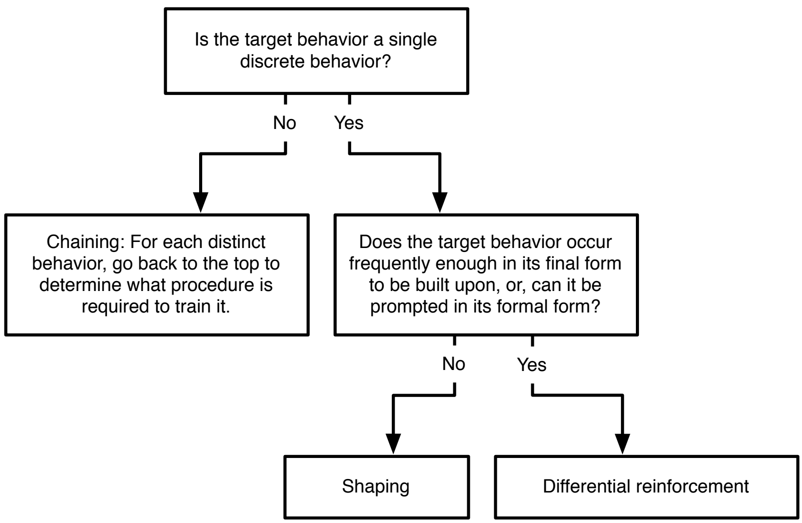

Figure 14. Flow chart for determining which procedure to use in training new behaviors.

How to Handle Non-criterion Responses

What should one do if the subject exhibits a non-criterion behavior (i.e., any behavior that is not the target behavior, including seemingly no behavior at all) during training? The need to respond to a failed trial, or

[48] Reference to "discrete behaviors" is convenient in discussing behavior chaining. However, please note that behavior is continuous, and the notion of discrete behaviors is a little misleading and arbitrary. Thus, we use the term here simply to distinguish between components in a chain of behaviors.

non-criterion behavior, indicates a failure to manage the environment well enough to ensure the subject exhibits only the target behavior. If the controls were present, the behavior would have occurred. The occurrence of non-criterion behaviors may mean that there was a failure to condition the target behavior, the trainer moved too quickly to the next level of challenge, or excess distraction was present.

Harsh behavior reduction procedures are best avoided in favor of a graded errorless approach that improves the likelihood of setting the subject and trainer up for success, but occasionally non-criterion behaviors occur, even with careful attention to setting the subject up for success. When this happens, you have two tasks. First, avoid reinforcing the behavior. That means extinction, and where appropriate, subtracted punishment if there is an ongoing reinforcer present. In many cases, simple deemphasized extinction is effective and it is not necessary to include a conditioned punisher (e.g., "Oops") and subtracted punishment (e.g., turning away for several seconds) unless the non-criterion behavior becomes problematic. Second, try to identify the source of the failure. What did you do, or fail to do, that resulted in inadequate environmental controls to generate the target behavior? If you are carrying out the first task, ensure that you give careful attention to this second task as well. Resolving the *cause* of the failure is more important than simply extinguishing or punishing a single trial in a training project, even though many trainers tend to be excessively focused just on the first of these two tasks.

As always, it is important to minimize the aversiveness of training, and to maintain the smooth pace of the training. Added punishment is unjustified and it is far too risky. Minimal use of extinction and/or subtracted punishment is effective, allowing you to get training back on track. But again, the occasion to consider these aversive procedures indicates your failure to manage the training project, and not the subject's failure, so at best, consider these as damage control while you get back on track. You should always carry out an analysis of failures.

Which among the extinction and subtracted punishment procedures that you decide use to prevent reinforcement of non-criterion behaviors, depends on whether the reinforcer involved is ongoing or not. Recall that, procedurally, extinction involves the failure of a reinforcer maintaining a behavior to follow that behavior, and that subtracted punishment involves the subtraction of an ongoing stimulus following a behavior. The distinction, in practice, is not always obvious. If you are training using treats, and cue a sit, but the dog lies down instead or looks over at a squirrel nearby, you would administer extinction, and withhold the treat that has been maintaining the sit behavior. If that treat was truly hidden, even to the dog's sense of smell, then it is indeed extinction, but as far as any awareness (smell, sight, etc.) that the treat is present goes, the same procedure might then be considered subtracted punishment if it ceases, contingent on the behavior. In some cases, your ongoing social contact is also reinforcing, and in later stages, it can sometimes become even more prominent as a functional reinforcer. This is an ongoing reinforcer, and if you briefly subtract social attention contingent on occurrence of a non-criterion behavior, this would be an example of subtracted punishment (assuming that the non-criterion behavior is reduced as a result). In that case, you are really exhibiting both extinction and subtracted punishment, since you withhold the treat and subtract the ongoing social reinforcer. The basic distinction is preventing the reinforcer that maintains the behavior versus subtracting an ongoing added reinforcer. Another way of framing the distinction is that extinction withholds the reinforcer maintaining the behavior, while subtracted punishment subtracts some *other* source(s) of reinforcement. In any event, simple unceremonious extinction is preferable, where available, because it manipulates the actual reinforcer that maintains the behavior and does so with minimal aversive stimulation. If a subject exhibits a non-criterion behavior and you withdraw your attention and the opportunity for reinforcement for several seconds and fail to provide the treat, which is a common procedure for non-criterion responses, you have actually applied both extinction and subtracted punishment. It is often preferable to keep this more intrusive procedure in reserve in case deemphasized extinction and analysis of your failure is not effective and the non-criterion behavior becomes problematic.

In its least aversive form, you might start with a deemphasized extinction procedure, pausing for two seconds or so without delivering the treat when a non-criterion behavior occurs, followed by resetting the environment and providing another opportunity to exhibit the target behavior, perhaps this time with a prompt, less distraction or whatever other measures will help ensure that the target behavior occurs. This leaves any other ongoing reinforcement present, but this minimally intrusive approach is often quite effective.

In cases where more emphasis is required, you might include a vocal marker (e.g., "Oops") the moment the non-criterion behavior occurs, followed by the two seconds of non-access to the functional reinforcer, followed, again, by resetting and generating the target behavior to be additively reinforced. The vocalized "Oops" will become a ***conditioned extinction stimulus*** and ***conditioned punisher***.

If the non-criterion behavior becomes problematic, you might resort to both extinction and subtracted punishment. In other words, you have withheld the functional reinforcer but other reinforcers might be present, most notably, continued social interaction. To include subtracted punishment, following the conditioned subtracted punisher (e.g., "Oops"), turn away, neither providing the functional reinforcer, nor social attention, nor the opportunity to access the added reinforcer for a few seconds, followed by turning back to the subject, resetting, and getting back on track. It is best to start with deemphasized and minimally intrusive procedures like the simple extinction procedure and reserve this more intrusive procedure for problematic cases.

Resetting the environment, as referred to above, simply means ensuring some kind of stimulation and some kind of behavior occurs after the non-criterion behavior in a way that differentiates the previous trial from the next trial. You always want to present the cue one time only, and never more than once. However, if you simply pause for a couple or few seconds and then recue the behavior, this might function as cueing the behavior multiple times. If you cue the behavior more than once, you will likely condition the subject to wait for further cues before responding—they will literally wait for the second, third, or more cues before responding. Therefore, by including the conditioned extinction / conditioned punisher stimulus "Oops" and looking away or briefly stepping away and then returning, you ensure behavior occurs between instances of the cue and hence it is less likely that the subject will be conditioned to wait. Instead, the extinction and subtracted punishment are most likely to occur. In some cases, even more of a separation between trials is required and in those cases, you can briefly lure the dog into a slightly different position or cue another behavior, even just a short distance recall or sit, in order to reset the environment for a new trial through the contingency.

Always be on the lookout for escape behaviors during training. If the non-criterion behavior were actually an escape behavior functioning to forestall the interaction, then your attempt at subtracted punishment would actually end up being an instance of subtracted reinforcement of the non-criterion behavior. In other words, if the training is "unpleasant" (which we operationalize with the verifiable notion of aversive stimulation) for the subject and they act disruptively, and that results in your withdrawing for even a few seconds, you could actually reinforce that disruptive behavior. Always be aware of the rate of the behaviors involved and what exactly is causing change in it. If disruptive behaviors are maintained or increasing in strength, this is an indication that you are actually reinforcing them, regardless of your intention to punish them. This is yet another pitfall of punishment.

Before moving forward, take note of the examples provided above. If the subject exhibits a behavior in response to some other aspect of the environment (e.g., looking at a squirrel), you have likely increased distraction levels too quickly. In this case, and in all others, this is not a "fault" of the subject; the subject simply reacts to the stimulation present and the history of conditioning they have been exposed to in the past. The "fault," lies in the planning and/or execution of the training project. But again, you too, are simply a "functioning physiology," your behavior is merely a reaction to the environment, and a product of conditioning, just as much so as a dog, cat, bird, horse, spouse, etc. So, go easy on yourself as well, and simply move forward with appropriate adjustments to your training behaviors. Avoid or minimize extinction and subtracted punishment trials, by utilizing a graded errorless approach—put the subject (and yourself) in a position to succeed!

Phase 3. Fluency Stage Training

Training for fluency generally includes these practices and generally in the order presented:

1. Begin fading prompts
2. Begin thinning the schedule of added reinforcement
3. Refine form, latency, and speed parameters
4. Bring behavior under stimulus control
5. Proof against three D-parameters (distraction, distance, duration)
6. Discrimination training

7. Introduce release stimulus

Planning Fluency Stage Tactics

Once you have trained the behavior through the acquisition stage in a minimally distracting environment, at a minimal distance, and requiring minimal duration, you are ready to begin transitioning to training for fluency of the behavior. ***Fluency*** is a characteristic of operant behavior featuring stability and reliability, that is, the contingency is strong, and subject exhibits the behavior smoothly and without hesitation.

Broadly, you will be fading prompts; thinning the schedule of reinforcement; refining the behavior features; proofing against distraction, distance, and duration; establishing the evocative stimulus; and working on generalization and discrimination. It also involves introducing a release word to replace the conditioned reinforcer for duration-appropriate behaviors. All of the refinement procedures are geared toward bringing the project to a point of reliability in everyday life, including maintaining it on a sparse and manageable schedule of reinforcement.

Training to achieve fluency involves quite a bit of work refining the form, latency, and speed of the behavior, and then the distraction, distance, and duration, which trainers are so familiar with, as well as carrying out generalization and discrimination training, and thinning the schedule of reinforcement. The process of working through training to strengthen stimulus control; working on generalization and discrimination; and improving distraction, distance, and duration is usually referred to as ***proofing*** in the dog training field. Generalization training is carried out to ensure that an appropriate range of settings evokes the behavior, and by suitable variation in the chosen evocative stimulus. Discrimination training is carried out to ensure that the chosen evocative stimulus reliably evokes the behavior, while other stimuli do not. Schedules of reinforcement are manipulated to make the behavior reliable and resilient against extinction, and to allow for variable responding, so that the form of the behavior can be fine-tuned.

Through the training process, you will be working on a number of specific features of the target behavior. You can work on some of these simultaneously, but you should work on many of them individually.

When you raise the criteria for distraction (i.e., concurrent contingencies), the distance between you and the subject, or the duration the subject maintains the behavior, briefly reinstate continuous reinforcement, and then re-thin the schedule. Thin the schedule gradually and seemingly randomly, but avoid thinning the schedule so quickly that ratio strain occurs, and the behavior actually extinguishes. Settle on a schedule that is as sparse as possible, while maintaining the behavior at an appropriate level.

The following sections are not broken into separate antecedent and postcedent sections because a chronological treatment is more effective here.

Begin Fading Prompts

Once you have the behavior occurring relatively smoothly and with minimal distance, duration, and distraction, you can begin fading prompts, especially treats used as lures. If you used the prompt as an unconditioned reinforcer (as with treat luring), fading should begin right away. Establish the evocative stimulus that you wish to use indefinitely, ideally after the subject exhibits the behavior reliably in its final form, and you have established all criteria. In some cases, you might be able to begin using the evocative stimulus right from the beginning. This would be the case for simple behaviors that you are sure that the subject will exhibit in its final form when prompted (for example, this is often the case with sit and down). In other cases, you may need to shape the behavior in order to ensure that its form meets the criteria before you can start using the evocative stimulus.

Fading prompts that include the unconditioned reinforcer (e.g., treats in hand) is usually the first thing you do in the fluency stage. This often starts as soon as you have a few good solid trials prompted and reinforced. A prompt that you use both antecedently as a prompt, and postcedently as the unconditioned reinforcer, is unique. With other kinds of prompts, the prompt and the evocative stimulus both take on stimulus control, and once the evocative stimulus becomes strong enough on its own, the prompt can be faded, usually quite easily. It is important to quickly fade prompts that also function as the unconditioned reinforcer because these prompts are particularly salient—they quickly take on stimulus control over the behavior and will be more challenging to fade. Since the prompt is not the stimulus that you want to act as the evocative stimulus for the behavior, it is best to fade it before this occurs. However, this usually works well because the first part of the fading procedure involves completing the same luring motion without the food in your hands. By the time that you complete this part of the fading procedure, the evocative stimulus has become even stronger, and then it leaves you in the position of fading the luring motion (now, without the added distraction of food in your hands).

One of the most common amateur training mistakes is failure to fade prompts that include the presence of the unconditioned reinforcer. In this situation, the prompt becomes a function-altering stimulus for the behavior. This has led to misguided (and fallacious) criticism of using unconditioned reinforcers in prompting (e.g., treats as prompts), and even in training with food in general. Although it is a specious argument, it results in people abandoning added reinforcement-emphasized training (and they have now eliminated one of the most powerful and easily managed added reinforcers from consideration, often leaving the training with aversive methods as their only option). The problem is simply a failure to fade this particular type of prompt.

To fade prompts that involve using the unconditioned reinforcer to lure a behavior, take advantage of training momentum. Lure two or three responses in rapid succession, and then lure again, but this time without the treat in your hand (your hand will still smell like treats, and this prompt is partly olfactory). The subject will almost certainly exhibit the behavior again—reinforce this. In most cases, you can simply continue luring without the treat in your hands from that point forward. If this is ineffective, lure with treats in hand, and out of hand, in a seemingly random manner, but continue to increase the percentage of prompts without treats in hand, until you have switched completely over to not using food to lure the behavior.

Once you have the treats out of your hand during luring, begin fading the luring motion prompt by transitioning from a lure motion to a hand motion. You can use the hand signal as the evocative stimulus while the form and latency of the behavior are fine-tuned. It is best to leave installation of the permanent evocative stimulus until the subject exhibits the behavior meeting most or all of the objective criteria. These two kinds of fading procedures are described in a previous chapter, however they are summarized again here. Gradually, make the lure motion look more and more like the hand motion. In fading the prompt, take advantage of generalization, which will promote occurrence of the behavior in these similar stimulus conditions. If the subject responded to the lure motion, they should respond to something very similar to it, and then once they respond to that reliably, they should again respond to something very similar, and on until your lure motion is actually the hand motion. This is the ***prompt fading*** procedure.

Begin Thinning the Schedule of Reinforcement aka Stretching the Ratio

In the acquisition stage of training, you use continuous reinforcement in order to achieve a steady and rapid increase in the rate of the behavior. As soon as the subject exhibits the behavior reliably, you enter the training for fluency stage, and it is time to start ***thinning*** the schedule of reinforcement. Behaviorologists also refer to this as ***stretching the ratio*** of added reinforcement. This is important because continuous reinforcement is challenging to maintain over the long term and variable intermittent schedules produce behavior that is much more resistant to extinction. Variable intermittent schedules also facilitate refining the form of behavior via shaping. The thinning process is a kind of roller coaster ride through the training project. You may begin thinning it, but each time you begin working on a new level of distraction, distance, or duration, you will return to continuous reinforcement and begin thinning the schedule again. Any time you increase the level of challenge, increase the density of reinforcement, and begin thinning it again. This will promote high levels of responding and effective conditioning. The thinning process will promote resilience.

Refine Form, Latency, and Speed

Once you have established the hand motion as the "working cue," use it while you fine-tune the form, latency, and speed. As usual, work these criteria separately. If you need to change the ***form*** of the behavior, that is, the way the body parts move, identify the exact change you need. You may be able to use a prompt to get that variation if it is not too different from the currently exhibited behavior. If that is not viable, you may need to use a series of approximations to shape the present form of the behavior toward the terminal form you want. When you are simply refining form, it usually does not require too many approximations in order to achieve success.

Reducing ***latency*** means reducing the time between the presentation of the evocative stimulus and the beginning of the behavior. To reduce the latency, identify the current average latency and set a new slightly shorter latency criterion that will ensure that most trials will meet the criterion. Reinforce only responses that occur in that interval. If the interval expires and the response has not been exhibited, administer extinction and/or subtracted punishment, and try again (but if failure happens more than once or twice, that means you are expecting too much too quickly). Once responding within that criterion interval is stable, set a new one that is a little shorter, and repeat this process until you have reached the final target criterion latency.

The ***speed*** refers to how quickly the subject exhibits the behavior—the amount of time it takes to complete the behavior once it has begun. We condition this, too, gradually by resetting the criterion in successive trials to ensure we reinforce most occurrences at the new criterion, and building on that speed.

Work through each of the above criteria one at a time. Once you have good form, latency, or speed, you should *maintain those criterion levels for each*. In other words, when you make progress on form, latency, or speed, do not backtrack or relax that progress. When working one of these criteria, you should bring the schedule of reinforcement back to continuous reinforcement and thin it again (it will go much quicker on subsequent runs through thinning), and it is a good idea to relax the distraction, distance, and duration parameters as needed (to be discussed below). However, as indicated above, once you have established the desired form, latency, or speed, continue to maintain these without backtracking, but relax the distraction, distance, and duration parameters and schedule of reinforcement.

To illustrate a problem of timing when training a new behavior, let us assume, for example, that you have a behavior that generally seems to take too long to complete. In practice, this likely means at least one of two things are involved. First, the behavior might be deficient if the subject begins exhibiting the behavior too long after you present the evocative stimulus, even if the behavior itself is exhibited in a quick motion once it begins (i.e., poor latency). Second, the subject might begin moving right away but exhibit the behavior itself quite slowly (i.e., poor speed). Whether sub-criterion latency or sub-criterion speed, you should work on it with a graded approach. Let us say the latency is deficient, and the body part currently begins moving only after three seconds, on average, after you present the evocative stimulus. In that case, keep the distraction, distance, and duration levels relaxed/minimal, and return to continuous reinforcement. Set the latency at ≤3 seconds, and begin running through trials until you get four reinforced trials in a row. That might happen right away, since the criterion was set at a point where the subject is already usually exhibiting it. Now set the criterion at ≤2.5 seconds. Reinforce only responses that occur within that interval, and extinguish non-criterion responses. Once you have achieved approximately four consecutive criterion responses, reset the criterion to ≤1.5 seconds and repeat the process at this reduced time. With this approach, gradually decrease the latency criterion until the subject is exhibiting the behavior to that criterion. If you are getting too many extinction trials, use smaller criterion jumps. For example, your first jump might be from ≤3 to ≤2.75. If the behavior was simply being exhibited too slowly, you would set a time unit for beginning to end of the behavior, and gradually, as described above, reduce it until the behavior meets the target criterion. Once you have achieved your goal for that criterion, put the behavior back on a thinning intermittent schedule for a few trials, and then work on another criterion, at first incrementally relaxing the distraction, distance, and duration criteria.

Training is a constant balancing act between maintaining progress on the one hand and not pushing too hard on the other. If you set the criteria too low, you will make very little progress, and the subject will become bored and easily distracted (as will the trainer). If you set the criteria too high, on the other hand, there will be too many extinction or subtracted punishment trials, and the subject will become frustrated (as will the trainer). One result of such frustration is the subject becoming anxious or apprehensive, behaving excruciatingly slowly—the more intensely one demands a behavior, the slower it seems the subject moves. Finding just the right balance in the pace of training for the particular individual requires careful judgment. Keep training fun, upbeat, and reasonably achievable, yet challenging, but not overwhelmingly so. Indications of boredom and distraction or frustration are indications of a problem with the pace of your training. With experience, you will become conditioned to manage this pace effectively and smoothly during your training sessions.

Bring Behavior under Stimulus Control

At this point, the behavior is actually under stimulus control but usually only by the temporary evocative stimulus used through training. In most cases, this is the hand motion. At this stage, it is time to bring the behavior under stimulus control of the cue that that you want to establish as the permanent evocative stimulus for the behavior, usually a vocal stimulus.

Once the behavior is being exhibited in the appropriate form and with an appropriate latency (that is, you have the behavior the way you want it), this is a good time to transfer stimulus control from the hand motion to a vocal cue that you want to use for this behavior with a ***prompt delayed*** procedure. To do this, present the new stimulus (the vocal cue), followed immediately by the current stimulus (the hand motion), which will evoke the behavior and generate the reinforcement. Repeat this sequence (i.e., contingency) several times. The new stimulus should take on stimulus control and come to evoke the behavior without use of the previous stimulus, and you can then drop the previous stimulus from the sequence. Continue to reinforce the behavior throughout the process.

Proof against the Three D-Parameters (Distraction, Distance, and Duration)

The ***three D-Parameters (or The Three Ds)*** of training are distraction, distance, and duration (Donaldson, 2005, p. 144). We keep all of these parameters at minimal levels during the acquisition stage of training in order to set the trainer and subject up for success as per the errorless approach. You will begin to improve these parameters one at a time in the fluency phase of training.

To begin this process, it is vitally important to success that you work only with one parameter at a time, relaxing the others that you have worked on, when you introduce a new one. For example, if you started by working the duration of a sit at 30 seconds with minimal distance (standing right in front of the subject) and minimal distraction (no distractions around at all), and then you decide to work on the distance parameter, take the duration back to just one second and work the distance up gradually, say to 8 meters. Then, you have a choice. You can work both distance and duration up together, gradually, or you can work distraction first and then work on combinations. Let us say you decide to work on distraction first. You will require only ½ meter distance and a second or so duration and you will gradually work the distraction parameter up. Once you have all three worked up well individually, you will start combining them and work them up gradually together. You might be able to work all three up together but it is more likely that you will need to keep one relaxed and work two up together and work the sub-combinations before working all three together. The main point here is that by relaxing other parameters and only working one at a time up gradually, as per a graded errorless approach, you will achieve a high degree of success. It may feel like it takes a long time to work them all individually in this manner, but the high rate of success will actually help achieve your objective much quicker than the failure-rich tactic of doing them all at once.

Plan to proof behaviors against the three D-parameters to a higher criteria level than you expect to require in maintenance. Consider what levels of each of the parameters can be expected/required after training, and proof the behavior against even higher levels to ensure that in maintenance, the behavior is less likely to deteriorate.

When working on a new D-parameter, reinstate continuous reinforcement and re-thin the schedule after it is smooth and reliable. Be sure to do this any time you introduce a new level of a D-parameter and each time you introduce a new D-parameter. These parameters are worked in a similar manner as training to improve form, latency, and speed, but remember that you should not backtrack or relax form, latency, and speed, as is done with the three D-parameters. In both cases though, it is important to relax the schedule of reinforcement and re-thin it.

Distraction

Distraction refers to the imposition of competing contingencies into your training environment. In the acquisition stage, it is important to keep distraction minimal. However, in order to train a behavior to be reliable in everyday situations, gradually introduce distraction throughout the fluency stage, to ensure that you can reliably evoke the behavior, even when alternative competing contingencies are vying for control over the subject's behavior. When attempting to identify distractors, look for reinforcers (or punishers). Is there something else in the environment that the subject pays attention to or behaves to contact (or escape)? The presence of other people or other animals can distract the subject from the contingency you are training. What these others are doing can contribute to the magnitude of the distraction. If the other person is standing, faced away from the subject, and not engaging the subject in any way, this will be far less distracting than if the person is calling the subject, holding a toy or treat, or getting close to the ground etc. These are typical variables that you will manipulate as you incrementally increase distraction levels during your training sessions. Always consider what other contingencies exist in the training environment, how much and what kinds of distraction you can have present and still achieve the training you need to achieve, as well as how you can increase the intensity of the distraction by very small increments to ensure you are successful. Throughout proofing against distraction, you will always be attempting to cover as many situations as you can and successfully modify the intensity of exposure. In many cases, you can use access to the distractors as the reinforcer for exhibiting the behavior you are training.

Distance

Distance refers to the distance between yourself and the subject during training. In the acquisition stage of training, you keep distance at a minimal level and increase it later in the fluency training stage, where appropriate. In many instances, you should be able to cue the behavior from further away than you did in your initial acquisition training. You achieve this gradually. Often, behaviors cued from a greater distance, without any specific distance training, will evoke coming to you in order to then exhibit the behavior right next to you. This is especially common with "sit," and it can be very useful to work distance into this behavior. For example, if there happens to be traffic between you and a dog, you need a way to ensure the dog will *not* come to you, but rather sit right where they are when the evocative stimulus is presented and remain there until released. In fact, you may wish to establish an alternative evocative stimulus that is visual rather than auditory for such occasions that extreme distance or noise prevents you from vocally evoking the behavior effectively; many trainers use raising their right hand high into the air to evoke this "emergency sit."

Duration

Duration relates to how long the subject maintains the behavior in position. As with the other parameters, expect minimal duration in the acquisition stage, and increase it gradually in the fluency training stage. You will recall the duration schedule from a previous chapter. This feature relates to thinning that schedule in order to increase the duration of the behavior. Not all behaviors will call for increasing duration but some will. "Sit" and "down" are good examples of behaviors you should train the subject to continue holding beyond the point when they actually achieve the position.

Discrimination Training

The introduction and fading of prompts is a form of discrimination and generalization training in the sense that they increase and decrease the number of stimuli that evoke the target behavior. Further discrimination and generalization training is required though. Recall that discrimination is not something an individual "does" but rather a feature of a pattern of responding. Discrimination occurs—the subject does not carry it out or "perform" it.

One of the tasks at this stage involves ***inter-stimulus discrimination***. Once you have at least three behaviors trained to this level, you will be able to evoke them in random order, so that you can extinguish merely changing position rather than exhibiting the behavior for which you present the evocative stimulus. For example, if a dog is seated and you cue "down" and there is a 50% chance the dog will "stand" and 50% chance the dog will "down," that means the evocative stimulus is only cueing a change in position rather than the behavior you want brought under stimulus control. Present cues for different behaviors in a random order, reinforce criterion responses, and extinguish non-criterion responses (i.e., responses that do not match the stimulus presented).

You should also narrow the range of evocative stimuli by extinguishing responding to similar, yet unacceptable, stimuli. Present the specific evocative stimulus, interspersed with similar stimuli. Differentially reinforce responses to the evocative stimulus and not to these other stimuli, thereby reducing the range of stimuli that will evoke the behavior. Use continuous reinforcement when working on discrimination.

Although some generalization will have occurred before this stage, there will be further generalization training to achieve. This usually involves presenting the evocative stimulus in different ways, in different places, or having other people present the evocative stimulus. Ensure that the subject exhibits the behavior reliably in various locations and under various conditions. For example, a good challenge in a group class for dog training that will drive this point home is to ask for the handlers to evoke a sit, which they will achieve with no problem. Then ask them to face completely away from the dog, or to lie down on their back, and present the cue. Many of the dogs will fail to respond or be slow to respond. This demonstrates the importance of generalization.[49]

Together, discrimination and generalization training promote occurrence of the behavior in the appropriate circumstances and not in others.

Introduce Release Stimulus

Once the subject exhibits the behavior fluently, it is time to discontinue using a clicker. We only use the clicker for training new features. For behaviors that involve maintaining a position—duration appropriate responses—you will need some way of releasing the subject. In order to transition from using the clicker to a release stimulus, simply begin using a

[49] The novelty in such an arrangement may evoke approach and investigative behaviors, which would be distractions as well. This kind of training will address both, distraction in this way, as well as generalization.

release phrase such as "that's all," instead of the click. Follow this with reinforcement if the subject breaks position. If the subject does not break position when released, simply provide the unconditioned reinforcer in a way that requires the subject to break position. You can use the release stimulus to end a behavior, or you can simply present a new evocative stimulus for some other behavior. The release stimulus will become a conditioned reinforcer, especially if you follow-up with treats or other unconditioned reinforcers at least occasionally, effectively replacing the clicker.

Phase 4. Maintenance Stage Training

Working Toward Maintenance of Fluency

Once the subject exhibits the behavior fluently, transition from active intensive training to daily ***maintenance*** of the conditioning. That is, once the evocative stimulus, under an adequate range of conditions, reliably evokes the behavior in its final form, speed, and latency, even when distractions are present, and the schedule of reinforcement has been thinned appropriately, you are ready to maintain what you have achieved, so that it does not deteriorate. The maintenance phase finished up the process of getting to that point.

Another component of maintenance training is transitioning from contrived trainer-mediated reinforcers to less contrived non-trainer–mediated reinforcers. This will help maintain a behavior on a very thin schedule. When you use added reinforcement to train a behavior, the occurrence of the behavior comes to elicit emotional responses that can help maintain the behavior. This endoreinforcement (i.e., reinforcement generated inside the body) contributes to maintaining the behavior, even when the trainer-mediated reinforcers are sparse. The behavior itself generates satisfactory reinforcement within the subject's body, and occasional trainer-mediated reinforcement helps maintain that contingency. Most professional dog trainers are familiar with the phenomenon of dogs rejecting treats, seemingly in order to get back to the training more quickly. This happens when occurrence of the behavior, and the changes that it generates in the environment, reinforce the behavior more effectively than treats.

A key task in this phase is to settle on a schedule of added reinforcement that will maintain the behavior adequately and is realistically achievable in the long run. If the behavior ever deteriorates, refresh the training. Also, ensure you refresh the training in different environments from time to time.

Constructing a Systematic Training Plan: Putting it all Together

We have addressed the components of a systematic training plan, as well as the type of training plan needed for a given training project (i.e., a short and simple plan versus an elaborate and complex one), dictated by the characteristics of the project. For training a simple behavior, identifying the target behavior objective and a few comments regarding how you will generate the behavior and reinforce it may be sufficient. When you will need instructions that are more detailed for a client, to increase confidence and accountability, or where the training will be complex, as in shaping or chaining projects, you should include more detail in the written plan. In this section, the components of a more elaborate training plan will be exemplified. A simple behavior will be used here for illustration purposes, but more details are included in order to present all of the features that we have explored.

Every training plan should contain the following information:

- Subject's name and breed
- Client's name
- Client contact information
- Formal behavior objective
- Assessment of proficiency
- Contingencies
- Conditioned and unconditioned reinforcers

    - Acquisition tactics
    - Antecedent tactics
- Postcedent tactics
- Fluency tactics

The first three items are simply to help keep track of the case, and this is only necessary if you are working with a client.

In the case of simple training projects, provide a formal behavior objective. In the case of a behavior chaining project, provide a formal behavior objective for each behavior in the chain. In the case of a shaping project, provide a formal behavior objective for the terminal behavior and a list of behavior approximations. These topics will be discussed in detail below. Where necessary, prepare any charts or graphs that will help you track the behavior over time.

Provide a statement regarding your assessment of the subject's current proficiency in exhibiting the target behaviors or components of it. What components of the training do you need to carry out and which ones do you not need to carry out?

Diagram the contingency you will condition. For instance:

"Paw" → Dog gives paw → Treat$^{(+R)}$

The evocative stimulus should be the final evocative stimulus that you want to control the behavior. The behavior should be concise when diagrammed, as it will refer to the full behavior objective. The reinforcer should identify the unconditioned reinforcer you will use during the training process, through the acquisition and fluency stages. You may include the conditioned reinforcer as another term, or include it along with the single consequence term—most trainers simply forgo the conditioned reinforcer altogether when diagramming the training contingency.

Diagram each behavior in a chaining project in the single contingency (using multiple behavior position terms), if each behavior can be trained with the same reinforcer and none requires shaping. If the chaining project is complicated by the use of shaping for certain component behaviors or the need to use different reinforcers, list each behavior in the chain as a separate and chronologically ordered contingency.

Present a statement identifying any antecedent tactics you will use to generate the behavior.

Present a statement identifying the postcedent tactics that you will use, including whether you will require added reinforcement only, graded errorless differential reinforcement, shaping, or chaining. Include details on each behavior in a chain and approximation details for a shaping project.

Present a statement regarding what schedules of reinforcement and/or schedule progressions you will utilize in the fluency stage.

Present your graded errorless plan, including what smaller more manageable sub-projects you can break the project into and identifying how you will ensure an errorless progression. This also includes how you plan to proof against distraction, distance, and duration. Identify those variables and how you will manipulate them to incrementally increase their intensity.

This does not usually need to be a very long, nor detailed, document in the case of simpler behaviors, but it is a good idea for initiating training projects to evoke preparation behaviors, even with simpler projects. The practice will become handy when you face a more complex training project that will require shaping approximations, and/or chaining techniques. The more extensive plans are most useful when you will be providing clients with training responsibilities that you cannot supervise. The clarity of a plan can be very helpful for them as they work with their dog. Using the preparation of this document as a sort of checklist will help ensure that you plan appropriately. For instance, it might be easy to ignore plans to ensure errorless training unless you require of yourself to write the plan for it out. As another example, by requiring yourself to consider the graded approach of breaking the project down into smaller projects, you are more likely to do this where it will be helpful to do so.[50]

Below is a sample training plan for "give-a-paw," a simple behavior useful for illustration purposes. You will require much more elaborate information for more complex training projects, and for simple projects, you might elect to omit a few sections, particularly once you have extensive experience training the chosen behavior.

Training Plan

Subject's name, breed, age: Jake, Doberman Pinscher, 8 months

Target behavior objective

Behavior Objective

S^{Ev}: Vocal "Paw."

Behavior: Jake will raise his left paw off of the ground, moving it in a downward arc forward, and place it on the person's palm if one is present.

Consequence: Treats (veggie burger bits) and continued social contact.

Criteria: Latency—2 second; duration—1 second; relative frequency—100% through 10 trials; distraction—various*.

* Distractions inside the house to include various people around, engaged in various activities including handling toys and talking, as well as with other dogs around, playing. Same thing but outside of house as well.

Assessment of proficiency

Jake currently lifts a paw slightly when people are near, and will usually

[50] When having clients work on training on their own, ensure that you demonstrate the procedure, discuss how they are to progress, and provide them written instructions for their reference. Have clients demonstrate the procedure, and remediate any deficiencies before leaving them to train unsupervised. The chapter on training humans provides detail on this topic.

place paw on hand if I present the hand right beside his paw, at a relative frequency of 80%. Not under stimulus control of a vocal cue, and hand needs to be lower to ground and closer to paw than desirable.

Contingencies

"Paw" → Dog gives paw → Veggie burger bits$^{(+R)}$

Conditioned and unconditioned reinforcers

Clicker as conditioned reinforcer and veggie burger bits as unconditioned reinforcer.

Acquisition tactics

Prompt with hand presented near front left paw, light touch to ankle if necessary. If unsuccessful, plan for shaping project. Fade later by gradually having hand further up and away from Jake.

Establishing operations: Train before meals and utilize most effective reinforcers only for training through acquisition and fluency.

Postcedent tactics

Graded differential reinforcement (shaping if necessary). Minimally aversive (deemphasized) two–second extinction for non-criterion responses. Change to five–second extinction and conditioned ("Oops") and unconditioned subtracted punishment if necessary.

Fluency tactics

Fade food prompt right away.

Utilize continuous reinforcement for the first several responses, and once stable, an intermittent variable ratio schedule, gradually thinned based on progress.

Work latency if required. Work duration first up to one second, then work distraction gradually, including other people present, then other dogs, then outside of the home in client's yard, and then away from home.

With each change, return to continuous reinforcement and re-thin.

10 Laws of Training

1. Plan your training ahead of time, including a target behavior objective, the strategy you plan to take, and procedures you will need to utilize, as well as any lists of approximations or task analyses. Break the project down into small manageable steps.
2. Utilize a graded and errorless approach, breaking complicated projects into manageable sub-projects and arranging the antecedent environment such that the target behavior is highly likely to occur and the subject successfully accesses added reinforcers.
3. Keep training sessions short, so that participation remains reinforcing and the subject does not satiate with respect to the unconditioned reinforcers used or with respect to social contact.
4. End sessions with successfully reinforced trials, even if you have to relax distraction, distance, and/or duration in order to generate a series of successful responses, and ensure the last few trials generate reinforcement. Ideally, end the session to engage in some other reinforcing activity.
5. At the beginning of each new session, review some of the progress made in the previous session—this will ensure smoother transitions in new sessions.
6. Present the evocative stimulus only once. If the target behavior does not occur, reset the environment with a brief lure to a different position or cue another preparatory behavior, identify why the target behavior did not occur, manage the environment to ensure occurrence of the behavior in the next trial and proceed to the next trial.
7. Participation in training should always remain highly reinforcing. Use tone of voice, energy level, pace of training, direction of attention, prevention of failure etc., to keep the training reinforcing.
8. Start with minimal distraction. Arrange the environment to make occurrence of the target behavior, rather than other behaviors highly likely, putting the subject and yourself in a position

succeed. You can gradually introduce greater distraction at a later stage in the project.

9. Before moving to a new phase in a training procedure or raising a criterion parameter, ensure the rate of the behavior has stabilized at the current phase or step to ensure the subject's nervous system—the thing being conditioned—can keep up with the pace.
10. When you begin working a new D-parameter, relax other D-parameters and the schedule of reinforcement. You can combine the D-parameters after you have worked each separately. However, when working form, latency, and speed, maintain the progress made—do not relax these features when introducing a new challenge.

Continuing Education

Courses provided through The Companion Animal Sciences Institute at www.CASInstitute.com address all of the topics covered in this chapter.

CHAPTER 6. ADVANCED TRAINING TECHNIQUES

Behavioral Objectives

The objective of this chapter is to measurably expand the reader's repertoire of behaviors in relation to describing and relating advanced training procedures (shaping, chaining, and sequencing). Upon successfully integrating the concepts outlined in this chapter, the reader, where exposed to contingencies to do so, will accurately:

- define shaping and describe under what circumstances this procedure, as opposed to others, would be most appropriate;
- determine when prompting would be most appropriate;
- describe a systematic series of steps necessary in planning a shaping project;
- prepare a list of behavior approximations;
- define chaining, differentiate this from sequencing and describe under what circumstances this procedure, as opposed to others, would be most appropriate;
- differentiate between forward chaining and backward chaining, and determine which is most suitable for particular behavior objectives; and
- conduct a task analysis to determine which behaviors will constitute the chain.

Introduction

Sometimes, the target behavior does not occur in its final form in the subject's repertoire of behavior at all and you cannot readily prompt it. Other times, the objective calls for a series of behaviors, exhibited in sequence, with only one trainer-mediated cue at the beginning. Other times, the objective calls for several behaviors to be well trained such that the trainer can cue them in any order very quickly and the subject will move to the next behavior seamlessly upon completing the behavior before it. These are examples of situations in which more advanced training procedures are required, rather than simply prompting and reinforcing the target behavior. In this chapter, the three most powerful advanced training procedures used for such situations will be described: shaping, behavior chaining, and sequencing.

Shaping

Definition and Appropriate Uses

Shaping is a procedure that involves the differential reinforcement of ***successive approximations*** of a target behavior. Shaping is a special type of differential reinforcement. All differential reinforcement procedures change the *rate* of a target behavior. Shaping changes the *form* of a terminal behavior, making it a unique type of differential reinforcement. Shaping involves a series of standard (i.e., rate-changing) differential reinforcement procedures carried out in succession. The rate of an approximation of the terminal behavior is increased through differential reinforcement, and then the same process is used with another, closer, approximation to the terminal behavior. This process is repeated until the subject exhibits the terminal behavior. The *rate* of each approximation is increased one at a time, allowing for training the next approximation until you achieve the terminal behavior *form*.

Not every response class member is precisely the same. This variability in the different properties of response class members from one response to another facilitates selection and reinforcement of some variations over others. The initial approximation is set such that it will occur frequently enough for the trainer to reinforce it.

The unaugmented environment may evoke the approximation, or the trainer may prompt it. Once that response class form has a history of reinforcement, it will occur more frequently. Then, that response class form is put on extinction in favor of the next approximation. A common byproduct of extinction is increased behavioral variability. Ensure that the second approximation is set such that it will fall within the range of variant response class forms resulting from the extinction process. In other words, the next approximation cannot be too different from the one you just finished establishing. This new approximation is then targeted for reinforcement and its rate is increased. The shaping process continues until the subject fluently exhibits the terminal behavior. This reiteration through cycles of differentially reinforcing approximations toward a terminal behavior form is referred to as “shaping.”

Shaping is an appropriate procedure for single discrete behaviors that do not occur frequently, and where the behavior cannot be readily prompted its final form. If the behavior can be prompted in its final form, then a single differential reinforcement procedure is preferable. If the behavior is actually a complex series of discrete behaviors that you want exhibited sequentially with a single trainer-mediated cue at the beginning of the sequence, chaining is the most suitable procedure, although each discrete behavior in the chain must be trained and may require shaping. Shaping is also used in many simple training projects in order to fine-tune the form of the behavior needed.

When considering whether a behavioral episode involves a series of approximations of a terminal behavior or a series of discrete requisite behaviors, determine whether the initial behaviors are actually approximations of the terminal behavior or simply requisite behaviors.

For example, the trainer wants to train a subject to turn in a circle and the subject does not currently turn in a full circle frequently enough to be feasible. The decision needs to be made whether a series of discrete behaviors is required to train the subject to turn in a circle (in which case, chaining is required) or whether there are approximations toward this terminal behavior (in which case shaping is required). The initial behaviors might involve turning the head, followed by turning the head to the point that the shoulders also turn, followed by turning the upper body sufficiently to turn the hips, followed by turning to the point that a step is required, followed by a turn of 120º, followed by a turn of 180º, followed by a turn of 270º, followed finally by a full turn of 360º. This is a clear example of a single terminal behavior for which approximations are required, rendering a shaping procedure necessary and appropriate.

An alternative example involves putting on a baseball cap. The trainer may need to train the subject to walk to the table where the cap is sitting, followed by picking the hat up, followed by putting it on their head. This is a clear example of a chain of discrete behaviors. Walking to a table is not an approximation of putting a baseball cap on one's head; it is a prerequisite behavior.

As mentioned, one way to help ensure that you are clear on whether you require a single shaping plan or a chaining plan is to consider whether the initial steps involve training a single dimension of the terminal behavior.

Turning in a circle requires the subject to keep going in the circle whereas putting on a baseball cap that is not already in one's hand, requires completely different dimensions—walking to the table, picking up the cap, and then placing the cap on one's head. The trainer may still need to shape some or all of the requisite behaviors but they must first determine whether to use a shaping plan alone or a behavior chaining procedure.

The definitive test, however, for determining whether a behavior episode is made up of approximations or a series of discrete behaviors is whether the early segments are *always* required for the behavior to occur or not. Turning a bit to one side is *always* necessary to achieve turning all the way around in a circle. Walking to a table is *not always* required for putting on a cap.

Shaping is a postcedent procedure because it manipulates what comes after the behavior. That is, shaping involves manipulating consequences in order to change the likelihood of the behavior on subsequent occasions. Shaping, itself, does not specify any antecedent conditions; it does not specify whether a trainer-mediated stimulus evokes the behavior or not. The somewhat colloquial term "***free-shaping***" indicates a shaping program in which prompting is avoided. There is utility in avoiding prompts in some shaping projects, particularly when the trainer is attempting to reinforce creativity[51] and persistence in general, as well as the specific behavior in question.

Trainers should consider some limitations to shaping. Cooper and colleagues (2007, p. 425) point out that shaping can be time consuming, progression through approximations is often erratic rather than linear and smooth, the trainer must be extremely attentive for indications of a need to change criteria, and it can be misapplied and promote problem behaviors. In addition, in order for shaping to be executed well, the trainer requires extensive experience and proficiency in a number of requisite trainer behaviors. If one does not execute shaping well, the subject (and the trainer) can become frustrated, which can cause significant disruption to training and indeed other aspects of the subject's life.

[51] "Creativity" refers to novel and productive responding.

Planning Behavior Objectives and Lists of Behavior Approximations

Preparation for a shaping project generally requires more planning than for most other procedures. As in any training project, one must establish a behavior objective. First, define the evocative stimulus and an operational definition of the terminal behavior, including a suitable measure for it (e.g., specific rate, relative frequency, and/or duration). Once you define the terminal behavior, prepare the list of behavior approximations.

Determining the list of behavior approximations requires careful judgment and flexibility. The best way to start is with observation of subjects who currently exhibit the behavior fluently. Find a subject who already exhibits the behavior, and either observe them exhibit the behavior, or better yet, video-record it and watch it repeatedly, perhaps in slow motion. You might be able to find such a video posted on one or more video sharing websites such as YouTube. By watching the video of the behavior being exhibited repeatedly, you will be able to prepare a more accurate list of approximations than if your only option is to visualize the behavior occurring. With experience, you will become familiar with the approximations useful for some of the more common behaviors.

The first approximation must occur frequently enough to provide adequate opportunity to reinforce the behavior. You need to be able to easily prompt it, or otherwise have it occur, so that you can reinforce it. Each approximation needs to make the next approximation likely to occur frequently enough to also strengthen it, whether it occurs within the normal range of variability when behaving the approximation before it or it is prompted. If the next approximation does not occur quickly, it will likely be frustrating for both the trainer and the subject, and training will progress slowly. Remember, a high rate of reinforcement is required to maintain pace, high levels of responding, and prevent frustration. The approximations should be large enough that the subject is not likely rapidly skipping multiple listed approximations at a time, but small enough that progress remains smooth and efficient. Err on the side of smaller approximations, because frustration is particularly disruptive to training. If the behavior is not being reinforced at least every few seconds, the approximations are probably too large. Break them down into small enough steps such that that they can be reinforced every few seconds to maintain a high rate of reinforcement. The approximations should be set to be as gradual as possible, so that training moves smoothly from approximation to approximation. Ensure that each approximation is operational (i.e., describes specific body part movements or very specific function).

Next, for each approximation, it is good practice (though not always necessary) to break it down into a couple small sub-approximations, in case you need to quickly utilize them to prevent frustration. In your written training plan, you can include them as an indented list that can be ignored unless it is needed.[52]

At a more advanced level, look at each approximation for functional alternatives. For the particular behavior identified, is there an acceptable alternative response class form that still results in progress toward the terminal behavior? Prepare yourself proactively for any step along the way where you might not immediately get the specific approximation you listed in your plan. It is possible that you will get a variation or response class form that is still acceptable, because it functions as a suitable approximation toward the terminal behavior. This may not be possible for all terminal behaviors; it is usually more applicable to more complex terminal behaviors. You may need to continue a new branch of approximations from the alternative behavior to your terminal behavior. Otherwise, note where it connects back to your initial list of approximations. You can put these alternative operants in a column to the right.

Implementation of the Shaping Plan

Shaping is an advanced training skill that requires practice in order to carry it out effectively and efficiently. A poorly executed shaping program can be frustrating for the subject as well as the trainer.

Managing smooth progression through the approximations involves several fluent trainer behaviors, including proficiency in making quick adjustments to both the plan and the techniques used at a given moment.

[52] For example, in your outline, these sub-approximations can be on a separate, indented line under the main approximation.

For example, if you need to break a step down into smaller steps, or you need to add a prompt, you need to recognize these requirements quickly and consistently, and you need to make the adjustments quickly and effectively.

The list of approximations will be your guide to training, but remain flexible, and prepared for off-list behaviors, be they acceptable ones or unacceptable ones. If the training is going smoothly and you are experiencing very few extinction trials, there are no long periods of time in which the target behaviors fails to occur, and the subject is focused and participating, it is likely that you are right on track. If, on the other hand, the subject is losing interest, failing to exhibit criterion behaviors, or is exhibiting non-criterion behaviors, it is likely that you are moving at an inappropriate pace. If you move too slowly, the subject may become exposed to competing contingencies in the environment sufficient to evoke non-criterion behaviors (i.e., they lose interest in the training contingencies). If you move too quickly, a greater number of frustrating extinction trials may occur. When beginning an approximation, there will necessarily be some extinction trials, but if you set the approximation and the pace appropriately, there should be very few. You should quickly progress to errorless or near errorless training.

If you reach a challenging part and the subject seems likely to become frustrated, it can be useful to take a break. Toss a treat to change the focus temporarily away from the contingency at hand and reset the environment. Try not to wait until the dog becomes frustrated and begins exhibiting disruptive behaviors or even subpar behaviors as these will be reinforced by taking a break—they are after all escape behaviors and you are providing effective escape. Don't let it come to that. Always be on the lookout for such subtractively reinforced behaviors that will be disruptive to training. If a non-criterion behavior results in an end to an aversive session, you can expect that disruptive behavior to increase. The goal is for training to be reinforcing. If it is not, your area of focus should be in solving this problem. Also, keep training fun so that escape behaviors are irrelevant! Take the break time to identify the variables that are causing the problem, so that you can fix them. Perhaps call the subject to you, request a simple previously well-conditioned behavior, and provide an enthusiastic reinforcement package (treats and enthusiastic praise). If need be, take a longer break to do something different, be it fun or relaxing, before proceeding again. Occasionally, it seems as though a "frustration loop" develops and has the potential to deteriorate the training. Taking a brief break can be immensely helpful in this respect. If the subject responds to training with escape behavior, this bodes very poorly for effective training. If that occurs, you will need to take it very slowly, ensure success at first and ensure it is fun.

It is important to remain at any particular approximation long enough to establish stability in responding, but no longer—mastery and maintenance are reserved for the terminal behavior. Moving to the next approximation before the behavior stabilizes will result in a greater number of extinction trials in the approximations to follow, and frustration will result. Remaining at an approximation too long will result in a conditioning history that is too strong and will require more extinction of that approximation in preparation for the next approximation. A good rule of thumb is that the training in any given approximation should proceed until the behavior has stabilized, but not longer, and that the training is progressing smoothly. Where it is not progressing smoothly, make necessary adjustments. Are you expecting too much or not enough? Are you moving too quickly or too slowly? Boredom and distraction are indicative of going too slowly, and frustration is indicative of moving too quickly.

If, when you move to the next approximation, the subject does not exhibit the behavior quickly, you need to be prepared. There is something to be said for allowing the subject to "figure it out" on their own—that is how they become conditioned to exhibit persistence and creativity. However, if it goes on too long, they can become excessively frustrated, and this will definitely disrupt training. If the subject does not exhibit the behavior quickly, go back and work through several trials of the previous approximation, and then insert an intermediate approximation or two (these should already be planned for in your list of approximations). You may have chosen an approximation that was too difficult. In this case, you can insert an easier approximation, which will more likely allow you to reach the target approximation. Then, you can continue moving forward with your plan. Having a plan will make it easier for you to quickly come up with intermediate approximations when needed. A well-placed prompt can also get you "over the hump" and back on track.

Chaining

Definition and Elements

A ***behavior chain*** is a sequence of discrete response class forms exhibited in close temporal succession, in which each response class form member produces a stimulus change that functions as a conditioned reinforcement for that response and as an evocative stimulus for the next response class form in the chain, and the entire chain of behaviors is maintained by a single unconditioned reinforcer delivered after the final response in the chain (adapted from Cooper et al., 2007, p. 436 & 690).

Notice that completion of each behavior serves a dual function; it functions as a conditioned reinforcer for the behavior the subject just exhibited, and it acts as the evocative stimulus for the next behavior in the chain. The opportunity to exhibit the next behavior in the chain reinforces the behavior, and this occurs for each link in the chain until the final behavior, which produces the trainer-mediated unconditioned reinforcer. This final reinforcement maintains the chain and the conditioned reinforcers that make it up. In other words, a behavior chain is a series of behaviors with one trainer-mediated evocative stimulus at the beginning, and unconditioned reinforcer after the last behavior—a series of chronologically exhibited behaviors is evoked.

To train a chain of behaviors, break the project down into component behaviors (links) that are first trained as separate projects, and then are linked together once the subject exhibits each individual behavior fluently. This linking process is referred to as *chaining* or *behavior chaining*. For example, training a subject to retrieve involves training the subject to run to a thrown object, *and then* grab the object, *and then* return to the thrower with the object, *and then* drop the object into their hand or at their feet. This complex sequence of behaviors becomes quite easy to train if each component behavior is trained and then chained together rather than the trainer trying to generate all of the behaviors at once. Often, simple differential reinforcement is used to train each component behavior, but some component behaviors may need to be shaped. Training each discrete behavior is a separate training project, requiring the use of procedures appropriate to that particular behavior. Behavior chaining is really about how to bring the whole sequence of behaviors, as a sequential set, under discrete stimulus control.

There are no trainer-mediated interjected cues in chaining. The evocative stimuli between each behavior are directly created by the completion of the behavior exhibited before it in the series of behaviors. Interjecting prompts or cues (vocal or otherwise) in the sequence of behaviors is *not* the same as chaining. The section on sequencing provided below elaborates on this distinction. The issue is raised here so that misunderstanding may be avoided. Prompts are not to be confused with interjected evocative stimuli. You may use prompts initially in training the component behaviors, or in linking them together, but these prompts are faded as soon as possible.

Once you make the determination that chaining is the most suitable training method for the target behavior, the following four steps need to be carried out:

1. Construct and validate a task analysis.
2. Assess the level of proficiency of requisite behaviors.
3. Train the component behaviors.
4. Chain the component behaviors together.

Constructing and Validating a Task Analysis

The first undertaking in the planning stage of a chaining project is to construct and validate a ***task analysis***. Constructing a task analysis involves breaking a complex behavior (i.e., multi-behavior chain) event into a sequential set of discrete component behaviors and describing each component behavior. The most useful way to construct and validate a task analysis is to observe a proficiently exhibited behavior chain. It is a good idea to observe multiple proficient occurrences of the sequence of behaviors to identify any useful variations that can inform the task analysis. Observing video is helpful because you can view the same behavioral episode multiple times and in slow motion. You can construct the task analysis from simple covert visualization of the sequence of behaviors, but this method is less reliable than planning based on actual occurrence of the sequence. In other words, if you "wing it," you are more likely to run into unforeseen problems during the training. From this careful observation, you can prepare a diagram that identifies each discrete behavior. The example below, involving a retrieve related sequence of behaviors, illustrates the product to be generated:

Given that a ball is thrown and the trainer says "git yer ball," the subject will:

- run to ball;
- take ball in mouth;
- run back to thrower with ball;
- drop ball at feet of thrower; and
- sit.

Below, a more detailed elaboration of the sequence of behaviors illustrating the actual changes to the environment that each response generates and acts as the conditioned reinforcer for the behavior it follows, and the evocative stimulus for the behavior to follow is provided. It is not usually necessary to provide such an elaboration and the format above is usually adequate.

- S^{Ev}_1 ("Git yer ball") → Behavior_1 (run to ball)
- S^{Ev}_2 (arrive at ball) → Behavior_2 (take ball in mouth)
- S^{Ev}_3 (getting ball in mouth) → Behavior_3 (run back to thrower with ball)
- S^{Ev}_4 (arriving at thrower with ball in mouth) → Behavior_4 (drop ball at feet)
- S^{Ev}_5 (dropping ball at thrower's feet) → Behavior_5 (sit) → Reinforcer

A less elaborate format (standard contingency analysis) will usually suffice:

Git yer ball → run to ball → take ball → run back → drop ball → treat

Assessing Level of Proficiency of Requisite Behaviors

Once you have constructed and validated a task analysis, your next undertaking is to determine which component behaviors the subject already exhibits and with what level of proficiency. There are a few ways to assess the subject's current proficiency level. First, identify which, if any, of the component behaviors the subject exhibits. Second, determine if you can evoke any segment of the behavior chain (i.e., more than one of the behaviors exhibited in the proper sequence without interjecting evocative stimuli or prompts). A third approach, useful in some cases, is the ***multiple-opportunity method*** wherein the trainer evokes the behavior chain and provides minimal prompts as needed to achieve occurrence of the entire behavior chain or as close to it as can be achieved (Cooper, et al., 2007, pp. 438–441). Avoid physical manipulation. Identifying where prompts are required and how salient the prompts need to be will inform you regarding proficiency level. All of these factors help you determine exactly what you will need to train and what you do not need to train.

Training the Component Behaviors

Each behavior in the chain must be trained before they can be chained together. The proficiency assessment will help you determine exactly what needs to be trained and what the starting points will be, but each discrete behavior is a training project of its own. Begin with the formal behavior objective and construct a training plan to achieve that objective. You may be able to simply differentially reinforce it or you may need to use shaping.

Behavior Chaining Methods

Once you have trained component behaviors, there are at least two ways to attach the links of the chain—carry out chaining a sequence of behaviors:

- Forward chaining
- Backward chaining

Forward Chaining

In ***forward chaining***, you train the behaviors in the order that you want the subject to exhibit them once the chaining process is complete. There are multiple approaches commonly used in forward chaining, two of which will be described.

Forward Chaining Method 1

For very simple and short chains, you may prompt or evoke each behavior in the sequence, reinforcing only at the end of the sequence. Prompt or evoke the first behavior, and then prompt or evoke the second behavior, and so on, until you have worked through the entire sequence. Repeat this sequence several times, and you should then be able to begin fading the interjected prompts. Present the first stimulus, and then continue as before, but then either (a) gradually fade the prompts, or (b) delay the next prompt for a second or two to determine if the next behavior occurs, that is, if stimulus control is strong enough yet. If the subject exhibits the next behavior, reinforce it. See how far you can get through the sequence and reinforce for successful occurrence of the smaller sub-chains. You may then need to work on adding more behaviors to the end of that chain in the same way in order to get all of the behaviors chained together. If you do not get far into the chain, you can try:

- several more trials, perhaps through a few sessions;
- fading the volume of the prompts; or
- method 2 described below.

In the retrieve example just discussed, you would start by cueing running to the ball when you throw it, and present the vocal cue. Then you would evoke the picking up of the ball behavior. You can then fade the prompt you interject, and when you achieve this, you evoke bringing the ball back to you, and then fade the interjected prompt for that linkage as well. Now you have all three behaviors linked in a chain.

Forward Chaining Method 2

The first method described above is a short cut that is often successful in simpler chaining projects, but in many cases, you will need to use this more elaborate procedure. For slightly longer or more involved chains, or if you tried method one and it is not progressing well, you can reinforce after each component behavior, and gradually thin the reinforcers. Begin by cueing the first behavior, reinforcing it, and then evoking the second behavior and reinforcing the second behavior. Thin the schedule of reinforcement for the first behavior, but maintain the second behavior on continuous reinforcement. Once you are no longer reinforcing the first behavior, and you can maintain the chain adequately with the continuous reinforcement of the second behavior, begin evoking the third behavior after the second behavior. Maintain the third behavior on continuous reinforcement, and begin thinning the schedule on the second behavior as you did with the first behavior. Progress through the entire chain in this way, adding new behaviors to the end and thinning the schedule of reinforcement for the behavior before it until you have met the objectives.

Forward chaining is used for relatively simple behavior chains, or when the first few behaviors are particularly easy to generate. The more proficient each component behavior is the more likely forward chaining will be effective.

Backward Chaining

In ***backward chaining***, the sequence is trained in reverse order. Evoke the final behavior in the chain and reinforce it, and once you can reliably evoke that, prompt the second to last behavior of the chain, and then prompt the last behavior right away and reinforce. Fade the interjected prompt, and once this chain is exhibited reliably, start prompting the third to last behavior, followed by the previous chain, and then fade the interjected prompt so that all three behaviors are exhibited when the evocative stimulus is presented and reinforcement is provided only after the final behavior. Continue this process until the entire chain has been produced.

Backward chaining is often used when the final behavior is critical in the sequence. In the retrieve example, start by evoking dropping the ball at your feet, and once that is reliable, evoke bringing the ball to you before dropping the ball at your feet, fading the prompts as you go, and on until you have worked through the entire chain.

A limited hold extension can be used when training behavior chains as well.[53] In a behavior chain with limited hold, the subject must exhibit the behavior within a specified interval of time in order to contact the final reinforcer. This can be useful in instances where quick behavior is important. The limited hold extension can be used near the end of training in order to tighten up the speed.

Quality of the Chain

Attend to the quality of the chain. Especially in relatively long chains, the subject may skip component behaviors, or behave sloppily in the initial part of the chain. This effect resembles the scalloping evident in certain fixed schedules of reinforcement. The subject responds poorly at first, and only responds adequately in the final steps of the chain because the reinforcer is made available only at the end of the series of behaviors. It is important to ensure that each component behavior be trained to fluency, that highly effective reinforcers are used, and that only full criterion occurrences of the behavior chain are reinforced. Do not reinforce subpar chains. It can be tempting to reinforce any completion of the behavior chain, but what you reinforce is what you get. Use a graded errorless approach to work up to that expectation.

Sequencing

Sequencing involves training a subject to exhibit a number of discrete behaviors and/or chains, and interjecting evocative stimuli after component behaviors or chains to initiate the next behavior or chain of behaviors. The entire behavioral episode of behavior is also referred to as a "sequence" (Alexander, 2003) and the evocative stimuli used between component parts are referred to as ***interjected cues***.

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[53] There are two common definitions for "limited hold." The more contemporary latency reduction version is used here, in which the behavior must occur within a specific limited amount of time in order for it to be counted as a criterion behavior and reinforced. The other, traditional, version makes the unconditioned reinforcer available after the behavior occurs for a specific limited time, and training proceeds if the reinforcer was not collected.

Sequencing can be extremely useful when a higher level of flexibility is required than a static behavior chain can provide. A common example involves a particularly long and complex agility run, in which the particular obstacles are arranged differently in each competition, and while each obstacle involves a chain of component behaviors that remain stable, the trainer must present cues in order to get the subject to initiate the next appropriate behavior or chain of behaviors.

If your goal is to train a series of behaviors that will remain the same each time and you utilize a single cue to initiate that process, you will be training a behavior chain. If you simply evoke a number of behaviors sequentially (each with its own cue), this is not a behavior chain. If the task requires flexibility (such as in an agility run), you may need to utilize sequencing. The process will involve training a number of behaviors and/or behavior chains, and using verbal or physical cues, "on the fly," to evoke the next behavior or chain.

Continuing Education

Courses provided through The Companion Animal Sciences Institute at www.CASInstitute.com address all of the topics covered in this chapter.

CHAPTER 7. TRAINING HUMANS

Behavioral Objectives

The objective of this chapter is to measurably expand the reader's repertoire of behaviors in relation to describing and relating the principles of behavior. Upon successfully integrating the concepts outlined in this chapter, the reader, where under contingencies to do so, will accurately:

- train humans to carry out dog training tasks, one-on-one as well as in group training environments.

Introduction to Verbal Behavior

The majority of work dog trainers carry out involves training humans to train their companion animals. Even as trainers are applying the appropriate procedures, they are explaining the process to the client.

Training humans is both similar to, and quite different from, training other species. The same laws, principles, strategies, and procedures apply to humans. On the other hand, humans exhibit some very complex verbal behavior that is called "language "and what is called "rule-governed behavior" when engaged in social interactions. Let us start with a few key concepts. ***Social behavior*** is behavior, the consequences of which are mediated by another organism. ***Verbal behavior*** is behavior, the consequences of which are mediated by an organism when the mediating organism is behaving in ways that have been conditioned and maintained in the same verbal environment (Ledoux, 2014, p. 443; Fraley, 2008, p. 949; Moore, 2008, p. 162). The main thing that makes verbal behavior a subset of social behavior is that the socially mediated consequence has been previously conditioned within a verbal community. Much of the verbal behavior exhibited by humans is characterized as "language." ***Language*** refers to relatively stable pattern of verbal behavior, including vocabulary, and rules of grammar and usage, which is conditioned and maintained by the contingencies in place within that verbal community (Fraley, 2008, p. 951). A ***verbal community*** refers to a group of individuals whose mutual mediation of reinforcement conditions the verbal and mediating behavior of the individuals in the group, because of the benefits that accrue to the group from generating and maintaining these verbal behaviors. Importantly, (a) verbal behavior involves a lot more than many people suspect (Ledoux, 2014, chap. 20), (b) individuals belong to shared verbal communities, and (c) our training of clients is largely carried out as verbal behavior. Of course, vocal behavior is verbal, but so too is sign language, as well as various private behaviors commonly referred as "thinking" (Fraley, 2008, p. 949). Notice that verbal behavior was defined above as reinforced "by *an* organism" as opposed to "by *another* organism."[54] Private (also called "covert") verbal behavior is still verbal behavior even though there is only one organism involved; the same organism mediates the verbal behavior and the reinforcement based on conditioning that has taken place within a verbal community. The verbal behaviors involved in thinking were conditioned in the verbal community as well, which is why they are considered verbal. Even a dog scratching at a door and the guardian opening the door to let the dog out is an instance of verbal behavior (Ledoux, 2014, p. 443). The dog and the person constitute a verbal community in which at least certain behaviors have come to be conditioned within that community. The dog scratches because scratching has historically resulted in a human opening the door, allowing the dog to go outside. That is verbal behavior. In the study of verbal behavior, we refer to the speaker as the ***verbalizer*** and the listener as the ***mediator*** (because they mediate the reinforcement) to allow for a broader range of verbal behaviors than just spoken or vocalized verbal behavior.[55]

From a psychology perspective, verbal behavior is explained by postulating underlying mental processes within the mind and treating it as the transfer of information from mind to mind. Verbal behavior is said to be the expression of the agent as in the statement "he is expressing himself." Words within a language are said to have "meaning" in the sense that the

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[54] Most sources define verbal behavior as behavior reinforced "by another organism" and they proceed to stipulate that the subject can act as both the verbalizer as well as the other organism mediating the reinforcement. This seems confusing and almost semantically void to me even though there may be certain theoretical benefits to considering the single organism as "many selves." That is why I bypass such confusion by defining verbal behavior as behavior for which the consequences are mediated by "*an* organism" rather than "by *another* organism" However, take note of these differing approaches to defining verbal behavior and allowing for private verbal behaviors.

[55] I prefer the word "consequator" to "mediator" because (a) consequator more accurately describes the "listener's" role in the contingency as providing the consequence that maintains the verbal behavior, and (b) the term "mediator" used to refer to the listener can be confusing since, while they mediate the consequence, the verbalizer mediates the verbal behavior. However, my preference is not standard terminology within behaviorology and I defer to the verbalizer/mediator terminology.

word has a referent. In behaviorology, "meaning" is defined by the contingencies under which a word is evoked and consequated. In other words, meaning is a matter of function.

Behaviorologists study verbal behaviors functionally, as verbal behaviors are operants. Just like other operants, verbal behaviors are conditioned and maintained in accordance with the laws and principles of behavior. Antecedent stimuli evoke them, reinforcement strengthens them, punishment suppresses them, and extinction eliminates them. No special laws or principles are required to explain verbal operants as opposed to any other kind of operant.

The main point of this section (the "take home message") is that verbal behavior is operant behavior, and just like any other operant behavior, it can be prompted, evoked, reinforced, punished, and extinguished, and it can prompt, evoke, reinforce, punish, or extinguish the verbal behavior of others. Verbal behavior is not some mysterious/magical "transfer of information" from "mind to mind" with "signals" as psychology's communication theory would suggest. Although it is extremely complex, it nevertheless is perfectly natural, and operates in an orderly and lawful manner, just like all other behaviors. By appreciating this fact and conceptualizing verbal behavior behaviorologically, you can more readily appreciate how to change the verbal behavior of others.

Encouraging Productive Verbal Behavior

At different stages of the professional relationship between you and a client, you will have different behavior objectives to achieve. You will not likely write them out, however, you will need to encourage honest and freely provided data regarding the client's behavior and their interactions with the dog. Later, you may need to convince a client to carry out specific tasks and provide instruction on that matter. At some point, you may need to address concerns or persuade the client to accept a particular point of view. On a moment–by–moment basis, you may need to extinguish counter-productive client verbal behavior and instead prompt and reinforce more productive verbal behavior in its place. Clients may exhibit very little verbal behavior or perhaps too much. Some clients argue every point, while others seek attention and sympathy. It is easy to forget, when working with clients, that the trainer's reactions to client verbal behavior are consequences for the client's behavior, but appreciating it as such can help keep the discussion on track and help you obtain accurate data, and avoid or escape certain problematic interactions. Set the occasion for and reinforce client sharing with undivided attention. Maintain soft eye contact, gently lean in and interject appropriate verbal prompts such as "uh huh," "okay," "I see," or "go on." Avoid checking your watch, looking away, checking your nails, or otherwise attending to outside contingencies. If the client veers off topic, avoid punitive reactions that may cause problematic side effects. Perhaps interject "Okay, tell me more about such-and-such," as a way to get the client back on track, evoking more on-topic discussion. Acknowledge the client's appropriate feelings and concerns but remain productive. If the client engages in counter-productive behaviors such as excessive complaining, criticism of previous trainers, excessive sympathy-seeking, argumentative verbal behavior, completely off-topic discussion, excessive criticism, etc., provide as little extra reinforcement as possible for these behaviors, prompt the discussion back to more productive topics, and reinforce these productive verbal behaviors. Remember to utilize a constructional approach and put the client in a position to exhibit the most productive behaviors possible.

General Strategy for Training Humans

Just as with dogs, the best way to train anyone to exhibit any behavior is to break the objectives down into manageable sub-objectives and then arrange the environment in such a way that the subject is very likely to succeed in exhibiting them, so that the behavior may be reinforced through an adequate number of trials, gradually working toward the ultimate goal. This constructional shaping model and graded errorless approach can involve various strategies and techniques. In even the simplest cases, various client behaviors need to be conditioned and brought under appropriate controls. One of the main training opportunities with clients involves training the client to exhibit certain specific training behaviors with their dog. The following steps provide a general strategy for training clients.

Establish Objective

Start by identifying the objective. For instance, this might simply involve explaining to the client that the goal will be for them to train their dog to sit (criteria specified) by the next time you meet with them (time specified). Training the client to train their dog to sit is used as an ongoing example.

Be specific and precise with your goals, rather than vague and open-ended. Some objectives might involve much more elaborate training and multiple tasks for the client. Set realistically achievable sub-objectives. For example, in a lengthy behavior chain, you might decide to train the client to achieve the training of the first behavior as their first goal. Then you can follow up with training other behaviors one at a time, and then finally, chaining them together. Once you achieve that objective, you can move on to the next objective.

Of course, at the same time that you are training the client, you and the client are training the dog. Establish a baseline for the dog's behavior and begin also training the client on how to quantitatively track the dog's behavior. Perhaps you will draw a rough graph and train the client how to identify the trials and mark the dots on the graph. This is important for training the dog, but it is actually also immensely helpful in training the client as well. The line on the graph will show, "in salient black and white," how well the training is progressing, which is much better than simply remembering "what it was like" before training. You will of course, arrange the circumstances so that progress is assured with the dog, setting the dog and client up for success, and achieving results right from the start of their training program. The clear evidence of progress will be a very powerful reinforcer for the client's training behaviors.

Describe, Explain, and Demonstrate

Describe the behavior you want the client to ultimately exhibit, explain what it will achieve and where it fits into the plan, and then demonstrate the behavior. In the example of training a dog to sit, you might begin by describing how to lure the sit, and then clicking and immediately follow up with providing a treat. Explain the function of the clicker and the treat as reinforcers, how this process will help increase the rate of the behavior, and how it will prepare you to install it in place of jumping up. It is a good idea to repeat descriptions and explanations, finding a new way of describing the process, to help clients comprehend what you are telling them.

Follow up your description and explanation with a demonstration of the behavior. Identify any potential pitfalls and the solutions as you demonstrate. For example, you might point out that if the client holds the treat too high above the dog's head, the dog might jump up instead of sit, or that some dogs tend to shuffle back rather than sit. Ask the client if they have any questions. In many cases, clients will nod in agreement that they understand when in fact they probably do not, but that is okay because in most cases, you will have described, explained, and demonstrated effectively and if it is not fluent right away, you have the opportunity when they demonstrate its performance to make adjustments. Clients will often avoid asking questions or suggesting they are not following your instructions. Ensure that you prompt and reinforce question-asking and honest concern-sharing as you progress in your work with your clients.

Avoid excessive jargon in your descriptions and explanations of behavior and conditioning processes. You can usually explain the basics of the ABCs of behaviorology without using excess jargon. Put the concepts in simple terms, and if you do introduce any technical terms, simply explain what they mean and then reiterate them a few more times during the discussion.

Remember that as you train clients to train their dogs, you are also training yourself and the client is training you! The clients' verbal behaviors and their successes will reinforce your effective training/coaching behaviors. However, not all conditioning will be as direct as this. Successes and failures might fail to meet the contiguity requirements for effective conditioning. When there is a problem in training, identify why and verbally tie the ineffective behaviors (mistakes) to the failure in order to condition more effective training. This will create a covert verbal contingency that will reduce the future likelihood of the problem training behaviors. Tie this also to solutions, more effective training behaviors that, when successful, you can tie to the success and hence reinforce solution-finding behaviors.

Here is an example that may make this training clearer. I may train a client to carry out the luring motion to generate a sit from the subject. If I fail to demonstrate how high to hold the treat over the dog's head and this failure on my part results in failure and frustration (and related behaviors) on the client's part through the week before our next visit, this may not change my behavior without verbal supplementation. That is, my behavior is separated in time from the consequence, making the contingency ineffective on its own (lack of contiguity). I may verbally tie these events together by thinking "my failure to demonstrate this height feature of training resulted in the client's frustration." This creates a contiguous contingency. I may even follow-up with a "verbal rule" such as "when training clients to lure a sit, explain that height of the lure is important." Then in the future, training a client to lure a sit will evoke my thinking (behaving) of the rule, which will evoke my more effective demonstration of the procedure. This rule-governed behavior demonstrates how our environment effectively conditions our behavior. Make sure to also recognize successes and tie those to effective training behaviors in the same manner.

Remember that aversive methods cause just as much harm to the client as they do to their dog. Indeed, aversive private verbal behavior can cause problematic side effects. Emphasize added reinforcement throughout the training program. This goes for the conditioning of your *own* behaviors as well! Arrange the environment such that the client, the subject, and yourself are in a position to succeed in small and gradually accumulating approximations of the terminal goal. This is the shaping model of education in action and it applies to everyone involved.

Assess Proficiency

Have the client carry out the behavior while you carefully observe them. Once they have done so, reinforce with appropriate praise. If it went really well, you can move forward. It is important to emphasize added reinforcement here.

If a client does something "wrong," there is no need to draw excessive attention to that with punishment. Instead, pick out what can be additively reinforced and then rearrange the circumstances to promote criterion responses over the incorrect responses. You might say "Okay great. Your timing was right on! How about we do it again, and this time, hold the treat a little closer to the dog's head? That will make it less likely for him to jump up." Rather than tell the client what to do, it is usually more effective to make a recommendation instead, as in the example above.

As you carry out the observation, you will be assessing the client's proficiency with the various components of the skill you are training them to carry out. Repeat until the client can adequately demonstrate the requisite behaviors. If there are too many failures, you need to back up a bit and establish smaller scale objectives to ensure a high rate of success and reinforcement. Does this sound familiar? This is exactly how we handle training dogs in a constructional manner.

Once you have achieved success, you may then move on to other behaviors. For instance, perhaps you will also describe, explain, demonstrate, and assess for luring a down and stand. Try not to add too many different skills at one time. You might also explain and demonstrate the training techniques that they will exhibit once they achieve the initial goal. For instance, you might explain that once the dog sits reliably and smoothly after several trials, they might start fading the treats-in-hand prompt and work toward fading the hand motion cue to a visual cue. You might also explain how to start increasing duration. Demonstrate and assess, as described above, in each instance. It is also a good idea to give the client a handout for each of the training tasks you trained them to execute. They can refer back to this as a prompt for the appropriate behaviors. Ideally, the client should be able to contact you in case they have any questions about the training. Remember, the key is to establish the objectives as you go, so that success is assured.

Follow-up

The next time you meet with the client, there will be a number of tasks to carry out. Start by simply asking how things went and find out if there were any problems. This will give you a bit of a "heads-up" for when you get started. Have a look at the chart or graph and point out the progress as a reinforcer. If there were failures, frame this for the client as an opportunity to fine-tune the training and continue to emphasize successes.

Start training with a review of what was previously covered. Next, have the client demonstrate the current state of the training. Make sure to reinforce their successes or improvements in their skill proficiency. Be excited and pleased with the progress. As before, go back to describe, explain, demonstrate, and assess for any deficient components, always being careful to frame these as opportunities to progress rather than "failures." Once you have achieved the objective or sub-objective for this segment of the training, you can then move on to the next objective. Continue to establish solid foundations for requisite behaviors and progress from there with new, more advanced, objectives until the ultimate objective that the professional relationship was established for is met.

Training Groups of People

Training group classes follows the same general outline above, but can pose a number of challenges not present when working with one individual. The virtue of training at the subject's pace is always important, but when you have a group of subjects that you are simultaneously training, you might be training at a pace appropriate to some class members, but that is either too fast or too slow for others. Those working ahead of you will be bored and those working behind you will be frustrated and discouraged. Some guidelines that can help you reach as many people as possible is discussed below.

Between four and eight students seems to be a good range for group classes if you are training alone. With less experience, aim for four to six students and if you have lots of experience, aim for six to eight. For puppy classes, aim a bit lower and for basic good-manners classes, you can usually aim a little higher. For specialty classes such as for reactive dogs, aim lower, and for sports with experienced handlers, you can usually aim a little higher. If you will have an assistant, you can involve another student or two and if you have two assistants, you might be able to include as many as three or four more students. Having an assistant allows you to continue on training, should one student needs extra assistance. For example, if someone needs closer supervision and advice, the assistant can work individually with them and get them caught up. Even with assistants to help you in class, make sure that you address each person individually and by name at least once during the class, ideally to include added reinforcement as well as some personalized instruction.

Try to keep the mood light, relaxed, and fun. Clients are likely nervous that they might "look bad" or that they won't be able to keep up, or their dog might do something embarrassing like urinate on the floor or jump up on someone, or just fail to pay any attention to them when they try to follow the directions. Use humor and an easygoing demeanor to help them feel more comfortable.[56] Anxious clients, like anxious dogs, are distracted. Make sure to start with particularly quick and easy tasks, so that each client achieves some quick success to reinforce their training behaviors. You can increase the pace of the class as appropriate, to keep everyone participating and progressing. Keep a close eye on everyone and if it looks like someone is having a hard time, an assistant can discretely approach and quietly help him or her through it. If more than a couple people are having trouble, back up a little and begin again to give everyone a chance to catch up and everyone else a chance to review. Make sure to reinforce particularly excellent breakthrough moments. Even just a quick smile and acknowledgement can really keep clients engaged and encouraged.

Wilde (2003, pp. 39–40) points out that there will often be clients that can disrupt or otherwise set the pace of training back. She warns of "Rambling-Rose" who asks a question and then launches into an extended off-topic story, "Look-at-me-Leah" who "acts out" for attention, "Know-it-all-Ned," and "Argumentative-Al," all of whom who will eat up time engaging you in disruptive discussions, if permitted. Keep the class on track and provide as little reinforcement as possible to disruptive behavior, instead reinforcing cooperative behavior wherever/whenever it occurs.

If you use games, or candy or ribbon reinforcers etc., to highlight good work, be careful. Competition involves winners and losers, and it is no fun

[56] Be careful with humor! Do not make anyone feel like he or she is the butt of a joke. Only use humor in a way that ensures the client feels at ease (e.g., the incident is no "big deal" at all, normal and common, in fact, and that you can all laugh together about it). When in doubt, avoid humor and simply assure the client that whatever it is, it is not a problem.

being the loser. Likewise, if you provide a grandiose reinforcer to someone, then this may highlight that there may not be one for someone else. If you use games, try to make sure there are no losers and reinforce everyone's effective training behavior. Be sure to deliver reinforcers to all of the class members.

Ensure that you adequately describe, explain, and demonstrate skills for your clients and then assess their execution of the skills, remediating where necessary. Provide homework and follow-up in the next class with a review, plus any required remediation, and then progress to the next set of skills.

Continuing Education

Courses provided through The Companion Animal Sciences Institute at www.CASInstitute.com address all of the topics covered in this chapter.

CHAPTER 8. TRAINING PROJECTS

Behavioral Objectives

The objective of this chapter is to measurably expand the reader's repertoire of behaviors in relation to describing and relating the principles of behavior. Upon successfully integrating the concepts outlined in this chapter, the reader, where under contingencies to do so, will accurately:

- implement a training plan for common good manners related behaviors, applying the systematic strategies previously discussed based on a systematic plan previously discussed.

The behaviors discussed below are common behaviors trained in basic good manners classes. These are the everyday behaviors that help clients manage their dogs, so that everyone can remain safe, and so the dogs can easily fit in to human society. Training each is basically the application of the systematic strategy outlined above, which itself is based on the principles of behavior covered in the early chapters. Think of the basic strategy outlined above as the formula and the information below as the specific details and extended examples. This chapter builds on the previous two chapters by providing more application-related details to the more general information provided in previous chapters.

Pay particular attention to *sit*. This includes many details that I avoid repeating in the behaviors that follow it. These details are important, but it would just be too tedious to read through the exact same material for every single behavior.

You might notice there is no *stay* behavior. Staying in the position cued is simply the duration parameter of that behavior being maintained, and is therefore, controlled by the cue that evoked that behavior. For instance, the cue to *sit* means to sit and remain in that position until cued otherwise, rather than sit and then you are immediately free to do anything else you want, except if you are cued to stay. *Stay* is redundant; it is simpler to treat it as the duration parameter of the behavior cued. Where a dog is already in the position you wish them to remain in for some duration, *wait* is used. It is similar to what one might refer to as "stay," except that the behavior is already being exhibited and was not initially cued by the trainer. If the dog is already in a position you want them to remain in, cue them to wait until released, but if you cue a behavior that involves duration, maintaining the position until released is simply the duration parameter of the behavior that was cued.

Name

A dog's name is nothing more than another evocative stimulus, as it is with humans. In this case, the dog's name evokes attending/orienting to the person saying it, usually in preparation for another cue. You should not use it as a recall stimulus, as it is important to have an evocative stimulus that simply and immediately evokes increased attention to you without any other specific behaviors. Nor should you use the name to express disappointment or to evoke *off*, as lay people commonly use it. Having the name evoke attending to a person can be particularly useful in a multi-dog household, where you may want to evoke a behavior from an individual and not from any other dogs that are present. In that case, the name evokes attending behavior from the dog named and no other dog.

In most applications, you will conduct this training with very young puppies or else as a form of discrimination training if the dog currently approaches when someone calls their name and you seek to retrain them to attend to you but otherwise stay where they are. It is also used when dogs are newly adopted and the new guardian wishes to change the dog's name.

Phase 1. Preliminaries

Behavior Objective

S^{Ev}: Vocalized[57] "name."

Behavior: Orient to look at the vocalizer (without approaching).

[57] The word "vocal" might evoke surprise in some readers expecting to see the word "verbal." Not all verbal behavior is vocal. In fact, most of it is not. Verbal behavior is behavior, the reinforcement consequating it being mediated by another individual that shares a history of conditioning the verbal behavior in a verbal community (Skinner, 1957/1992). When exposed to contingencies to vocalized verbal behavior, the word "vocal" is the appropriate term.

Consequence: Treats and continued social contact.

Criteria: Latency: 1 second; relative frequency: 100% through 10 trials; distance: minimum 5 meters; distraction: various.

Phase 2. Acquisition

The best approach for training attention and orientation to "name," especially if you are replacing approach behaviors with simple attending behavior is a graded errorless approach with special attention to the distance parameter. Ensure there is minimal distraction. Stand close to the dog. Say the dog's name, and chances are the dog will look at you—simply attending to the novelty of the vocalization. Click the very moment the dog looks at you and deliver the treat.[58] It is important to stand very close to the dog, so that they do not have the opportunity to approach you. The criterion for this behavior is simply to look at you. If the dog does not look at you right away, make a noise (prompt) that will ensure you get the dog's attention and then click and treat when you get it and try to have less vocal behavior and other distractions present for future trials.

Phase 3. Fluency

Repeat the sequence a few more times, transitioning to an intermittent schedule of reinforcement, and include praise to increase its effectiveness as a conditioned reinforcer for later. Begin moving gradually further from the dog, at *very* small increments. If the dog moves toward you (other than to orient the body to better attend to you), administer deemphasized extinction, utilizing more emphasized extinction and subtracted punishment only if necessary, which is usually should not be. Refer to the chapter in which this process was discussed in detail. Consider having something between you and the dog, thus blocking the dog's access to you if you are finding this process challenging. This will rule out accidental reinforcement and maintain the sole behavior of looking at you. This behavior in particular can be challenging to train, especially in cases in which the dog's name has been well-trained as a recall cue or as a rebuke.

[58] Descriptions of this sequence are usually shortened to the phrase "click and treat."

It requires a careful graded errorless approach in these cases. Next, simply begin using the dog's name before cueing other behaviors, and avoid using it to as a synonym for "here" or "off" or any other specific behavior aside from paying attention to you. It will take on greater stimulus control as you use it in training.

Phase 4. Maintenance

Look for opportunities to occasionally evoke attention/orientation and reinforce it in order to maintain the fluency that you have achieved.

Sit

Phase 1. Preliminaries

Behavior Objective

S^{Ev}: Vocalized "Sit."

Behavior: Contact rear end to the ground (or as close as is physically possible) with front paws on ground, front legs straight and front paws within 13 centimeters of back paws.

Consequence: Treats and continued social contact.

Criteria: Latency: 2 seconds; duration: until released, minimum 1 minute; relative frequency: 100% through 10 trials; distance: minimum 5 meters; distraction: various.

The dog may exhibit the position by sitting from a down position or sitting from a standing position, or even from lying on their back. It is important to address each of these common response class forms in training. You can train them at the same time simply by ensuring that you include the down and standing starting positions into your training sessions.

Some breeds cannot actually place their rear ends on the ground, so a *sit* for them will be for them to put it as close as they are capable (their upper rear thighs will touch their hocks as the joints articulate as far as they are capable). Eventually you will include the criteria that they exhibit the behavior within, say two seconds of it being evoked, and they will remain in the position until some other behavior is evoked, say a minute or two. As per a graded errorless approach, begin with these criteria relaxed and gradually build them up.

The distraction criteria are vague in our behavior objective. That is partly because this is general, rather than specific to an individual and for conciseness purposes. If you allow a vague reference to distraction or any other criterion in your behavior objective, it is a good idea to include an addendum or footnote with some specific details. You might need the dog to sit close to traffic, in a crowded mall, with a bunch of other dogs or children running around, or when greeting all sorts of people. Identify the specific requirements and prepare a comprehensive list of the requirements you need for the dog to meet and the circumstances involved.

Identify the conditioned reinforcer and unconditioned reinforcer you will use. Use a clicker and small (approximately pea-sized) treats that do not take long for the dog to chew.

Increase the rate of responding by conducting training when the dog is not satiated with either your social presence or food. In order to ensure concentration and focus, train at a time when the dog is not too tired, but also not excessively energetic. These establishing operations prevent other contingencies from taking control over the behavior. Ensure that you begin training in a low distraction environment (i.e., there are few competing contingencies that would control the dog's behavior). You can allow for increased distraction later in the process—for now, set yourself and the dog up for success with a graded errorless approach.

Phase 2. Acquisition

In the case of "sit," prompting is usually a quick and easy antecedent strategy for getting the behavior to occur. To prompt sitting, place a small treat between your thumb and fingers. Ensure you have a good grip on the treat, so that the dog cannot grab it before you let it go. With palm up, allow the dog to sniff the treat. Move it around to ensure the dog is "targeting" it (i.e., the dog's nose goes where the treat goes).

Once the dog is targeting the treat, move the treat slowly over their head so that they crane their neck to continue targeting it. If they jump up to target the treat, it is likely that you are holding the treat too far above their head. In this case, quickly withdraw the treat and try again with the treat held a bit closer to their head. If they back up while you lift the treat over their head, withdraw the treat quickly and try again. If they do this again, you might want to perform the targeting with the dog's rear end close to a wall or corner, so that they are unable to back up. But, if you do this, be careful that the dog does not "feel cornered."

As they crane their neck to target the treat, they should sit. You now have a criterion-meeting trial. Once the dog has exhibited the target behavior, immediately click the clicker, and then deliver the treat to the dog right away.

The click ends the trial. Therefore, if the dog gets up after the click is sounded, that is not a problem.

Carry out a few more trials. You should be able to exhibit the luring motion more quickly and effortlessly in each successive trial, as the prompt and other stimuli take on stronger control over the behavior.

Phase 3. Fluency

Begin Fading Prompts

After the first few trials, begin fading the food component of the prompt. Whenever you use the unconditioned reinforcer as a component of the prompt, you should fade this part of the prompt quickly, so that it does not become an establishing function-altering stimulus. This is the first thing you will do in the fluency phase of training.

Start with a few rapid trials of the sequence with the treat in your hand. Then in the next trial, leave the treat in your treat pouch, and perform the prompt motion just as before. The momentum, the similarity of the trials, and remaining odor of the treat in your hand will promote evocation of the behavior. Once exhibited, click and treat. Through the next several trials, continue to reinforce on a continuous reinforcement schedule. In most cases, you can simply fade the treat-in-hand stimulus permanently this way.

If the dog seems "apprehensive" with this change, you can fade the prompt more gradually. In that case, carry out that first trial without the treat in your hand as above and reinforce. Then carry out another trial, this time with the food in your hand. Through the next several trials, alternate between having the treat in your hand and not, in a seemingly random manner, gradually increasing the ratio of food-out-of-hand to food-in-hand prompts until you can run through several trials without the treat in your hand, and the dog exhibits the behavior smoothly.

Always end your training sessions on a positive note. If you believe that the dog is becoming satiated (i.e., bored) with the reinforcer, restless, or the training may soon slow in terms of progress, end the session there. If things are not going as well as you would like, end the training session by cueing a behavior that the dog already exhibits fluently, reinforce the behavior and work on the new behavior later. If you believe the dog can continue without deterioration of the training, then continue, but always strive to end sessions *before* deterioration of any component begins.

To start your next session, briefly review the training from the previous session, to ensure a reliable start to training. There are a few new protocols to execute at this stage of training. You should now be presenting the prompt without food in your hand at all. The luring motion should be taking on stimulus control of the behavior at this point.

Before the lure motion becomes too well established as a cue, begin fading the prompt, transferring stimulus control from the lure motion to a hand motion. The hand motion typically used for "sit" is a palm up motion from a straight arm to an articulated arm while you stand straight up. This resembles the lure motion, and so transferring stimulus control is an easy process. Taking advantage of stimulus generalization make the current stimulus (the lure motion) seem (in this case, look) increasingly like the new stimulus (the hand motion) during each successive trial over several trials. Do this incrementally and gradually, and the dog should continue to exhibit the behavior reliably through each trial. If not, you are probably moving too quickly through this process.

You should now be able to evoke the behavior with the hand motion alone every time. Use this temporary evocative stimulus until the behavior is fully formed the way you want it.

Begin Thinning the Schedule of Reinforcement

Until this point, the behavior has been on a continuous schedule of added reinforcement. You can now move to a gradually thinning, variable ratio schedule of added reinforcement. The goal here is to gradually thin the schedule of reinforcement in an indiscernible pattern. Remember to re-thin it each time you introduce a new D-parameter or a new D-parameter level.

Start by failing to reinforce a response, but quickly carry out another trial and reinforce that one. The extinction-generated aversive emotional arousal will not last long and you will begin conditioning persistence and resilience. Now, gradually increase the number of unreinforced trials to reinforced trials around a gradually increasing average. Randomize reinforced and unreinforced trials, to avoid producing discernible patterns. Go from a VR-2 toward, say, a VR -6 or VR -8. Move at a pace that continues to maintain the stability of the behavior. Beware of ***ratio strain***, wherein the schedule is thinned too quickly, the dog becomes frustrated, and the behavior becomes unreliable or unstable, and can actually extinguish. Be sure to always progress at the dog's pace.

Refine Form, Latency, and Speed

Utilizing a graded errorless approach, begin gradually working form, latency, and speed, one at a time, as needed, until each satisfies the behavior objective requirements. Assess the features you need to change based on current proficiencies and the target criteria. This might include decreasing the latency or training a quicker motion from beginning to sit to being seated—speed. Work through one feature at a time. Refining the form means shaping. If any components of the form are inadequate, identify exactly what movement(s) needs to change and what they will look like when satisfactory. You may need a list of approximations, if there is a significant difference between the current motion and terminal motion, but often, this kind of refinement simply requires slight shifts in form that can be achieved with one or two levels of approximations.

Bring Behavior under Stimulus Control

Once you have the behavior's form and latency to criteria, you should establish the permanent vocal cue. To transfer stimulus control from the hand motion to the vocal cue, simply repeat the sequence of new stimulus (vocal "sit"), followed by the old stimulus (hand motion), followed by occurrence of the behavior, followed by reinforcement. Carry out several trials through the contingency and the new stimulus should take on stimulus control of the behavior. Pause after saying, "sit," to determine whether the dog will sit in response to just the vocal cue. It might take an extra second or two, as the subject waits for the hand motion, but they will likely exhibit the behavior. If not, repeat several more trials and try again until the new vocal cue evokes the behavior on its own.

Proof against the Three D-Parameters

You now have the target behavior under stimulus control and it is time to begin "proofing" the behavior against dynamic real world challenges involving the three D-parameters. Remember to work only one at a time.

Start by introducing small distractions such as a motionless and quiet person nearby looking away from the dog. Take the schedule briefly back to continuous reinforcement and thin it gradually with the new D-parameter in place. Introduce incrementally greater versions of the distraction, but again, do this at a pace that maintains the stability of the behavior. Once you are able to evoke the behavior under rather distracting circumstances, you might introduce another kind of distraction—evoking the behavior in other locations. For instance, instead of training in your living room, try several trials in the kitchen, remember to relax other D-parameters briefly, return to a continuous schedule of reinforcement and then re-thin the schedule. This can usually be done quickly, but always manage the level of frustration and stress, keeping these minimal and your training fun. Then you could attempt trials in a boring backyard (perhaps after the dog has already been out for a while to promote satiation with regard to the other reinforcers in the yard). Then you could run through the training with other added distractors. Then you could run through the process away from the yard, on a sidewalk. Have you ever noticed cases in which a dog and guardian are in a pet supply shop and the guardian is so surprised when the dog does not sit in response to the "sit" stimulus? This is because they simply have not proofed the behavior to that point; it is probably a fast, reliable, and sharp looking sit at home. Make sure to take opportunities to reinforce occurrence of the behavior in a diverse range of different places and under many different circumstances. You do not need to get to this level of proofing before you can begin working the other D-parameters. Get a good start on distraction, but if you choose to work another D-parameter, relax distraction until you increase the other D-parameter. Then you can start combining them.

Distance will involve and require duration—therefore, it is best to work on duration before introducing distance where duration is appropriate, such as with *sit*. We train duration in the same way as distraction. Set a specific criterion and establish it reliably before increasing it again. Up to now, you have been reinforcing the sit immediately. So, begin to expect at least two seconds on maintaining the sit position before reinforcing. Move at the dog's pace to ensure that all or nearly all of the trials meet the criterion. If you see the dog is just about to get up, resist the temptation to click and treat in order to avoid the non-criterion trial. You did *not* catch it in time—the behavior actually began before you would have seen anything external happen. Reinforcing at this time will only result in reinforcing getting up. When the behavior fails to meet the duration criterion, administer extinction or subtracted punishment (in accordance with the deemphasized procedure before resorting to the emphasized procedure), identify your failure in generating the behavior (you likely waited too long or allowed excess distraction) and try again.

In the case of distance, you should be able to simply "inch" your way further from the dog through successive trials. Work up this D-parameter gradually as with the others and once it is well on its way, you can begin combining D-parameters. When you combine more than one D-parameter, remember to build them up gradually again.

Set the criteria in all of these parameters to ensure success in most if not all trials, but with a degree of difficulty that maintains interest and progress. This judgment in maintaining smooth progress and minimal frustration is the trickiest set of trainer skills to teach trainers and the most challenging skill to acquire, primarily because it requires the generalization of many related behaviors to be exhibited reliably and quickly. Attend to expanding your repertoire in this regard; the appendix on trainer exercises will help. Attend to and recognize inefficiency and ineffectiveness in your training behaviors to differentially reinforce your own effective training practices. At the same time that you are training others (e.g., a dog or guardian), you are also training yourself.

Discrimination Training

Once you have two behaviors trained, you should work on inter-stimulus discrimination training. Run a series of trials, cueing one or the other in a random manner, reinforcing criterion behaviors and extinguishing non-criterion ones. This will be a good test of stimulus control, since many factors except for the evocative stimulus itself will be the same in both arrangements. Remember the differential outcome effect—use distinct reinforcers for each behavior and your training will be more efficient and effective.

Once you have three behaviors trained, you will find it is even more challenging as you randomly evoke different behaviors. That is because with two behaviors the strategy of simply "changing position" can work, (assuming you don't evoke a behavior the subject is already in the position for). With three behaviors, this strategy will only be effective 50% of the time (rather than 100% with two behaviors).

Introduce Release Stimulus

Once you are ready to begin phasing out the conditioned reinforcer, which until now has been acting as the release, you can begin using a release stimulus in its place. The release stimulus will act as a conditioned reinforcer in place of the click. You can use "that's all" as the release phrase or pick something else but try to avoid phrases that are common in everyday discourse such as “okay.” You can introduce the release stimulus as you train. Begin presenting the release stimulus right before treat delivery, instead of the click. If the dog does not break position when released, you can prompt it easily enough with open arms, backing up, and praising the dog, or offering the treat at a slight distance, requiring the dog to break position in order to access the treat.

Phase 4. Maintenance

Once you have achieved the final form, speed, and latency criteria of the sit behavior, it is under stimulus control, and reliably proofed through the three D-parameters, you can begin working toward maintenance. The line between fluency and maintenance phases is not always clear—and it is not vital that it always be clear, as maintenance represents a smooth progression of the fluency phase. You will likely want to continue to develop proficiency in new locations or with new distractors etc., but once you are well into the process, it is time to begin transitioning from the intensive training activities of the fluency development phase to less intensive maintenance of the fluency you have achieved.

Begin generalizing the reinforcers from just treats, for instance, to praise and sometimes petting, or perhaps a quick tug-of-war game, as long as these things are actually reinforcing. Remember also that the clicker is just for acquisition and training toward fluency. Start reinforcing with the unconditioned reinforcers and leave the clicker for new parameters. Begin using fewer trainer-mediated reinforcers, too. Use activity reinforcers (via the Premack principle) in order to help you maintain control over the behavior.[59] For instance, if eating is reinforcing, then take the opportunity to require a sit before allowing the dog access to their food. If going outside or having a leash put on acts as a reinforcer, require a sit while you open the door or prepare the leash. The same goes for sniffing fire hydrants or meeting other dogs, etc. The goal in this phase is to work toward simply maintaining what you have achieved through training with minimal contrived activity outside of the evocative stimulus. If at any point, any component of the training seems to be deteriorating, refresh the training by building that parameter back up.

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[59] The Premack principle states that a lower probability behavior can be reinforced by making access to a higher probability behavior contingent upon occurrence of the lower probability behavior.

Common Challenges

For some breeds of dog, the seated position is seemingly uncomfortable and hence aversive. In these cases, you will be imposing an added reinforcement contingency over an existing punitive contingency. In practice, this usually means slow, awkward training and an unreliable final product. Although the sit behavior is useful, especially when you want a dog to wait without moving for more than a few seconds, or as a greeting behavior to prevent jumping up etc., it might be worth considering using a standing position. In this case, you can specifically work remaining in place for the stand as part of your proofing of this behavior.

Some dogs will tend to crane their necks and turn around, stand, or jump up, rather than easily take a seated position to target a treat during prompting. If you are raising the treat too quickly or high over the dog's head, they will often turn or jump up instead of sitting. If this happens, experiment with moving more slowly and maintaining the treat closer to the dog. You do not have to keep the treat "out of reach" when luring; just do not let go of the treat until it is time to reinforce the behavior. For dogs that simply scuttle back, rather than crane their head to target the treat, consider training with the dog's back against a wall, so that they physically cannot back up. Just be sure this is not aversive.

Down

Phase 1. Preliminaries

Behavior Objective

S^{Ev}: Vocal "Down."

Behavior: Contact both elbows, and either both hocks or either hip, with the ground.

Consequence: Treats and continued social contact.

Criteria: Latency: 2 seconds; duration: until released, minimum 3 minutes; relative frequency: 100% through 10 trials; distance: minimum 5 meters; distraction: various.

As with *sit*, *down* involves generating a specific position that can be achieved in more than one way, requiring more than one kind of movement. For example, the dog could lie down from a seated or a standing position. Just as before, ensure that you train for both specific response class forms. The distraction criterion is vague here as well, because this is a general set of guidelines. Ensure it is specific to your requirements, or provide a brief addendum with some kind of specific criteria to refer to during your training.

Identify the conditioned reinforcer and unconditioned reinforcer you will use in training.

Phase 2. Acquisition

Utilize the same establishing operations as discussed for *sit*.

In the case of *down*, prompting is usually quick and easy. To prompt a *down*, place a small treat between your thumb and fingers and lure the *down*. Luring a *down* is a little trickier than *sit*. You may need to kneel or sit on the ground to start. Once the dog is targeting the treat, move your hand slowly straight down to slightly forward, between the dog's front paws. Many dogs will bow their front ends rather than lower their whole body into a lying down position. Usually, if you wait a couple seconds, the rear end will also go down. If you cannot manage to generate the down position this way, you may need to sit with one leg bent, to form a triangle tunnel, and lure the dog to move through the tunnel. With large dogs, you may need to use a table or chair. In any case, form a tunnel with the dog on one side and you on the other, and lure the dog down and into the tunnel, so that they must lie down in order to continue targeting the treat. You would then need to fade the obstacle as well. Generating *down* can sometimes take finesse and creativity. As soon as the dog achieves the down position, click and treat, and repeat through several trials. You should observe that evoking the behavior becomes smoother and easier.

Phase 3. Fluency

Follow the same general steps to train for fluency of *down* as you did for *sit*.

After the first few trials, begin fading the food-in-hand prompt as described for training *sit*.

You should now be prompting without food in your hands at all. The luring motion should be taking on stimulus control of the behavior at this point. Before this becomes too well established, begin fading the prompt, transferring stimulus control from the lure motion to a hand motion. A typical hand motion for down is a palm down motion from an articulated arm to a straight arm, while standing straight up. This resembles the lure motion, and so transferring stimulus control is an easy process. Do this incrementally and gradually and the dog should continue to exhibit the behavior reliably through each trial. If not, you are probably moving too quickly through the process.

Up to this point, the behavior has been on a continuous reinforcement schedule. You can now move to an intermittent schedule of reinforcement and begin thinning that schedule. The schedule of choice for down and similar behaviors is a variable ratio schedule.

Now that you are reinforcing some, but not all of the responses, and the schedule is not too sparse, you should take this opportunity to refine the form, latency, and speed as needed. Work through one criterion at a time, and take the schedule back to continuous reinforcement, re-thinning it each time you modify the criterion.

Once you have the behavior close to the form and latency that you are comfortable with, you are well positioned to establish the vocal cue.

You now have the target behavior under stimulus control, and it is time to begin proofing the behavior against the three D-parameters. Remember to work only one at a time while relaxing the criteria for the previously conditioned parameters, and with each newly introduced parameter, re-thin the schedule from continuous reinforcement. Work distraction, distance, and duration in the same way that you did for sit.

As explained under sit, you should promote discrimination between the evocative stimuli you have trained to this point. If you have only worked *sit* and *down*, you can have the dog perform "pushups" by evoking each in turn. Remember to include some evocative stimuli for the position they are already in, to ensure that the evocative stimulus is not simply evoking change of position.

Phase 4. Maintenance

Once you have the final form and latency criteria of the down behavior, it is under stimulus control, and reliably proofed through the three D-parameters, you can begin working toward maintenance. Continue to develop proficiency in new locations or with new distractors etc., but once you are well into the process, it is time to begin transitioning from the intensive training activities of the fluency development phase to less intensive maintenance of the fluency you have achieved.

Begin generalizing the reinforcers as you did with *sit*.

Common Challenges

As with *sit*, lying down can be uncomfortable for some dogs. In these cases, as with *sit*, consider proofing a good solid stand and wait position instead. However, more commonly, we use the down position for longer duration maintenance of position than would be comfortable for a stand or even sit. In that case, consider specifically training a comfortable down behavior. First, ensure that where the dog is required to lie down is soft enough. This is particularly important for dogs with minimal fur and fat (e.g., Doberman Pinschers, Greyhounds, Boxers, and Dalmatians). Second, train the dog to lie down leaning to a side with one of their hips on the floor and both front elbows on the floor to ensure they will be comfortable. Find a position and solution that will work and if you cannot, consider using some other behavior to achieve your goals when a soft thick bedding material is not available.

For some dogs, lying down seems to be a more vulnerable position, particularly when they are around other dogs, and especially if unfamiliar dogs are present. Attend to the context in which you train and cue *down*.

Consider using a *sit* or some other behavior that causes fewer vulnerability-related behaviors in the dog (i.e., reluctance, escape, emotionality). If remedial socialization and behavior change programming is required to reduce fear, consider doing so.

Small breed dogs in particular tend to be averse to the down position. It can be challenging to lure *down* and other position behaviors in some small breeds. Consider starting the training as you sit beside the dog for the initial acquisition stage.

Some dogs will lower their front end to target the treat, but never lower their rear end. In some cases, it takes a very long time before the entire body achieves the down position. As described above, consider sitting and creating a triangle tunnel with one bent leg to lure the dog through. Although physical manipulations are usually more disruptive, and even sometimes aversive in training, consider a very light touch to the top of the dog's back between the back hips. This is *not* a push or shove, but just a touch, which directs the dog's attention to the proprioceptive position of their rear quarters. If this works, it will work well and quickly, and you can fade that tactile prompt very quickly, but if it does not work quickly, it is best to abandon it. Please do *not* misunderstand these instructions. This is a mere touch to direct attention, rather than a pushing motion. If it does not work right away, discontinue it. If the touch is strong enough, it will elicit the opposition reflex and fail, so it must be simply a brief light touch to elicit proprioceptive awareness behaviors. In cases where this might be appropriate, it works right away, which in turn prevents a lot of frustration. A mere touch (discontinued if it does not work) should not be aversive at all and is less aversive than the frustration of ineffective training. Use any physical manipulation with great caution and avoid such manipulation where possible. Remember that to modify speed, which this is, you gradually require just a slightly faster behavior until it is stable and then shift the criterion again and on like that until you have met the speed criterion objective. In some cases, this particular criterion can take a while to train. An alternative option to get past this problem if it arises, is to gradually shape the down position or to train a chain of sit and down exhibited quickly and smoothly.

Stand

Phase 1. Preliminaries

Behavior Objective

S^{Ev}: Vocal "Stand."

Behavior: Assume position with legs straight and all four paws on the ground with no other body parts touching the ground, at ≈90o angle with the floor.

Consequence: Treats and continued social contact.

Criteria: Latency: 2 seconds; duration: until released, minimum 2 minutes; relative frequency: 100% through 10 trials; distance: minimum 8 meters; distraction: various.

The dog might stand from either a seated or a down position, so include both response class forms in your training. Training *stand* can be useful for applications in grooming and veterinary exams. It is also useful in that it allows a third basic position (along with sit and down) for training inter-stimulus discrimination, which can improve training of *sit* and *down*, the arguably more important of these three position behaviors. The distraction criteria are vague because this is a general example, so either ensure it is specific to your requirements, or provide an addendum with some more specific criteria.

Identify the conditioned reinforcer and unconditioned reinforcer you will use in training.

Phase 2. Acquisition

Utilize the same establishing operations as discussed for *sit*.

In training *stand*, prompting is usually quick and easy. To prompt *stand* when the dog is seated or lying down, place a small treat between your thumb and fingers and get the dog to target it. Once the dog is targeting the treat, move your hand slowly up a bit and straight away from the dog toward you for a distance equal to about one of the dog's steps. The dog will stand to track the treat. Reinforce this the instant the dog is standing. Repeat through several trials until it is smooth and reliable.

Phase 3. Fluency

Follow the same general steps to train for fluency of *stand* as you did for *sit*.

After the first few trials, begin fading the food-in-hand prompt as described under *sit*.

You should now be carrying out the prompt without food in your hands at all. The luring motion should be taking on stimulus control of the behavior at this point. Before this becomes too well established, begin fading the prompt, transferring stimulus control from the lure motion to a hand motion. One hand motion for stand is to have your arm straight at your side with the palm toward the dog and then move it backward behind you (arm still straight). Use this hand motion as the cue until the behavior meets criteria.

Now move to an intermittent schedule of reinforcement, and begin thinning that schedule.

Once you have the behavior in the form, latency, and speed you are comfortable with, you are free to establish the vocal cue with the procedure previously outlined.

Begin proofing the behavior against the three D-parameters. Remember to work only one at a time, and use the advice previously outlined.

As explained for *sit*, you should promote discrimination between the cues you have trained to this point. At this point, you can use a three-way discrimination, which is particularly useful, because the next evocative stimulus presented is not equivalent to a simple change in position; it would be one of at least two different positions. Once this is going well, include a test trial, cueing the behavior the dog is already in the position for to see if they remain in that position or change positions. Extinguish any changes in position and additively reinforce maintenance of that position.

Phase 4. Maintenance

Once you have achieved the final form, latency, and speed criteria of the stand behavior, and it is under stimulus control and reliably proofed through the three D-parameters, you can begin working toward maintenance. Continue to develop proficiency in new locations or with new distractors etc., but once you are well into the process, it is time to begin transitioning from the intensive training activities of the fluency development phase to less intensive maintenance of the fluency you have achieved.

Begin generalizing the reinforcers as you did with *sit* and *down*.

Common Challenges

It can sometimes be challenging to train a maintained *stand*, because the dog walks in the standing position (rather than the seated or down position). In these cases, it is simply a matter of working the duration component more gradually and using highly effective reinforcers, as well as managing concurrent contingencies (i.e., distraction) more closely.

Wait

Phase 1. Preliminaries

Behavior Objective

S^{Ev}: Vocal “Wait.”

Behavior: Cease moving if in motion and remain motionless otherwise.

Consequence: Treats, food and continued social contact.

Criteria: Latency: ½ second; duration: remain in place until released, minimum 2 minutes; relative frequency: 100% through 10 trials; distance: minimum 5 meters; distraction: various.

Wait is similar to *stay*, except that you would not use it for duration maintenance for behaviors you have already evoked. In those cases, simply train the subject to exhibit the behavior until you release them—no secondary *stay* or *wait* cue is required. *Wait* can be useful at doors, when being fed, before grabbing a toy, or in any circumstance where you would like the dog to briefly halt their movement. Again, in actual cases, make distraction criteria specific in the definition, or provide an addendum with explicit and unambiguous distraction criteria.

Identify the conditioned and unconditioned reinforcers you will use.

Phase 2. Acquisition

Utilize the same establishing operations as discussed for *sit*.

Training *wait* is all about gradually increasing duration. Begin with a simple wait-appropriate arrangement. In this example, I use waiting for you to present a food bowl, but you can start with waiting at a doorway or other scenario. An advantage of starting with waiting for food is that it generates an effective reinforcer, and the continuous schedule it necessitates is more suited to the beginning of a training program. In any case, you will promote generalization to these other situations as you proceed with the training. You can ensure more trials by presenting only an eighth to tenth of the dog's meal on each trial. You may adjust the specific procedure to allow for any differences in how you prefer to present meals. Make sure you see the challenges section below before deciding to start with this reinforcer.

Begin by approaching the dog's eating area with his or her bowl in your hand. Rather than requiring some specific behavior such as *sit*, simply present a hand in front of the dog's face, palm facing them, and quickly place the bowl down (with the clicker in that hand), click, remove the hand and allow the dog access to the food. The palm hand motion and position will be in their way, between them and the food and should cause at least a momentary hesitation long enough for you to click, place the bowl down and remove the hand. You do need to carry out this sequence quickly at first to ensure success. If you need to eliminate the clicker from the sequence, it should be okay, as you will be quickly providing the unconditioned reinforcer. The dog will then begin eating the food, providing added reinforcement for the behavior. Remember that whether the dog is sitting or standing does not matter. In fact, it will be more useful if you achieve a mix of these starting positions in order to achieve appropriate generalization and discrimination. Repeat this sequence through several trials until you have presented the entire meal. If the sequence is smooth and reliable at this point, you can move right to the fluency stage. Otherwise, repeat this for the next meal until the sequence is smooth and reliable with the minimal duration. If the dog barges through to the food before the click, simply say "Oops" while pulling the bowl away, bringing it back to the counter and trying again. If this happens more than once or twice, reconsider the training plan as this will quickly become frustrating for the dog.

Phase 3. Fluency

Without prompts and especially prompts involving the conditioned reinforcer, fluency is a simpler process. Furthermore, because we use *wait* in instances where access to a reinforcer is simply delayed, there is no need to involve complex schedule thinning procedures, making the process simpler yet. Although training for form, latency, and speed is not usually required, the three D-parameters are vital.

Once the sequence is smooth and reliable at minimal duration, transfer stimulus control to a vocal cue. As before, say "wait," present the palm hand motion, and then release when the dog has ceased approaching. Repeat through several trials in order to condition the vocal cue, whereupon, you can eliminate the hand motion. Because the hand motion is so salient (it being between the dog and the food and preventing the dog's approach), it may take a few more trials than usual in other training projects to get past this part of the training.

Once the vocal cue is established, begin gradually increasing the duration criterion. If you were requiring the dog to wait for a half of a second, begin requiring a full second for several trials, and once this is smooth and reliable, set the duration criterion to two seconds. If the dog breaks the wait position before you release him or her, say “Oops,” remove the bowl in as non-confrontational a manner as possible, and try again from the counter position. Move through the duration steps slowly, and avoid or deemphasize extinction and subtracted punishment trials as much as possible, as this will be frustrating for the dog and could lead to problematic side effects. Try to begin making the duration seem random around a gradually increasing mean average. For example, one second, then two, then a half, and then two, and then two, and then one, and then three, and then one, and then two, etc. Remember to adjust the criterion gradually enough to minimize extinction and subtracted punishment trials, and keep the progress smooth. Also, maintain minimal distraction while you work on duration.

Start utilizing a release word. To do this, say the release phrase, usually “you’re free,” right before you click. You can click as soon as the dog begins moving, but the use of a conditioned reinforcer is not usually necessary after a release.

It can be useful to begin working generalization with treats and toys, requiring a *wait* before accessing them when you place them near the dog. This allows you to administer more frequent trials, and makes it easier in different places. Start close to where you feed the dog, and as usual, when instating a new D-parameter, relax the others. For example, begin with minimal duration and work your way back up. This should go more quickly this time. Then, practice in different places, each time relaxing the duration and working it back up. Once this is going smoothly, begin using *wait* for other situations, such as waiting before going through a doorway or the opportunity to play with another dog, etc. When you introduce a different item, reset the duration criterion and build it back up. Try to maintain minimal distraction through these trials. Once this is going smoothly, you can work in the distraction criteria. Begin using *wait* for more highly effective reinforcers, that is, things that are tougher for the dog to wait for. In each new case of distraction, reset and rebuild the duration component.

Phase 4. Maintenance

Continue to generalize to different stimuli and settings. Also, continue to generalize the reinforcers, utilizing a wider range of non-trainer–mediated activity reinforcers (via the Premack principle). The task in the maintenance phase is simply to ensure that you continue to present trial opportunities to keep the training fresh. If, at any point, the training begins to deteriorate, refresh the training with more frequent sessions with initially relaxed duration and distraction, and build them back up.

Common Challenges

Some dogs will lunge or charge right through or around your hand for the food even before you put the bowl down. If you cannot get *wait* long enough to put the bowl down, ensure that you are able to retract the bowl and prevent reinforcement. However, do *not* get into a wrestling match with the dog. Instead, try doing the exercise with a less reinforcing food item if need be and doing so after the dog has eaten a full meal. You may need to start with a less effective reinforcer. Find a reinforcer and motivating operation combination that will allow you to get through the trials successfully and build up gradually. The more effective the reinforcer you are cueing the dog to wait for, the slower you will have to go in terms of increasing the duration criterion and the more trials you will have to use. If you are getting too many extinction or subtracted punishment trials, this usually means that you are moving too quickly or not putting in an adequate number of trials before increasing the criterion.

Take It / Drop It

Phase 1. Preliminaries

Behavior Objective

S^{Ev}: Vocal “Take it.”

Behavior: Take and hold an object in the mouth.

Consequence: Object (e.g., toy), but eventually opportunity for next link.

Criteria: Latency: 2 seconds; duration: maintain until released, minimum 10 seconds; relative frequency: 100% through 10 trials; distraction: various.

Behavior Objective

S^{Ev}: Vocal "Drop it."

Behavior: Release from the mouth whatever is in it.

Consequence: Treats, food and continued social contact.

Criteria: Latency: 1 second; relative frequency: 100% through 10 trials; distance: minimum 3 meters; distraction: various.

Drop it and *take it* are useful because they allow you to quickly get potentially dangerous things away from the dog. It is helpful to train *take it* and *drop it* together, since exhibiting one provides a perfect opportunity to exhibit the other and because *take it* is usually an effective reinforcer for *drop it*. This also provides a good basis for training the dog to retrieve.

Phase 2. Acquisition

Utilize the same establishing operations as discussed for *sit*.

Prepare a list of all the most effective reinforcer toys for the dog. Start with the least effective item, and if need be, ensure satiation. Hold the item, and encourage the dog to chew on the other end of it. Keep hold of the toy. Once the dog has it in their mouth, wait a few seconds, say "drop it," and then hold up a very effective treat. The dog will usually let go of the item to investigate the treat, especially if you started with a minimally effective reinforcer for them to hold onto and a relatively effective reinforcer to trade for it. As soon as they open their mouth and release the toy, click, deliver the treat, and offer the toy back while you are still holding onto it. If you are confident that the dog will take the toy back, say "take it" after you present it to them, but before they actually take it. Repeat the sequence several more times, and then quickly attempt a trial without the treat in your hand. Behavioral momentum will make occurrence of the behavior very likely. Repeat the sequence several more times with no treats in your fingers but maintain continuous reinforcement.

For training techniques like this one that are difficult to train with only two hands, it is usually most effective to hold the toy with one hand and the treat and clicker in the other hand. Hold the treat between the index finger, middle finger, and thumb. Keep the clicker in the palm of the treat hand with the button available to the small or third finger. You could hold the toy and clicker in one hand, but the clicker will likely be too close to the dog's ear and the clicking sound might startle them.

Begin testing the effectiveness of *take it* by waiting for a few seconds before presenting the cue. If they mouth at the toy before you present the evocative stimulus, say "Oops," and pull it away, reset the environment and repeat, offering the opportunity to wait for the cue again. Once the dog waits for the cue before attempting to take the toy, click and give the toy to the dog. Extinction and subtracted punishment are aversive, though mildly; try to minimize these trials with a graded approach. Start with just a few seconds and increase it gradually, ensuring you get very few punitive trials.

Next, run through this protocol with the next item on the list of most effective reinforcers. Work your way through each of the items on the list in this manner. Start to practice relinquishing constant contact with the item too, allowing the dog to simply drop the item, so that you can pick it up and offer it back to them. Occasionally, practice not offering the toy back to the dog. In that case, provide several treats that will take them a few seconds to find on the floor and eat while you place the item out of sight. It is important that you condition the dog such that the item sometimes will not come back. The distraction and the highly effective nature of the treats will help maintain the behavior under this condition.

Phase 3. Fluency

Once you have worked your way through most of the dog's favorite toys, begin practicing trials with other items outside of training sessions. Part of what controls the behavior is the trainer-mediated and controlled training session arrangement. Practice presenting the evocative stimulus with these items at seemingly random times, as well as when the dog is already in contact with the items, without you having encouraged them to take it first.

Begin proofing the behavior against the three D-parameters. In the case of *take it* and *drop it*, all three are applicable—as always, work through one at a time and relax the others (as well as adjusting the schedule of reinforcement) when increasing a parameter level. Duration is a special case in training *drop it*. Your goal is to delivering the *drop it* cue, have the dog drop the item, and wait for an extended period of time, before *take it* is evoked or they are released. This allows you to present the cue from a distance and cover that distance while the dog continues to wait without taking the toy back. Practice in close proximity first, and gradually increase the time between the dog drops the item and you reinforce with the opportunity for the dog to take it again. Approaching the dog and item is likely to be a distraction, so work this aspect separately from duration training and then combine them afterward. After duration is covered, work distance gradually and incrementally. Distance, as usual, involves presenting the evocative stimulus from further and further away from the dog. You can work *sit* into this sequence if you like. This could be a behavior chain of dropping the item and then sitting.

Phase 4. Maintenance

Continue to generalize the behavior to various items, at various times, and in various places. If, at any point, any component of the training seems to be deteriorating, refresh the training, taking a run through building that parameter back up.

Common Challenges

If the dog has a history of aggressive behaviors evoked by others contacting toys that they are in contact with or near, you will need to be particularly careful and address that problematic behavior *before* proceeding.

One particular challenge you might face with some dogs is that they do not tend to take things in their mouths, particularly when you offer it to them by hand. In that case, break the process down into smaller steps.

Begin with an item that the dog is more likely to take. Place it on the ground so that you are not holding it. Begin shaping interest in the item, and then closer and closer approaches to taking it. Initially, aim for the dog to touch the item and then for taking the item in their mouth. Use highly effective reinforcers. Bring this under specific stimulus control. Once this is complete, you should find it much easier to train the dog to take the item from your hand. To begin, hold the same toy close to their mouth, and reinforce tolerance and interest related behaviors through several trials. You may find that the dog will begin to take the item on their own, and if that occurs, reinforce, and build on that. If they do not take the toy, touch it to their mouth to encourage them to take it. If none of this works, you may elect to work *drop it* and *take it* without your actual contact with the toy. This will then likely involve shaping. Many dogs tend to retrieve with little or no dedicated training, and if this is the case, you might be able to take advantage of that to train *take it* and *drop i*t.

Here (Recall)

Phase 1. Preliminaries

Behavior Objective

S^{Ev}_1: Vocal “Here.”

Behavior$_1$: Begin approaching the caller.

Consequence: Treats, but eventually opportunity to exhibit next link.

Criteria: Latency: 2 seconds; speed: at least a trotting gait; relative frequency: 100% through 10 trials; distance: minimum 15 meters; distraction: various.

S^{Ev}_2: Arrives at person.

Behavior$_2$: Sit in front of caller, facing caller, remaining still while collar is handled.

Consequence: Treats and release.

Criteria: Latency: 1 second; duration: maintain until released, minimum 2 minutes; relative frequency: 100% through 10 trials; distraction: various.

This is a behavior chain, as there are two distinct behaviors exhibited in sequence, with only one evocative stimulus at the beginning, and reinforcement provided by the trainer only after the last behavior. The definition can be supplemented with the following task analysis:

Upon being called, the dog will:

- Approach caller
- Sit in front of caller, face caller, and remain still while collar is handled

If you have already trained *sit* to the maintenance phase, you will not have to train it as a part of this training project. If you have not trained it fully, you will need to do it as part of this training project. The forward chaining procedure will be described here, as the chain is short and simple.

Coming when called is extremely important. This behavior helps us manage where the dog is, it is useful in getting them away from potential problems, and it allows us to provide the dog with more freedom, stimulation, and exercise. *Recall* training is often challenging, usually because guardians have managed to effectively counter-train it prior to being coached to train the behavior by a professional (and then often during and afterward training, as well). Three common mistakes are: (a) the vocal stimulus is used before the behavior is reliable, and hence the cue is weakened as an evocative stimulus; (b) guardians tend to inadvertently impose subtracted punishers, and in some cases, added punishers for coming when called, particularly outside of formal training sessions; and (c) guardians expect too much, too quickly, especially with regard to distance and distraction, which degrades the effectiveness of training. Avoid these three common mistakes and help guardians avoid them, and the training will proceed more smoothly.

It is preliminary to training *recall* to ensure that coming to people is always reinforcing and never punitive, or at least as close as possible to this ideal. This should be the guiding rule before, during, and after training, both in training sessions and in everyday life. Reinforcing does not always mean providing treats or toys when dogs come to us. It means generally being a source of all sorts of reinforcers and the source of very few aversers. It means becoming a conditioned reinforcer, like a clicker. Avoid calling a dog in order to carry out tasks like nail trimming or getting the dog into a crate, if this will be aversive, and if it is, then work on "desensitizing" the dog to these things and otherwise reducing the aversiveness of them. Instead, work tirelessly to ensure that being near you, and coming to you, is as reinforcing as is possible!

A common pitfall scenario for training a solid recall occurs outside of training sessions, wherein the guardian has the dog outside and calls the dog to come inside. In one scenario, the guardian calls the dog and then brings them inside, which punishes coming to the guardian. In another scenario, the dog does not come to the guardian, because competing contingencies prevail, thereby weakening the recall stimulus. These are two lose-lose scenarios.

It is best to avoid these scenarios to begin with, but if the guardian determines that it is unlikely that the dog will come to them in this situation, the guardian can either enforce the contingency by going to get the dog, or continue in their attempts to persuade/prompt the dog to come to them, or give up and wait for the dog to eventually come to them. These are also lose-lose scenarios.

Guardians will frequently ask the trainer, "What do I do when I call the dog and they do not come to me?" In this case, remind clients not to attempt to evoke the behavior unless they are sure that the dog *will* come to them. In these early stages, a light long-line leash is an option that allows the guardian to gently control the dog. Another option is to wait for the contingencies to change (e.g., making coming inside more reinforcing than being outside). Feeding a meal or special treats upon coming inside can help in this regard, as can having favored toys only available inside. Much of this involves being *proactive* rather than *reactive*. This is a vital general paradigm shift that, once made, will benefit training on many fronts. **Be proactive rather than reactive**.

You can of course manipulate the contingencies yourself, rather than wait for satiation of being outdoors and deprivation of being indoors. A squeaky toy might lure the dog indoors. Although not ideal, it does contribute to your reinforcing effect and minimizes certain lose-lose scenarios involving waiting or coercing the behavior. In this case, follow up by making sure that coming in after this is highly reinforcing. In any event, avoid forcibly retrieving the dog (often called "enforcing the command" by the trainers inclined to be reactive as a basic strategy in training the recall, rather than proactive). If you go get the dog, this commonly results in one of two outcomes: either the dog runs away and you have now initiated the "keep-away game," or you do get the dog and the coercion of coming inside deteriorates your relationship (i.e., making social contact with you is punitive, rather than reinforcing, resulting in a deterioration in responding to cues in general). You do not want your approaching the dog to evoke running away, as this can be dangerous. Coercion is fraught with so many problems; it is best to focus on management and prevention, and if need be, even temporarily bribing[60] in emergency situations. Arrange the environment so that you have effective reinforcers available to the dog if they come in when called, such as meals, special treats, or new toys etc.

This behavior chain involves the trainer handling the dog's collar. If this handling evokes escape behaviors, it is important to resolve that problematic behavior before proceeding to use it in training. In this case, carry out a few sessions with several trials each of delicately touching the collar and providing a treat for tolerant non-escape behaviors. Work your way up to quicker and more forceful grabs of the collar. You should do this at a pace that ensures evoke escape behaviors are not evoked at any point. The grabbing of the collar is not to be a very forceful form of handling but it is important that taking hold of the collar is not aversive.

Identify the conditioned and unconditioned reinforcers to be used.

Phase 2. Acquisition

Utilize the same establishing operations as discussed for *sit*.

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[60] Bribing, in nontechnical terms refers to promising something to someone in order to get him or her to do something "wrong." The term is used more broadly here, as it currently is used in the animal training field to mean showing the reinforcer before the behavior occurs as a prompt.

Because this behavior is frequently required in everyday life outside of training sessions, there are a few rules to which everyone should adhere. Avoid punishing either remaining near you or coming to you. For instance, avoid additively punishing coming to you by calling the dog to deliver a reprimand or to do something else that might be aversive such as clipping nails and so on. Avoid subtractively punishing coming to you by calling the dog away from reinforcing activities such as playing or interacting with another dog. Being near you and coming to you must always be reinforcing, ideally more reinforcing than any other contingency, which is a tall order, so heed the rule.[61]

The "come-to-me" game is a great way to get started with recall training. You will require the dog and a helper. As always, start acquisition training in a very low distraction environment like a hallway or boring room. Each person should take turns calling the dog (without the "here" cue for now, unless you are *sure* the dog *will* come to you) away from the other person, clapping and encouraging the dog, in order to prompt the behavior.

If the subject exhibits the behavior eagerly and solidly, you should be able to take a short cut in the forward chaining procedure here. The short cut involves evoking *sit* as soon as the dog gets to you and then reinforcing the behavior chain. If this short cut works, proceed in this manner, cueing *recall* and then when the dog gets to you, cueing *sit*, and then clicking and treating once the dog is sitting. If this short cut is not viable, the full procedure involves clicking and treating when the dog arrives, and then evoking *sit* and reinforcing once the subject sits. The short cut is usually quite effective in this simple behavior chain and allows you to avoid transitioning from reinforcing both behaviors separately to reinforcing them together. You might find it useful to review the section on forward chaining.

Once this is well under way, you can begin calling the dog without a partner. Choose these times carefully! Ensure a high degree of likelihood that the dog will come to you, away from whatever they are doing.

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[61] One thing I personally do, because my dog loves in-shell peanuts, is drop one in the backyard and then, seemingly out of the blue, I call my dog and when he gets to me, I point to the peanut and he is allowed to pick it up. I do this at least two to three times per week. When he is in the back yard and I call him in the back yard, he eagerly comes running to me. This is just an example of one way to keep being near you and coming to you reinforcing. Find effective ways to keep the dog eager to run to you. In colloquial terms, make it worth their while!

Once these are fairly smooth and reliable, you can move on to training for fluency.

Phase 3. Fluency

Now, begin fading the prompt, and install a temporary evocative stimulus. You will still have some training to do, in order to hone certain features of the behavior (e.g., the speed with which they run to you, and the latency between evocative stimulus and initiation of the behavior), but it is useful to have a vocal cue to use in the meantime. Some trainers like the phrase "come-on," but you can choose something else. (If the dog quickly comes when called 100% of the time or close to it, you can use the permanent cue at this point.) Begin fading the prompts by saying "come-on" in a happy tone, and follow that with the prompts. After a few trials, begin gradually reducing the prompts—the vocal cue, which should have taken on stimulus control, should evoke the behavior alone. If you need to provide gentle praise while the dog is on their way to you, you can use that but fade the praise prompts as well.

Now change to an intermittent schedule of reinforcement, and begin thinning the schedule as previously outlined. Unlike most other behaviors, it is usually advisable to maintain a recall on a rich schedule of reinforcement, to keep it highly reliable.

Begin refining the form, latency, and speed of the behavior. As usual, work one at a time, and each time you introduce a new feature, bring the schedule back to continuous reinforcement. Remember, relax the three D-parameters and schedule of reinforcement, but do not relax form, latency, and speed; once you achieve progress in these features of the behavior, maintain them.

Begin proofing the behavior against the three D-parameters. For this application, you will focus heavily on distraction. Begin incrementally increasing distraction at a pace that still allows you to achieve success in 100% of your trials or very close to it. At first, it is usually best to arrange for highly contrived and controlled environments. Begin working in more real world distractions as you proceed to proof the behavior.

You might arrange for another kind of two-person recall game, wherein the person that the dog is near has toys or treats readily visible to the dog, providing a reinforcing competing contingency. The trainer calls the dog away from a short distance. If the stimulus fails to evoke the behavior, the distractor does not relinquish any of the reinforcers. Reset the environment and try again, adjusting the level of distraction as appropriate until you achieve success. Praise enthusiastically if the dog moves toward you in order to prompt (encourage) coming to you, if needed. If the dog turns away, stop praising. Do not evoke the behavior again; present cue only once per trial. Once the dog comes to you, evoke the *sit*, gently take hold of the collar, click, provide a hidden treat, and allow immediate access to the distractor and the treats or toys in their possession. Repeat the procedure several times until the recall becomes reliable. Once it does, you can work on increasing the level and variety of distractions, including different locations. Evoking a *recall* away from a reinforcer is a big step—take it gradually.

This is a good time to perform the chaining procedure. In fact, particularly if the short cut was effective, you might find that, by this point, the dog sits when he or she gets to you before you present the cue for it. If that is the case, you can likely drop the interjected evocative stimuli and reinforce the complete chain. If not, test the stimulus control by waiting before presenting the "sit" cue to ascertain whether the dog will sit without the vocal cue. If they do, you should be able to drop the interjected vocal cue and reinforce the complete chain. If this does not work, either train through several more trials before testing the effectiveness of the stimulus control again, or begin gradually fading the interjected evocative stimuli. In this case, the evocative stimulus is vocal and so, on each trial, you would make the vocal cue quieter and quieter until there is no vocalization. Do not rush this fading process.

Once you have worked through increasing levels of distraction, several different types of distraction, and at a variety of locations, begin more spontaneous real-life trials. For example, you can call the dog away from increasing levels of distraction, ensuring that the behavior is reinforced. A good game to play at this stage is calling the dog away from a distraction of some kind only to immediately release and reinforce with the opportunity to reengage the distractor. This is useful, especially when the dog is playing with other dogs. In all of these cases, it is important to take a graded errorless approach. Start by only calling the dog away from minimal distraction, then, increase the level of distraction gradually, only after the behavior is exhibited fluently.

Once you have the behavior's form, latency, and you have worked distraction and distance up to appropriate levels, you are free to establish the final vocal cue. To transfer stimulus control from the temporary evocative stimulus to the permanent one, use this sequence: "here," followed by "come-on." This will evoke the behavior, which you then reinforce. Repeat through several trials, until you can drop the old temporary stimulus from the sequence.

Phase 4. Maintenance

Continue to generalize the reinforcers utilizing the Premack principle, in order to help you maintain control over the behavior by providing the opportunity to exhibit other more effective reinforcer-contacting behaviors. If, at any point, any component of the training seems to be deteriorating, refresh the training by taking a run through building that parameter back up.

Common Challenges

By far, the most common challenge with the recall behavior is failure to achieve sufficient mastery at one level of difficulty before moving to the next. In other words, people usually expect too much, too soon in this training, and they fail to adequately manage the situation in order to ensure successful rehearsal. The *recall* faces competing contingencies almost by definition since the dog will usually be contacting some reinforcer when you call them. More than most behaviors (along with *off* and *loose leash walking*), distraction is a ubiquitous and powerful challenge. The reinforcement for approaching you must surpass the reinforcement available elsewhere.

Off

Phase 1. Preliminaries

Behavior Objective

S^{Ev}: Vocal "Off."

Behavior: Look away from whatever is being attending to but has not yet been taken in mouth.

Consequence: Treats and toy.

Criteria: Latency: 1 second; relative frequency: 100% through 10 trials; distance: minimum 10 meters; distraction: various.

The *off* cue can be useful in helping direct dogs away from things that might harm them or to aid in other training endeavors. Although *off* is sometimes framed as "what *not* to do," *off* behavior is best framed in a positive form. *Off* requires the dog to move their muzzle away from what they are attending to. We define the behavior objective as looking away although it can be useful to include stepping away from the stimulus as well, since proximity allows the stimulus to exert stronger control over the behavior. Proximity to the problem "thing" may become strong enough to exert control over the behavior again. It is a matter of defining the behavior. It can also be useful to evoke a *sit* immediately following *off*, or you can chain the two behaviors, so that *off* evokes looking away followed by sitting and waiting. Alternatively, you can specifically train the dog to both look at you and sit. Again, define the behavior for your specific requirements.

Off can be a double-edged sword, and caution must be exercised when considering its use. It is common to inadvertently chain problem behaviors to *off*. Any time that an evocative stimulus is presented during or immediately after a problem behavior, such as *off*, to "redirect" a dog away from something, there is a possibility that the problem behavior will become chained to the *off* behavior. It is best to use *off* in the moments before the subject contacts something problematic (i.e., when the dog is merely attending to the stimulus from which you want to call their attention). In emergencies, you can use *drop it* to have the dog let go of something they have in their mouth. I considered leaving *off* out of the lineup in this chapter because of these pitfalls, but I personally have found it to be very useful and as long as one pays careful attention to avoiding the potential pitfalls, I believe that it can be useful for others as well.

The *off* cue, as presented here, evokes looking away from whatever the dog is paying attention to, but that which they have not yet taken in their mouth. This response class allows for various specific response class forms. It is good practice in this case to ensure that you include various specific response class forms in your training. In specific cases, it is also a good idea to provide an addendum to your definition of specific distractions. If you find that a specific response class form emerges in the training, you might also elect to adopt that narrower form as the response class.

Prepare a list of effective reinforcers, in rank order, that you can use for training. Start with a small treat as the first item, but ensure it is a minimally tasty treat to ensure success. This first one should be a small treat as it will be in your hands and used as the unconditioned reinforcer. The list should include as many items as possible, because it will be the list that you work off of all the way through to the maintenance stage. It should include things like garbage cans, other dogs, and fire hydrants—things that will attract your dog.

Identify the conditioned and unconditioned reinforcers you will use.

Phase 2. Acquisition

Utilize the standard training practices previously discussed regarding setting the dog and yourself up for success.

One way to train *off* is to shape it.[62] Begin by holding a treat in your hand far out to your side. Make sure the dog sees that there is a treat in your hand. Hold the treat out of the dog's reach and simply wait. Timing is critical here! Eventually, the dog will glance away from the hand with the treat. This is usually *very* brief the first time. The instant that they glance

[62] This approach was conditioned in me in 1999 as I observed Carolyn Clarke's puppy classes at Carolark (http://www.carolark.com), instructed by Carolyn and Jo-Ann Steele and it has served me well ever since.

away from the treat, even very briefly, click and release the treat from your hand. Repeat the process several more times, requiring only a glance away from the treat. You should find that the dog more readily looks away from the hand as you repeat the process. Once you find this is proceeding smoothly, you can increase the difficulty by setting the criterion to a definite look away that lasts a full second. Repeat through several trials. Once it is smooth and reliable, set the criterion to two seconds, building it up gradually and incrementally in that manner until you have a look away for approximately five seconds.

Once these are fairly smooth and reliable, you can move on to training for fluency.

Phase 3. Fluency

There are no contrived prompts to fade, making the process a little simpler at this stage than it is for some other behaviors. Start by putting the behavior on a gradually thinning variable ratio schedule of reinforcement, and refining the form, latency, and speed, as needed. At this point, the hand motion/position functions to evoke the behavior. Once you have the behavior exhibited to criteria, establish the vocal cue for the behavior. Give the *off* stimulus, present the hand and the behavior should occur. Reinforce the behavior. Repeat through several trials until the vocal cue is established.

Once you have the vocal cue established, begin generalization training. Start by putting the hand holding the treats in different positions and directions. Then, once that is solid, begin applying the stimulus to treats that are not in your hand. Then, begin presenting the evocative stimulus for other things and in different places. Remember to relax the three D-parameters, and return to continuous reinforcement when introducing each new criterion feature. Each time you change the criterion, expect the dog to look away only briefly at first. You can gradually build the duration back up.

At this point, begin proofing the training against the three D-parameters. It is usually best to start with more controlled situations with trainer-mediated reinforcers; work with more intrinsically reinforcing real-world situations later. Start using more effective reinforcers such as better treats or toys, and then begin *mild* deprivation to further increase the rate of responding. It would be a good idea to plan some of your distraction items ahead of time. Disengaging from approaching or eye contact with another dog is often a high-level distraction, as is approaching to sniff a fire hydrant or garbage can. Work through your list of increasingly strong reinforcers. Remember to relax duration and distance when introducing a new feature. Similarly, you might work the duration up to 15 seconds. You may not need more than this for general use. Distance would include increasing how far you are from the dog and stimulus when you present the cue.

Once you have worked through increasing levels of controlled and contrived distraction, including several different kinds of distraction and a variety of locations, start more real-life trials, cueing the dog to disengage from increasing levels of distraction in the real world, ensuring that the behavior is reinforced, if not by contact with the stimulus they were called away from, then by other effective reinforcers.

Once the cue is effective in a wide variety of situations, begin thinning the schedule. It is usually a good idea to maintain a rather rich schedule of reinforcement for the *off* behavior.

Phase 4. Maintenance

Continue to generalize the reinforcers, utilizing the Premack principle, in order to help you maintain control over the behavior, by providing the opportunity to exhibit other behaviors that access preferred reinforcers. Often the most effective reinforcers will be reestablishing contact with what you called the dog away from. However, this will not always be acceptable, so continue to include controlled and contrived trials for stimuli you can allow the dog to contact, and have highly effective reinforcers ready for times when you cannot allow continued contact with the stimulus in question. If, at any point, any component of the training seems to be deteriorating, refresh the training by taking a run through building that parameter back up.

Common Challenges

Some dogs, particularly active breeds, will jump up at the hand during the initial stages of your shaping program. You can try training at times when jumping up will be less likely such as after exercising. You can also use subtracted punishment or extinction trials for jumping up, if necessary. The best option may, however, be to lower yourself so the dog does not need to jump up to access your hand. You have to ensure you have a good grip on the treat and that you do not release it until you have clicked for a criterion response. The dog will mouth and nibble, but you will simply wait for the glance away. Typically, at first, the looks away are glances at you as if to say “Hey, what’s up? Let-go my Eggo.” That is fine; reinforce it. This usually also involves significant patience, waiting for the dog to calm down and look away from the treat.

Another common challenge is the potential for a behavior chain to develop. In some cases, you may reinforce attending to the object by providing the opportunity to respond appropriately to the “off” cue. In other words, the dog looks at the problem stimulus *because* that leads to the vocal “off” cue and then a reinforcer. If moving toward and attending to something makes available the opportunity to move away from it in order to contact treats (as per the Premack principle), then you can expect the rate of approaching the problem stimulus to *increase*. Carefully observe for increased interest in problem stimuli after *off* training has started. It is best to manage the environment so that dogs cannot access problem stimuli and to use *off* only for situations where you do not anticipate contact with any problematic stimuli. If a problem chain is conditioned, try to manage access to the stimulus as part of an antecedent control strategy, instead of continuing to strengthen a behavior chain. Another tip is to use the *off* cue for a wide variety of items in training, but not extensively for any one item. If you find that you are using *off* stimulus for one item a lot, you should find a way to preemptively manage access to that item to prevent use of *off*.

Let's Go (Walking on a Loose Leash)

Phase 1. Preliminaries

Behavior Objective

S^{Ev}: Leash on.

Behavior: Walking adjustment behaviors such that the dog's shoulders stay within 1.8 meters (standard leash length) of the handler [Leash tightens at 1.8 meters indicating a non-criterion behavior].

Consequence: Treats and forward progress.

Criteria: Relative frequency: 100% through 10 trials; distance: maintain minimum 3 standard city blocks (approximately 1/4 km); distraction: various.

Work with a standard 1.8–meter leash. Walking with a slack leash rather than a tight one is important and challenging to train. Some might say pulling is a "natural" behavior, but of course, all behavior is natural. It is simply that the general strategy of quickly approaching something reinforcing tends to have a stronger history of reinforcement as opposed to approaching more slowly or walking away from it. Furthermore, most dogs move at a quicker pace than most people do. In addition, the opposition reflex can often encourage dogs to pull against a tight leash. Most dogs, even puppies, who pull on leash have a strong history of reinforcement for that behavior. Thus, it can be very challenging to avoid the problem behavior while you establish a preferable one.

Some trainers tend to frame this behavior in a negative form, stating what behavior to avoid, rather than the behavior to exhibit. However, we can frame the response class of walking on a loose leash positively as "walking with their head within 1.8 meters of the handler." The trainer may specify a side to walk on as part of their criteria (e.g., the trainer's left or right side). To train a formal *heel*, the trainer may also specify a very close proximity level and specific position in relation to the handler's left leg. Most trainers frame loose-leash walking in negative terms because tightened leash is a clear and reliable indication that a mutually exclusive non-criterion behavior is occurring and hence the criterion cannot be occurring.

There are several ways to train loose-leash walking. One straightforward method is described here. Before beginning, prevent pulling on the leash as much as possible in non-training session times. Every instance of pulling on the leash will make progress through the training process more challenging, because you will have to counter-condition it. I recommend that you use a standard body harness, rather than a neck collar, as this will reduce the opposition reflex that will challenge your training. It is probable that there are times when the dog will be less likely to pull. Try to identify these times and begin training then. For instance, many dogs will pull less when they are walking inside rather than outside, or walking toward or away from home rather than the opposite, or after a good bout of exercise. Many dogs pull less in novel environments/neighborhoods. Work your way through a ranked list of increasingly challenging environments. This will help set both you and the dog up for success.

Identify the conditioned and unconditioned reinforcers you will use.

Phase 2. Acquisition

A graded errorless approach works well for training loose-leash walking. Rather than providing the dog with the opportunity to either pull or not, and reacting differentially to each with reinforcement and punishment, set yourself and the dog up for success by setting the criteria low, then gradually and incrementally increasing the level of difficulty, to keep the progress smooth and efficient, with a very high rate of success. Begin by holding the leash with the dog seated or standing still beside you, facing the same direction. Press the hand that is clasping the leash up against your belt line and keep it in this position. This ensures that the distance to the end of the leash is a stable 1.8 meters at all times, and the distance will not be modified by your reach. You can place your thumb into the waistband of your pants. This acts as a quick release so that you don’t get pulled over if the dog bolts for some reason, your thumb will come out of your waistband, and you’ll have a brief interval in which to prepare to maintain your hold on the leash and prevent a sudden jerk on the leash.

Although being on leash will set the occasion for keeping close to you, a vocal cue such as “let’s go,” can be useful, as the dog may interact with the environment on walks, and you will want a cue to proceed with walking. When initiating your movement, say “let’s go,” take a step forward, and as the dog begins to walk, click and treat after their first step. Repeat through several trials. Once this is smooth and reliable, set the criterion to two steps.

If the dog bolts forward at any point and the leash goes tight, say “Oops,” stop, and do not move or engage the dog for a few seconds. Evaluate whether you are moving too quickly through the task increments, and reduce the number of criterion steps if needed, to ensure that you minimize the number of subtracted punishment trials. Proceed after the subtracted punishment interval and once the dog is not pulling on leash. In other words, count the time-out interval and then, when you have finished counting, you may begin walking again as soon as the leash goes loose, if it was not already loose when the interval was up.

Continue to work in this manner, varying the criterion in a seemingly random manner, until you can get several loose-leash steps and very few non-criterion behaviors.

Use direction changes to help get more steps per trial and avoid subtracted punishment trials. Walking on a loose leash is really made up of a long series of evocative stimuli and changes in walking behavior; the dog attends to your trajectory and speed, and these cues evoke the changes in their trajectory and speed. When you change directions, you encourage the dog to pay close attention to your location, and it puts you further ahead of them, which allows for a greater number of steps before they pull on the leash. It also increases interest. Once you have taken several steps and are getting to your current limit, try changing directions at a 45 to 90° angle. Consider using a greater angle relative to how close the dog is to the end of the leash. For example, if the dog is still walking close to you, a slight change in direction can spice up the walk a bit, but if the dog is getting close to the end of the leash and it is about to go tight, use a wider angle, maybe even 90° or more. Avoid jerking the leash though. With this clever technique, gentle pressure on the leash will come to evoke attending to you for directional cues, which is easiest for the dog when they are closer to you.

Novice trainers often use the leash during training to generate the behavior, rather than focusing on the training and the dog's behavior. Maintain a consistent leash length and focus on the dog's behavior instead. Avoid inadvertent prompting with the leash.

Phase 3. Fluency

Continue to work toward more steps between reinforcers, thinning the schedule as you proceed.

Next, begin proofing against the three D-parameters. You can use reinforcers found in the uncontrived environment as distractors. For example, if the dog indicates an interest (e.g., attention and approach behaviors) in sniffing a fire hydrant or meeting another dog, make access to these things contingent on walking close to you until you arrive at the thing. Reserve this exercise for when you are far enough along in the training to be confident that you will succeed. You can include a release phrase (e.g., "you're free") but one is not usually necessary. The "let's go" cue can be used to get back on track. If you find you need to use this cue frequently, try to work on extending the time between the cues.

Duration is how long you walk before reinforcing. Work on the duration gradually, and as usual, relax other D-parameters when you increase the duration.

Distance is not applicable to walking on a loose leash since it is an up-close behavior only.

Phase 4. Maintenance

Continue to generalize the reinforcers utilizing Premack reinforcers, in order to help maintain control over the loose leash walking behavior with the opportunity to exhibit other more reinforcing behaviors. If at any point any component of the training seems to be deteriorating, refresh the training by building that parameter back up.

Common Challenges

Rehearsal of Pulling

By far, the most common challenge in training walking on a loose leash is that guardians establish a long and strong history of reinforced pulling behavior. If training is to be effective, the dog must *not* be allowed opportunities to exhibit the behavior, even though this is indeed an inconvenience. If walking on a loose leash is ever to be successful, pulling must be extinguished! Help clients brainstorm ways to prevent and manage situations where the dog might pull while on leash. Where necessary, use a distinct and salient restraint device when the dog *will* pull, to help protect the training associated with the usual harness (via discrimination training).

Diehard Puller

A strong history of reinforcement for pulling can be a major obstacle to training. In these cases, the same procedure discussed above can be used, but the progress will be much slower, and the training will take longer, because pulling will need to be extinguished. In some cases, an anti-pull harness might be worth considering.

Trailing Behind

Some dogs hunker down like the proverbial "stubborn donkey" and refuse to move forward. They may or may not pull forward on leash at other times, but when a dog refuses to move forward, attempting to pull or otherwise force them forward, usually results in a longer battle.

First, identify whether the dog may have medical problems, perhaps with arthritis or joint dysplasia, or perhaps the dog is heat intolerant. Determine whether the dog seems fearful of something specific, and if so, avoid that situation while trying to train loose-leash walking. Address the emotional reaction with a proper contingency management plan. If the dog lags behind in specific situations, then perhaps a previous experience with this situation was overwhelming or otherwise aversive.

If none these factors appear to be an issue, then be patient. Wait a few moments with a slack leash, and perhaps then gently verbally coax (prompt) the dog forward. If the dog does not respond to this, discontinue coaxing, and begin a shaping program for moving forward. The benefit is derived from not only achieving reinforcement opportunities, but also that the added reinforcers will "desensitize" any problem emotional arousal occurring during the situation. First, be patient and have fun, *especially* at these times! Start by evoking a few other behaviors (e.g., down and sit or look) that you can reinforce and have fun with, perhaps including a game of tug-of-war.

Next, shape forward motion. Observe for the slightest relaxation in stance or a forward lean, and click and treat, shaping forward motion. Repeat several times, and then adjust the criteria to require slightly more of a lean or movement forward. In this way, shape the walking forward behavior. Work your way up to places/situations that more readily evoke reticence.

Dog is Too Strong or Big Compared to Guardian

When the dog is exceptionally strong or large compared to the guardian, good training practices are even more important. Manhandling the dog becomes impossible and requires manipulation of the reinforcers as opposed to the dog, forcing good training practices. Carry out the training as described, but pay particular attention to ensuring successful trials, particularly with raising distraction levels.

However, this situation can be particularly challenging because if the dog does barge forward toward a reinforcer, the guardian may not be able to effectively ensure extinction. Consider using an anti-pull harness for these dogs for such situations. Avoid relying on anti-pull devices to make pulling aversive. Focus on controlling the dog's behavior with added reinforcers. However, for times when the guardian simply cannot effectively control the dog, the anti-pull harness may improve controllability. If the situation is extreme, then the guardian should consider hiring a capable dog walker.

Dog is "Crazy"

Although professional trainers, concerned with clarity, do not use such vague terms, trainers are quite familiar with the complaint that walking on leash is impossible, because the dog is "crazy." Determine specifically what actual behaviors the subject exhibits and what stimuli are controlling them. This encompasses various scenarios, such as a dog that expends extensive energy engaging in many behaviors rapidly (e.g., bolting in different directions, chewing at the leash, bouncing, or jumping). The key element is that the dog engages in numerous and various non-criterion behaviors rapidly. This is common with some puppies and dogs new to leashes, or dogs with bodies that are activity-deprived. It can also be common with dogs that are under contingencies involving problematic emotional arousal. These non-criterion behaviors function to self-distract or escape something.

If the dog is new to leashes, introduce the leash slowly, and shape tolerance-related behaviors with increasing contact with the collar and leash. If the dog is exhibiting escape behaviors, instate a contingency management plan to change the emotional reaction, and come back to loose-leash walking when you can, or else find a time and place where you are able to bypass these behaviors.

If it turns out that the problem is associated with excess stimulation, find a minimally arousing environment for the initial stages of walking on a loose leash and consider whether you could also behave in a more low-key manner yourself. Work in increasingly arousing environments as part of proofing for distraction practices. Carry out the training after intensive exercise or play sessions, or identify times when the problem is less likely to occur. Exercise is commonly very helpful in these situations. In any case, arrange to set the dog up for success as much as possible and maintain the basic strategies of training.

Make the behavior you want more likely and other behaviors less likely, set the criteria low, and gradually and incrementally work your way through the levels of difficulty with a graded approach. Try to avoid participating in the "craziness" and instead be calm, contributing as little stimulation and reinforcement as possible to the situation. Consider cueing a few other behaviors and calmly reinforcing those if you believe you can get the behaviors under such distraction. Reinforce any instances of calmness in a calm way. In this way, you will shape calmness and participation in walking. Ensure the process is a calm type of fun for the dog.

Go to "Bed"

Phase 1. Preliminaries

Behavior Objective

$S^{Ev}{}_1$: Vocal "Go to bed."

Behavior$_1$: Proceed to a designated mat.

Consequence: Treats, but eventually opportunity to exhibit next link.

Criteria: Latency: 2 seconds; speed: average walking gate; relative frequency: 100% through 10 trials; distance: minimum 5 meters; distraction: various.

$S^{Ev}{}_2$: Arrives at mat.

Behavior$_2$: Lie down on the mat.

Consequence: Treats, comfortable bed and access to specific toy.

Criteria: Latency: 1 second; duration: maintain until released, minimum 6 minutes; relative frequency: 100% through 10 trials; distraction: various.

This is a behavior chain comprised of two distinct behaviors. In this case, you can supplement the behavior objective with the following task analysis:

Upon “go to bed” being vocalized, the dog will:

- Proceed to the designated mat.
- Lie down on the mat.

Just as with recall training, there are two simple behaviors involved here, one of which is likely already trained to fluency. If the dog does not already exhibit *down* fluently, include training it here as a component project.

You can use this evocative stimulus to direct the dog to go to specific places. The actual cue you select is based on the location where you want the dog to go. You can use this to train a dog to go to a crate or bed, and this is the context outlined here. However, you can use it to direct the dog to other locations, or to find and go to specific people. The training process here is for the vocalized “go to bed” to evoke going to the mat or bed and then for the dog to down on the mat or bed.

Phase 2. Acquisition

Utilize the usual establishing operations.

The most effective and efficient way to train this behavior is with the use of a remote treat dispenser since it helps with administering treats from a distance. However, the training here is described without such a device. Remember to begin in a minimally distracting environment.

Forward chaining is suitable for a simple chain of behaviors such as this. Assuming the *down* is fluent, begin by training the dog to go to the mat. Start by standing only about three feet from the mat with the dog beside you. Present the temporary cue of pointing to the mat, and immediately lure the dog with a treat to the mat You face the same choice as with the recall, as to whether you can use a shortcut or carry out the longer chaining procedure. If the behavior of going to the mat is smooth and reliable, you may be able to simply cue going to the mat, prompt it, and once it is exhibited, cue *down* and then reinforce that when the dog is lying on the mat. If this is not viable, evoke and reinforce going to the mat and then evoke and reinforce lying down on the mat. Repeat through a few trials. Begin fading the food-in-hand prompt to an empty-handed prompt.

You should now have already trained both behaviors that compose the chain this point, though minimally, and not yet linked together.

Phase 3. Fluency

Just as with recall training, you might find that the dog lies down on the mat before you present the cue. You may need to delay presenting the cue for *down* momentarily in order to determine whether *down* is now under stimulus control of arriving at the mat. If it is, reinforce this and repeat through several trials to further strengthen the stimulus control. If not, then you may need to fade the vocalized “down” cue, saying it quieter during each trial, until the stimulus is absent and the behavior occurs, evoked by arriving at the mat.

Put the reinforcement on an intermittent schedule, and gradually thin it in a variable fashion, as described previously for other behaviors.

Next, begin proofing against the three D-parameters. If you begin with duration, remember to keep distance and distraction minimal, and to briefly reinstate a continuous reinforcement schedule. Instead of clicking immediately upon the dog getting to the mat or lying on it, you should wait an extra second or two and then click and treat. Gradually work the duration up to a few minutes, and begin thinning an intermittent schedule of reinforcement again.

Once you have a reliable duration, begin working distance. Go back to continuous reinforcement and relax the duration feature as you start gradually increasing the dog’s distance from the mat when you evoke the behavior. Ensure that you include the special feature of cueing the behavior when the mat is not directly within the dog’s sight. Again, once the distance criterion is reliable, put the behavior back on a gradually thinning variable ratio schedule.

Finally, you can proof the behavior against distraction. Start with minimally distracting stimuli present while relaxing the schedule of reinforcement, duration, and distance criteria. Begin introducing incrementally more distracting stimuli into the environment, until the dog reliably exhibits the behavior, even under moderately to very distracting stimulation. Put the behavior back on a thinning schedule of reinforcement, and then begin working the features together.

Training will run smoothly with some dogs, while some dogs will require remedial work at certain stages. Be prepared to track your progress and adjust as needed to ensure success. You should now be able to evoke the behaviors from a greater distance, under distracting circumstances, and the dog will reliably go to the mat, lie down, and remain there until released. At this stage, replace the click with a release phrase.

Once the behavior chain is about where you want it in terms of the criteria, transfer stimulus control from the temporary cue of pointing, to a permanent vocal cue if you did not do so already. Say "go to bed," and then point to the mat, at which point the dog will exhibit the behavior and you can reinforce it. Repeat through several trials until you can drop the old temporary cue from the sequence.

Phase 4. Maintenance

Continue to introduce new distractions as they become apparent, thin the schedule of reinforcement, and keep up regular practice, to ensure the training is maintained. If at any point any component of the training seems to be deteriorating, refresh the training by building that parameter back up.

Common Challenges

One of the major challenges in training a dog to go to and lie down on a mat is to maintain the effectiveness of the reinforcer. Usually, lying on a mat, even with a treat coming their way after some period of time, cannot compete with concurrent contingencies. That is, the dog lies down, but then gets bored and gets up to do other things instead of staying on the mat. Use highly effective reinforcers. Another trick to addressing this is to consider providing some ongoing reinforcer at the mat location. You could tie a rope to a Kong dog toy, and attach that to the crate or an eyehook screwed into the baseboard near the mat. You could have treats and/or peanut butter inside the Kong toy. This will keep the dog interested and make being at the mat reinforcing, since this is the only place they can access that particular reinforcer. You can also get remotely released treat dispensers that you can keep near the mat.

Continuing Education

Courses provided through The Companion Animal Sciences Institute at www.CASInstitute.com address all of the topics covered in this chapter.

If you are looking for a good book to give to clients, consider these books:

- Dog-Friendly Dog Training, by Andrea Arden
- The Culture Clash, by Jean Donaldson
- Getting Started Clicker Training for Dogs, by Karen Pryor
- The Power of Positive Dog Training, by Pat Miller
- The Toolbox for Building a Great Family Dog, by Terry Ryan

CHAPTER 9. TRAINING CHALLENGES AND SPECIAL CASES

Behavioral Objectives

The objective of this chapter is to measurably expand the reader's repertoire of behaviors in relation to describing and relating the principles of behavior. Upon successfully integrating the concepts outlined in this chapter, the reader, where under contingencies to do so, will accurately:

- describe common challenges in training dogs and general strategies for overcoming these challenges.

Multi-Dog Training

Karen London and Patricia McConnell wrote a terrific book called *Feeling Outnumbered? How to Manage and Enjoy Your Multi-Dog Household*, in which they outline a basic strategy for working with dogs who reside together. Being among the first to abandon the outdated practice of "supporting the hierarchy," London and McConnell (2001) outlined an operant conditioning approach that has proven very successful for many trainers, myself included, over the years. I outline this general approach below.

Train Each Dog Individually

Guardians should arrange to have time alone with each dog for training. This can be incorporated into walks and play sessions, or exercise sessions, as well as training. With multiple dogs providing a significant distraction for each other, it can be challenging to compete with, and soon, stimuli lose their evocative capacity. The guardian must train each dog individually at the start. Where it might be omitted when training an individual dog in many cases, ensure that the dog's name precedes all other cues. This will be a cue for attention and a function-altering stimulus for exhibiting the primary behavior.

Train in Pairs

Once you are at a reliable point in individual training, you may start training the dogs in pairs, even if you have several dogs. Ensure you precede cues with the dogs' names. Carry out much the same training as you did with the dogs individually, but review it with the other dogs present to ensure appropriate discrimination training so that each dog exhibits the behavior that you present the cue for and other dogs do not. At first, other dogs may respond to the cues but discrimination will occur when you fail to reinforce those responses that were not preceded with their name.

You can also work on group cues, using a group name such as "Everyone," followed by the primary cue. Only those dogs who exhibit the behavior are given treats. This group cue will come in handy when the client wants all the dogs to respond similarly together. For instance, it can be useful to be able to evoke sit from all of the dogs.

Train in Groups

Once you have worked your way through training each pair combination to a reliable level of distraction, you can start working with combinations of three dogs. The training will proceed in much the same way as with pairs. Once significant progress has been made in these small groups, in each possible combination of three, you can start adding in any other dogs within the household, until you have your whole group working together. Clients should be encouraged to maintain the training by continuing to work with the dogs individually and as a group, and applying the training to everyday life when possible.

Training Toy Breeds

Toy breed dogs are frequently "fearful," especially when close to people walking around, because they are at significant risk of being stepped on. Consider at least administering the acquisition stage of training while you are seated on the ground next to the dog, both to prevent emotional arousal that can arise from you moving around near them, but also to get closer to the dog in order to achieve the maneuvers appropriately. This will need to be faded.

Another challenge with training some toy breed dogs is not really a challenge with the dog him or herself but rather with guardians. Because one can physically manipulate toy breeds so easily, people frequently do not train their toy breed dogs. Sometimes they simply fail to recognize that there is a reason to do so and/or sometimes they simply find it challenging because of the dog's size. Lack of training is likely the major reason for the stereotype of the "snappy and yappy" toy breed dog. People fail to take these and other problem behaviors or lack of training as a serious problem. It is important to recognize the need for basic training and to emphasize this to guardians. Being "snappy and yappy" is *not* inevitable for toy breed dogs. A well-trained toy breed dog is a joy to be around.

Social Contact not an Effective Reinforcer

For some individuals, social contact is not an effective reinforcer, and this can affect training quite dramatically—people become quite used to utilizing social reinforcement. Trainers often tend to identify a treat as the reinforcer for a behavior they aim to train, but reinforcement is frequently a package of stimuli including the social contact that comes with exhibiting social behaviors (e.g., during training) and receiving the reinforcer. Even if praise or touch are not used during training, and vocal and visual prompts are not used either (they frequently are), the social contact that otherwise accompanies training contributes to generating and reinforcing behaviors. With this major source of motivation reduced or eliminated, training can be more challenging.

Social reinforcers are composed of a combination of conditioned and unconditioned reinforcers. A history of aversive conditioning can overshadow the effectiveness of social reinforcement. Furthermore, a lack of effective early socialization can prevent social contact from becoming reinforcing. There might also be genetic influences on the effectiveness of social reinforcement. Careful history talking might provide clues as to the cause of the current status of social contact. If the dog lacks a history of effective socialization, remedial socialization may help. If the dog has a history of aversive conditioning mediated by humans, careful rehabilitation will be required. In either case (remedial socialization or rehabilitation), gradual graded errorless added reinforcement can increase the effectiveness for social reinforcement. Generally, you can improve social motivation by reinforcement-rich social interaction. Identify and eliminating aversive social contingencies in the subject's daily life.

Satiation, with regards to contact with a person, can reduce the reinforcing effect of contact with that person. Normalizing the amount and intensity of contact with the person can reduce the satiation effect and increase motivation. This is *not* to promote social isolation and strong deprivation states! This is about fixing problem situations where too much social contact is causing a satiated body and hence aversive social interactions. Next, increase the magnitude and rate of contact with reinforcing contingencies associated with the dog and trainer. Hand feeding of favored treats and food can help. Participate in games and other reinforcing activities. End sessions on a positive note *before* the dog becomes excessively satiated with the contact. Try to become a source of more reinforcement for the dog in general, but without overdoing it. As social reinforcement effectiveness increases, training should become more fun and productive for both the dog and trainer.

Food not an Effective Reinforcer

For many dogs, food is simply not very effective as a reinforcer. In many cases, you can find better treats and deprive the dog of this most effective reinforcer to maximize its effectiveness. When this does not increase the effectiveness of the treat as a reinforcer, consider other reinforcers such as contact with a favored toy, perhaps involving a quick game of tug-of-war with the trainer. For some dogs, praise and certain specific kinds of physical contact can be an effective reinforcer. The trainer may need to experiment with different kinds of social contact to determine what is reinforcing; usually, gentle to moderate contact on a shoulder works well. Observe what the dog expends significant energy contacting on a daily basis for reinforcers, including activity reinforcers. Once you have a list of effective reinforcers, consider *mild* deprivation to increase their effectiveness.

Hyperactivity

Some dogs are so hyperactive that it becomes a significant disruption to training. This is common with certain breeds and with puppies/adolescents. The most common solution for this problem is exercise, manipulation of excess stimulation during training, and shaping, focusing on attention and calmness. Exercise sessions should be designed carefully, ideally with the help of at least a veterinarian, if not a canine fitness consultant with specialized skills in working through aerobic exercise programs, and ideally implemented under supervision. However, in many cases, guardians alone can increase exercise, as long as they operate within the medical and biological condition of the dog, and gradually increase the dog's exercise level. The sessions should be scheduled regularly and ideally involve games to make it fun. Ensure that there are warm up and cool down periods, and observe the dog carefully for indications of fatigue. You might notice some benefits of moderate to intense appropriately implemented exercise programs after only a few sessions, but you will recognize most of the stable physiological benefits after several weeks of exercise. The trainer should also choose times of day and times with suitable weather conditions that are more conducive to training.

General Sensitivity and Risk Averse

Dogs, who are generally sensitive and risk-averse, require a careful approach to training. Trainers need to attend to and recognize escape contingencies and sensitivities, so that they can avoid these forms of stimulation while working through training.

In some cases, these dogs are sensitive to social pressure and cower when someone towers over or approaches them. In these cases, train while sitting beside the dog, perhaps right on the ground. Face slightly away and avoid staring at the dog. Avoid sudden movements and be calm, but gently praising. Train in an environment that you are sure you can control. Take extra care to avoid aversive stimulation, such as techniques involving extinction or subtracted punishment trials. Ensure success by moving at an appropriate pace, utilizing a very careful graded errorless approach. Begin introducing simple shaping exercises with minimal prompts. Generally, free-shaping can reinforce creativity, persistence, and resilience in general. Severe case may require a dedicated contingency management plan, designed and implemented by a qualified animal behavior technologist.

Easily Frustrated and Impulsive

Frustration refers to the obstructed access to reinforcers and the emotional arousal elicited by extinction. ***Impulsivity*** refers to the tendency for a dog to seek out immediate smaller reinforcers when faced with concurrent contingencies with delayed access to a much greater source of reinforcement—they go for the quick fix, rather than putting in slightly more time and effort for a much greater gratification.

One must carefully handle dogs that are impulsive and easily frustrated. They can be conditioned to delay gratification and experience less frustration if the contingencies are arranged in an errorless manner. The trick here is to take a graded errorless approach, specifically with regard to response effort and duration features of training. Gradually train behaviors that require duration but move at a pace that allows the dog to succeed with contacting highly effective reinforcers that require a bit more effort and time. Similarly, use shaping exercises with minimal prompting to condition creativity and persistence that will allow the dog to easily work around frustrations. By emphasizing success generated by creativity and persistence, the dog will begin respond to frustration with other novel productive behaviors and strategies that will access the reinforcer, rather than strange non-criterion behaviors.

Continuing Education

Courses provided through The Companion Animal Sciences Institute at www.CASInstitute.com address all of the topics covered in this chapter.

Feeling Outnumbered? How to Manage and Enjoy Your Multi-Dog Household, by London and McConnell is excellent!

APPENDIX 1. TRAINER EXERCISES AND SKILLS DEVELOPMENT

Behavioral Objectives

The objective of this appendix is to measurably expand the reader's repertoire of behaviors in relation to applying fundamental strategies, principles, and procedures in hands-on exercises. Upon successfully integrating the concepts outlined in this appendix, the reader, where exposed to contingencies to do so, will accurately:

- analyze their training behaviors for effectiveness and efficiency, providing data by which trainers may reinforce effective behaviors, extinguish ineffective behaviors, and shape their training skills.

This appendix is composed of a series of exercises that trainers may find helpful in expanding their repertoire of effective training behaviors. These exercises build upon one another—early exercises provide the repertoire expansion necessary for the later exercises. Thus, in order to maximize the benefit from these exercises, sequentially work through them from first to last.

Video-record all of your exercise sessions. A big part of the conditioning experience will come from observing and scrutinizing the videos, rather than just carrying out the training exercises. It is a good idea to take note of any deficiencies that you can improve upon and repeat the exercises, to ensure that improvement has occurred. Recognize these improvements in order to reinforce your own effective behaviors. Continue to carry out the exercises, observe the video, and repeat this sequence until you are demonstratively proficient with the exercise. Reinforce your own improvements and successes, literally. This will improve your conditioning.

Exercise #1. The Bouncing Ball Exercise

This exercise will help you improve these behaviors or features of behaviors:

- timing;
- concentration;
- clicker accuracy/dexterity; and
- quantitative tracking behaviors (basic).

You will need:

- an assistant;
- a ball;
- a clicker; and
- video-recording equipment.

Video-record all of your training sessions including this one and try to ensure that the microphone is as close as possible to the clicker for the most accurate video to audio correspondence.

Have your assistant bounce a ball with a variable interval (with a range of around one to ten seconds) between bounces. Ideally, they should toss the ball up a foot or two, allowing it to fall and bounce (as opposed to simply throwing the ball to the ground). Your assistant should bounce the ball ten times, take a 30 second break, bounce the ball ten more times, take another 30 second break, and then bounce the ball ten more times. Your objective will be to click the clicker at the exact moment the ball bounces on the ground for each repetition. Carry out this exercise with your favored hand, and repeat the exercise with your other hand. Confirm your accuracy by observing the video. The click should occur precisely at the moment the ball contacts the ground. Use a table to help you record criterion behaviors (perfect timing) and non-criterion behaviors (off timing). For any off-timing behaviors, is there a trend in terms of whether you click after or before the bounce? If so, use this to help you improve your timing for the next round.

Repeat the exercise until you have achieved 29 out of 30 precisely timed clicks with each hand. Once you have completed this exercise, literally pat yourself on the back, and follow up by treating yourself in some way! This is no joke. If you find a way to treat yourself for completing these exercises that you would not allow otherwise, you will be more likely to complete them.

Exercise #2. The Tossed Ball Exercise

This exercise will help you improve these behaviors or features of behaviors:

- timing;
- concentration;
- clicker accuracy/dexterity; and
- quantitative tracking behaviors (basic).

You will need:

- an assistant;
- a ball;
- a clicker; and
- video-recording equipment.

For the Tossed Ball Exercise, you will carry out the sequences exactly the same as in the Bouncing Ball Exercise, except that the ball will be tossed between one and three feet into the air instead of bounced on the ground. This exercise is more advanced because the bouncing is approximately a fixed distance, whereas the tossed ball will have a much more variable distance, as well as a lack of auditory feedback as the bouncing ball contacts the surface when the click is supposed to occur. Click the clicker at the precise instant the ball reaches the apex of its arc.

Once you have completed this exercise with a success rate of 29 out of 30 with each hand, pat yourself on the back, and follow up by treating yourself in some way!

Exercise #3. The Ball and Treat Exercise

This exercise will help you improve these behaviors or features of behaviors:

- timing;
- concentration;
- clicker accuracy/dexterity;
- quantitative tracking behaviors (basic); and
- accurate treat delivery to stationary target.

This exercise builds on the ball exercises and introduces another skill set. This exercise requires that a number of behaviors be exhibited, either consecutively or sequentially, in a short period of time. Thus, this exercise will help increase the number and level of difficulty of behaviors you can exhibit effectively.

You will need:

- an assistant;
- ball;
- clicker;
- standard drinking glass;
- treat pouch;
- treats; and
- video-recording equipment.

Video-record all of your training sessions. Carry out this exercise exactly as in the basic Bouncing Ball Exercise previously described, except this time, you will be incorporating treat delivery as well. Instruct your assistant to allow you a maximum of one full second ("one alligator") to deliver your treat before they begin counting silently toward their inter-trial interval. Carry out the exercises right beside a table at about waist height. Have the drinking glass placed on its side on the table propped with erasers, blocks, or something similar, so that the glass does not roll away. Your objective is to click precisely at the instant the ball bounces on the floor, and within one second of clicking, retrieve a treat from the pouch and place it inside the glass, without knocking the glass out of position.

Use the video recording to observe and quantify your accuracy for both click timing and treat delivery. Record the number of times you clicked precisely when the ball bounced, and track the number of treats administered into the glass within one second of your click. Missing the glass and/or delivering the treat outside of the one-second interval are non-criterion behaviors.

Repeat the exercise until you have achieved 29 out of 30 precisely timed clicks, and 29 out of 30 accurate treat deliveries. Once you have completed this exercise, pat yourself on the back, and follow up by treating yourself in some way!

Exercise #4. Planning List of Behavior Approximations for Shaping

This exercise will help you improve these behaviors or features of behaviors:

- judging appropriate behavior approximation size based on how difficult the different components will be;
- breaking approximations into smaller sub-approximations;
- planning for acceptable operant approximations.

Planning a shaping project requires a repertoire of various behaviors, and one of them is planning your list of behavior approximations. Although one must remain flexible in training to quickly accommodate unexpected events, prevent frustration, reduced rate of responding, or to take advantage of sudden leaps in progress, one can only really be truly flexible if one prepares a plan that allows for such contingencies. In this exercise, you will practice planning a list of behavior approximations for a training project, including allowing for acceptable deviations.

You will need:

- a pen or pencil; and
- paper.

Choose a behavior to shape. This should be a behavior that is more or less unlikely to occur frequently in its final form, and that you cannot readily prompt in its final form.

First, prepare a list of behavior approximations for the behavior. The approximations should be large enough so that the subject is not rapidly skipping multiple steps at a time, but small enough that progress remains smooth and efficient. Ensure that each approximation describes specific body part movements—that they are operational.

Second, for each approximation, break it down into three small sub-approximations, in case you need to quickly utilize them to prevent frustration.

Third, look at each approximation. For the particular behavior identified, is there an acceptable alternative response class form that still progresses toward the terminal behavior? In other words, prepare yourself now for any step along the way where you might not immediately get the specific approximation you listed, but you might get another response class form that is still a suitable approximation toward the terminal behavior. This may not be possible for all terminal behaviors and is usually more applicable to terminal behaviors that are more complex. If you need to continue a new branch of approximations from there to your terminal behavior, do so. Otherwise, note where it connects back to your initial list of approximations.

Once you have completed your list, you should be well prepared for deviations and challenges, such as the subject progressing more quickly than anticipated, or becoming frustrated due to too large a step, or bored by steps being too small. Making these judgments in the training situation requires another set of skills, but the repertoire of behaviors practiced in this exercise will help ensure you are prepared, setting both you and the subject up for success. This exercise helps establish a stronger training foundation and demonstrates the benefits of planning.

Consider doing this exercise with two other simple behaviors and then perhaps one more sophisticated behavior to challenge you.

Once you have completed this exercise, pat yourself on the back, and follow up by treating yourself in some way!

Exercise #5. Free-Shaping a Friend

This exercise will help you improve these behaviors or features of behaviors:

- timing;
- concentration;
- clicker accuracy/dexterity;
- relying less on trainer-mediated prompting;
- planning behavior approximations for a shaping procedure;
- identifying target behavior suitable for trainer proficiency;
- maintaining high rate of reinforcement to avoid reduced rate of responding and frustration (on-the-fly judgment-related behaviors); and
- treat handling.

This exercise is an excellent way to practice shaping without subjecting a dog to the frustration and confusion often associated with novice-level training in what is an advanced training procedure. It is largely based on the excellent "Training Game" described in *Don't Shoot the Dog,* by Karen Pryor, with the addition of a concerted shaping plan before the game, and an exercise analysis stage at the end (debriefing). As always, video-record your training exercises.

You will need:

- a clicker;
- at least one assistant for the exercise (although it is more fun with two or more);
- reinforcers (e.g., quarters that can be given to the subject in order to simulate treat delivery);
- piece of paper;
- pen or pencil; and
- video-recording equipment.

Planning Stage (You as Trainer)

There are two projects in this exercise, one in which you are the trainer and the other in which you are the subject. In the first project, your assistant is the subject and you are the trainer. The subject leaves the room for the planning stage. Identify an operationalized behavior to train the subject to exhibit. Write down your target behavior and prepare a plan of approximations just as you would if you were planning a training project (as described in Exercise #4).

Training Stage (You as Trainer)

Once you have a plan, have the subject come back into the room, so that you can begin the training. No speaking or contrived prompting, including subtle head nods and noises or other facial expressions are allowed. You can justify occasional non-vocal prompts in this exercise in order to work through a particularly frustrating series of trials, but try not to use them unless you absolutely need to in order to be successful. Rather, focus on preventing the need for them—working through these challenges with adjustments to approximation size and pace. One tip: if you need to readjust to a smaller approximation, rest the environment in some way to identify the change in contingency. This might mean cueing a fluent behavior, calling the subject to you for a "free" reinforcer or the like.

Click for successive approximations of the target behavior in accordance with your training plan, but be prepared to adjust your tactics where appropriate. Maintain a high rate of reinforcement to ensure smooth training and minimal frustration or confusion for the subject. In place of the unconditioned reinforcer, give the subject quarters or some other physical reinforcer for this exercise to simulate treat delivery. When the subject finally exhibits the terminal behavior, the game is over.

Exercise Analysis (You as Trainer)

Once you achieve the terminal behavior, observe the video several times, each time looking for specific things.

First, observe for clicker accuracy. Did you click at precisely the correct time? How many clicks out of the total number would you judge to be precisely accurate within 1/16th of a second or so?

Second, observe again for pace management. Did you set the approximations at suitably sized steps to maintain smooth progress and prevent frustration? Where you did not, had you planned appropriately ahead of time for these occurrences? In the training session, did you remain flexible, adapting quickly and effectively to adjust the approximation size and reinforcement rate to manage the frustration? Did any superstitious behaviors occur, and if so, did you work through them or use extinction to prevent them from becoming too disruptive?

Third, observe again, now looking for prompts. Did you rely solely on reinforcing from among variations exhibited without contrived trainer-mediated prompts, or did you prompt? Although this exercise features avoidance of prompts in order to focus on other skills, you can and should use prompts where they prevent frustration. Did the prompts you used function to move past a particularly troubling series of extinction trials or were they unjustified? Were they successful in moving you past a particularly frustrating part? Ask yourself whether you could have avoided any of the prompts and still staved off frustration? How could you have done so?

Next, ask your assistant for their observations on the experience as a subject. Consider asking them which part was the most confusing or frustrating rather than if they were confused or frustrated in order to reassure them that it is okay to identify those parts. Ask them why they believe they became confused and/or frustrated. Then, ask what other parts were confusing or frustrating in order to identify other problem areas. Ask them open-ended questions about their general evaluation of the skills that you utilized in the exercise as a trainer, including your clicking and "treat" delivery skills. Ask them what improvements they believe might help. Ask any other observers these questions as well—they may have useful observations regarding both the subject and the trainer that neither the subject, nor the trainer may have identified.

Finally, identify at least three less-than-proficient skills in your training, and for each, identify specific ways you can improve upon them. This might include what you could have done differently, but it also could include how you will change your training practices to adjust and refine these particular skills. For any skills that you believe definitely need more practice, identify specific ways that you can improve your performance.

Planning Stage (You as Subject)

Carry out the exercise again, this time with your assistant carrying out the training and you acting as the subject. Have your assistant plan a shaping project for you to engage in as the subject. Coach them how to go about doing this. You may want to video-record your coaching so that it can be included in your analysis of the exercise. You do not need to find a proficient trainer for this exercise. This part of the exercise is for you to experience being on the receiving end of training, which is a valuable experience for all trainers—you may experience a more useful expansion of your repertoire of behaviors with a novice trainer than an expert. The frustration and confusion you experience here will generate empathy and benefit your own training skills.

Training Stage (You as Subject)

If your trainer is not proficient, that is okay. Take this opportunity to coach them on the basics of choosing a suitable behavior and suitable behavior approximations, as well as timing and the rules regarding reinforcement while avoiding prompts. This coaching will likely be a repertoire-expanding conditioning experience as well. If your assistant is already a proficient trainer, ensure they know what is required from the exercise and proceed. Be sure to video-record this session.

Exercise Analysis (You as Subject)

Once you have exhibited the terminal behavior, you have the opportunity to evaluate many of the same skills, but this time for someone other than yourself. This change in perspective can be an exceptional conditioning experience.

First, take note of your feelings. Feelings are your experience or awareness-related behaviors in response to emotional arousal (which itself is the physiological processes going on inside you). Do you feel exhilarated and excited or bored? Do you feel frustrated? Attempt to identify likely causes for these feelings. What exactly about the experience elicited/evoked these feelings? Translate these into accurate descriptions of training proficiencies and deficiencies. Once you have a list of training deficiencies, for each one, identify what actions should have been exhibited instead. In addition, separately identify how the trainer should have handled the situation as soon as it became clear that the subject was becoming frustrated or confused.

Next, observe the video for the same type of things you observed in your own training video. Look for timing and management of pace, etc., and make notes about each of the factors.

Once you have completed this exercise, pat yourself on the back, and follow up by treating yourself in some way! You may wish to also treat the people who helped you with the exercise with something that is reinforcing to them.

Exercise #6. Targeting

This exercise will help you improve these behaviors or features of behaviors:

- timing;
- concentration;
- clicker accuracy/dexterity;
- location of treat delivery; and
- handling multiple items at once.

For this exercise, you will need:

- a targeting stick (or a suitable substitute, such as a pencil);
- treats;
- treat pouch;
- clicker; and
- a reinforcer-deprived dog who has been clicker trained but has not been target trained; and
- video-recording equipment.

This simple exercise is a good place to start expanding your skills in training dogs, because, while it is simple, it also involves several key training skills. One new skill this exercise presents is choosing a location to deliver the treat, which will affect how the behavior comes to be exhibited—this is discussed below. Another new skill that this exercise introduces is simultaneously handling multiple pieces of equipment. In this case, you will be handling the clicker, the target stick, and treats at the same time, requiring you to use at least one hand for more than one piece of equipment. You will hold the targeting stick and clicker in the same hand, using your other hand to retrieve and deliver treats.

Planning Stage

As with any training project, prepare a plan ahead of time. In this case, you will likely be able to achieve the final form of the behavior, so you do not need to shape this behavior. You might shape a little bit to tighten up the spot touched or the latency, but you can leave this aside for now and treat this as a simple differential reinforcement procedure. Write down your target behavior in operational terms. You can plan to measure the relative frequency of the behavior, since it is most informative to measure the number of times the subject exhibits the behavior in comparison with the number of opportunities they are provided to exhibit it (i.e., you can determine the percentage of times the behavior is exhibited). You can record this when you watch the video of your sessions. Gather and place all of your equipment and have it ready to go.

Training Stage

Present the targeting stick to the subject within a few inches of his or her nose. The subject will likely sniff it. If they do not contact the tip of the targeting stick within a few seconds, pull it away, turn away for a few seconds to reset and then present it again. If this is not working, you should increase the salience of the stimulus by rubbing treats on the tip of the stick (although this is rarely necessary). The instant the subject touches the tip of the stick, click, and deliver the treat to the subject's mouth at their head height. The location of treat delivery is important. You could just click and drop a treat to the ground, but this will affect the behavior you are training. If you deliver treats on the ground after the targeting behavior, you will likely notice that the subject responds to presentation of the stick with touching it and then quickly lowering their head down toward the ground. This might not be a problem in some situations, but this exercise provides the opportunity for you to practice delivering treats at a specific spot in order to promote a nice clean targeting behavior, without subsequent by-product responding.

Repeat through a few more trials. You should see the behavior becoming smoother and more reliable, as you continue through the process.

Begin presenting the stick about five or six inches away from the subject's nose, and once that is reliable, present it far enough away that it requires that the subject take a few steps to touch the target stick.

Once you have this trained reliably, begin to randomly present the stick on either side of the body. You should very quickly have this behavior exhibited at a relative frequency of 100%.

Once you have achieved ten consecutive behaviors, in which the target stick is touched within a couple seconds of presentation regardless of the location that the target stick is presented, you can consider the project a success.

Be sure that you video-record all of your training sessions.

Exercise Analysis

Now observe the video. Take note of your timing. Was it precise each time? Were you able to deliver the treat within one second every time? Did you accidentally click any times when the subject did not exhibit the behavior? Were there any extinction or subtracted punishment trials. If so, why? Did you increase the difficulty level too quickly? How did you work through this on the next trial? Finally, find something that you could improve upon. Write that down, as well as exactly what you can do to improve that aspect of your training.

Once you have completed this exercise, pat yourself on the back, and follow up by treating yourself! Perhaps purchasing one of the target sticks with a built-in clicker (e.g., a Clik Stik® clicker and target stick) would be a nice reinforcer.

Exercise #7. Simple Shaping Project

This exercise will help you improve these behaviors or features of behaviors:

- timing;
- concentration;
- clicker accuracy/dexterity;
- relying less on trainer-mediated prompting;
- planning behavior approximations for a shaping procedure;
- identifying target behavior suitable for trainer proficiency;
- maintaining suitable energy/enthusiasm level;

- maintaining high rate of reinforcement to avoid reduced rate of responding and frustration (on-the-fly judgment-related behaviors); and
- setting criteria for next behavior approximation to avoid excess extinction but still reliably responding at the next approximation.

You will need:

- a clicker;
- treats;
- treat pouch;
- paper;
- pen;
- a reinforcer-deprived dog who has been clicker trained but has not been target trained; and
- video-recording equipment.

Building on your work in previous exercises to shape a human behavior, you are now going to transfer these skills to working with a dog. In this exercise, you will shape a simple behavior with your dog. This will build on the exercises you have already completed and introduce the challenge of shaping.

Choose a behavior that suits your situation; for this exercise, it will be something related to a cardboard box. If the box is large and low enough, in relation to the subject, you might shape stepping into the box with all of their feet. If the box is small enough, you might train the subject to pick the box up in their mouth or to push the box with their nose for a short distance. You may choose another behavior, but ensure whatever you choose is a single discrete behavior and not a sequence of behaviors.

Planning Stage

Begin by defining your target terminal behavior operationally, as well as the behavior approximations you will use to achieve it. Remember to plan for the necessity to break a step down into smaller steps.

Training Stage

Begin training, utilizing the skills you have been practicing, including precise timing of the click, treat delivery within one second, and accurate placement of the treat to avoid post-reinforcement behaviors that might disrupt training. Maintain a high rate of reinforcement to avoid a reduced rate of responding and frustration. Be sure to video-record all of your training sessions.

Once you have achieved stable responding with a behavior approximation, move to the next approximation. Take care at this point; you will be evaluating this skill later. If you wait too long after achieving reliable responding at one approximation step before setting the next approximation, the behavior will have become well-conditioned or entrenched, and this will require more extensive extinction when you reset the criteria for the next step. If on the other hand, you reset the criteria for the next step too quickly before the behavior is stable, the subject may fail to exhibit the next approximation at all. You need the step to be small enough that a little variability in responding will lead to the next approximation. It is a constant balancing act of criterion size and at what point you change the criterion that represents a major difference between the "chops" of a professional and those of a novice. Emphasize this on-the-fly judgment in this exercise by paying close attention to the rate of responding and reinforcement, and any disruptions to smooth continuous conditioning. Also, be sure to use an appropriate level of animation or energy/enthusiasm to keep the process fun and smooth, but not overwhelming.

Continue training until the subject exhibits the criterion terminal behavior five times in a row when the box is presented. You should keep sessions generally short. Stop while the training is still fun for all concerned. You may be able to complete this training in one or two training sessions, but if you need to take more sessions, do so. Remember to end sessions on a positive note, and when you start a new session, review earlier steps before proceeding further into the list of approximations.

Exercise Analysis

Observe the video several times, looking for specific features each time. Take note of all the things that you previously practiced, such as the precise timing of your click, whether you delivered the treat within one second, whether you delivered the treat precisely, whether you missed any opportunities to click, and how many times you clicked for a non-criterion response. It should become habit (i.e., well-conditioned behavior) for you to evaluate all of these factors every time you evaluate your training skills. Note how well you planned your approximations. Were all of the approximation steps a suitable size, or did you need to adjust them, and if you did, how might you plan more effectively next time?

For this exercise, you also need to evaluate your energy level—that is, how you use encouragement, tone of voice, and how animatedly you move, in order to maintain the subject's rate of responding at an appropriate level. Were you animated enough or perhaps too much? Take special care to look for your proficiency with the last two behavioral objectives identified for this exercise.

Observe the video at least once with an eye to assess whether you maintained a high rate of reinforcement by correctly adjusting the approximation size. Did the subject become frustrated or bored at any point? If so, why? What can you do to avoid this in the future? If it occurs, what can you do quickly to get back on track?

Observe the video at least one time with an eye to assess your timing, regarding instating the extinction criterion for the present approximation step, and instating the reinforcement criterion for the next step. Were the first few responses at the new step confusing for the subject? Did the subject continue to exhibit the previous approximation behavior more than a few times, or did behavioral variability occur, but the subject failed to exhibit the next approximation behavior quickly? These are disruptions to the smoothness and efficiency of training. Ask yourself how you could have planned more effectively to avoid this situation or how, when you changed from one approximation to the next, that might have influenced this disruption. Specifically, what could you do to avoid, and to respond to, these disruptions. Write your questions and answers down on paper. If this exercise did not go perfectly smoothly, try again, this time with a different behavior. Remember also that you will benefit from identifying errors and solutions. Do not ignore or gloss over them. You are the only person involved in this exercise, so do not deprive yourself of the opportunity.

Once you have completed this exercise, pat yourself on the back, and follow up by treating yourself in some way!

Exercise #8. Task Analysis for Chaining

This exercise will help you improve these behaviors or features of behaviors:

- identifying discrete behaviors in a behavioral situation involving a series of behaviors exhibited one after the other.

You will need:

- paper and
- a pen.

Even many simple behavior episodes that you seek to train involve more than one discrete behavior. To carry out an effective chaining project, you need to be able to effectively plan the project. To plan a sequence of behaviors in a chaining project, conduct a task analysis. In most cases, you will observe dogs exhibiting the behavior you plan to train, and from that, identify each of the discrete behaviors that comprise the overall behavior. In other cases, you may be able to simply visualize the occurrence of the behavior.

Part of the skill in carrying out task analysis and planning a chaining project involves determining what the discrete behaviors are. Any behavior can be broken down into multiple finer motor actions. Thus, part of the judgment regarding what is a discrete behavior is context-related and depends on the appropriate scale for the task. For example, taking a sip of water from a glass that you are already grasping might seem to be a single behavior but it might potentially be analyzed to be two behaviors: raising the glass and then taking a sip, depending on the events that evoked the analysis (e.g., if you are training a young child or a stroke victim). You might even break it down into several discrete behaviors involving finer motor actions involving the lifting of the glass, opening the mouth, generating a firm seal with the glass with the mouth, moving the tongue to allow water into the mouth, closing the mouth, removing the glass away from your face, and finally swallowing the water. However, over-analyzing can become counter-productive at a certain point, depending upon the context of your purpose. Determining appropriate discrete behavior demarcation points, for training the specific chain you plan to train, requires balancing the scale of specificity.

In this exercise, analyze a complex behavioral event, breaking it down into appropriately sized discrete behaviors. First, identify a complex behavioral episode on which you can carry out a task analysis. Start by observing a member of the same species (or genus) exhibit the behavior chain, or visualizing it. What are the discrete behaviors in this chain? When will you end the chain? Decide on all of the specific operational details for this exercise. Carry out your analysis until you are satisfied that it contains sufficient but not excessive individual links.

Once you have completed this exercise, pat yourself on the back, and follow up by treating yourself in some way!

Exercise #9. Simple Chaining Exercise.

This exercise will help you improve these behaviors or features of behaviors:

- discriminating between suitability of different chaining procedures;
- determining whether shaping or simple differential reinforcement is most suitable to a task; and
- transferring stimulus control to attach links in the chain.

You will need:

- a clicker;
- treats;
- treat pouch;
- task analysis from exercise #8;
- a reinforcer-deprived subject that is clicker trained; and
- video-recording equipment.

In this exercise, you will build on the task analysis you developed in exercise #8, and actually carry out the training required to achieve the chain. The exercises are becoming more challenging and advanced, requiring many more proficient environment-behavior relations combined into one project.

Planning Stage

You already have a task analysis completed, so this will be the basis for your chain. One of your next goals will be to decide which particular chaining strategy will be most suitable to your project—will you utilize forward or backward chaining? You may want to review the section on chaining. Consider your project, and write down your choice of strategy and the reasons why this strategy is more appropriate to your project than the other.

Now that you have your basic strategy decided upon, you will need to consider how you will train each behavior. Start with a formal behavior objective for each behavior, including form, speed, and latency features as well as distance, duration, and distraction. For each discrete behavior, write out how you plan to train it. What procedure will you use? This should only take a single sentence per behavior, since you are more or less deciding whether to shape it or just differentially reinforce it, and whether to prompt it or not, and if so, how.

Next, plan specifically how you will fade prompts where appropriate and transfer stimulus control of each behavior to completion of the behavior before it. Write this down as well. Now you should have a basic plan of action.

Training Stage

Your next task is to carry out the training. Handle it systematically, training each behavior or segment as required, and appropriate to your plan, including its various features. Treat each discrete behavior as a separate training project until it is time to chain them. Be sure to video-record all of your training sessions.

Once the subject exhibits the entire sequence of behaviors, without any interjected prompts or cues, five times in a row, perfectly to criteria, you are finished with this phase of the exercise.

Exercise Analysis

Review your video several times. As before, review the video for the usual set of accuracies described in previous training exercises. After this, consider any difficulties or disruptions that may have occurred. What were they and what caused them? What changes to your plan or your reaction to the disruptions would generate more effective and efficient training? Write these questions and their answers down. The skills you are evaluating are broader than in the initial simpler exercises and so the questions are generally broader, as well. Your goal is to evaluate your planning and execution of the training project objectively, and identify your strengths and weaknesses in planning and executing that plan. Recognize particular excellences and the behaviors you could improve. The key to making them a conditioning experience that will result in an expansion of your repertoire of effective and efficient training behaviors is to identify deficiencies, explicitly explain what caused them to be deficiencies, explicitly identify what you can do to make them more efficient, and finally integrate these changes into your training and evaluate whether the changes are indeed effective. This will be your task in the exercise analysis aspect of this exercise.

Once you have completed this exercise, pat yourself on the back, and follow up by treating yourself in some way! This was a big and advanced project and you deserve some pride reinforcement.

Exercise #10. Discrimination and Generalization Training

This exercise will help you improve these behaviors or features of behaviors:

- planning for an appropriate level of discrimination and stimulus generalization, and
- carrying out discrimination and stimulus generalization training.

You will need:

- a clicker;
- treats;
- treat pouch;
- a reinforcer-deprived dog that is clicker trained;
- and video-recording equipment.

Most of the previous exercises have focused on the planning and acquisition stages of training. In this, the final exercise, the focus is on some behaviors that are more associated with the fluency and maintenance stages of training. Recall that in discrimination training, the general tendency toward stimulus generalization is conditioned against by narrowing the range of stimuli that will evoke the target behavior. Decide on the specific stimulus to control the behavior and rule out similar stimuli. How narrow or tight you make this depends on your objectives for the behavior. For example, you may want the word "sit," and not similar stimuli such as "sip," to evoke sitting behavior, but you likely want "sit" verbalized by other people as well as you, to evoke sitting. This is an instance of allowing a certain amount of stimulus generalization. If generalization is too narrow or too broad, problems will arise.

Training Stage

Start by choosing a behavior that has not yet undergone any discrimination and generalization training. You might have a behavior you have been working on that is just not at that stage yet, or you may need to train a behavior from the beginning. In this case, choose a simple behavior such as spinning in a circle, rolling over, or high five. The simplicity of the behavior does not matter for this exercise, so choose something that you can quickly and easily train to this level.

Once the behavior is reliable, and under stimulus control, you can begin discrimination training, ruling out similar stimuli. Reinforce for the target stimulus and not for other similar stimuli. Take it to a level that is appropriate for the behavior in question. This includes trials allowing for appropriate stimulus generalization (such as having other people to present the evocative stimulus, or you cueing it while facing away from the subject or lying down, rather than standing).

The key in this exercise is to rule *in* all applicable stimulus features and rule *out* all inapplicable stimulus features. Once you can reliably evoke the behavior with appropriate stimuli, and several similar stimulus conditions will not, you are finished with the training component of the exercise and you can move to the exercise analysis stage.

Exercise Analysis

Observe the video of the training several times. As usual, observe for the common mechanical and judgment skills evaluated in previous exercises. Then, observe how effectively and efficiently you conducted your discrimination and stimulus generalization training. Did it run smoothly, or did anything cause frustration or otherwise disrupt training? What exactly caused any frustration or disruption? What exactly could you have done to prevent these frustrations and/or disruptions? What can you do next time, in response to these frustrations and/or disruptions that would minimize them and get training back on track? Write all of these things down. Consider this exercise as a whole, and identify any behaviors that might improve your efficiency in performing this kind of training.

Once you have completed this exercise, pat yourself on the back, and follow up by treating yourself in some way!

Continuing Education

Courses provided through The Companion Animal Sciences Institute at www.CASInstitute.com address all of the topics covered in this chapter.

REFERENCES

Alexander, S. (2003). *The Quicker Clicker Kit*!

American Psychological Association. (2014). How does the APA define "psychology"? Retrieved February 19, 2014, from http://www.apa.org/support/about/apa/psychology.aspx#answer

Bailey, J. B., & Burch, M. R. (2002). *Research Methods in Applied Behavior Analysis*. Thousand Oaks: Sage Publications.

Balaban, M. T., Rhodes, D. L., & Neuringer, A. (1990). Orienting and defense responses to punishment: Effects on learning. *Biological Psychology, 30*, 203–217.

Burch, M. R., & Bailey, J. S. (1999). *How Dogs Learn*. New York: Howell Book House.

Catania, C. A. (2013). *Learning* (5th. ed.). Cornwall on Hudson: Sloan Publishing.

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

Chiesa, M. (1994). *Radical Behaviorism: The Philosophy and the Science*. Sarasota: Authors Cooperative.

Cipani, E., & Schock, K. M. (2011). *Functional Behavioral Assessment, Diagnosis, and Treatment: A Complete System for Education and Mental Health Settings* (2nd ed.). New York: Springer.

Clark, T. W. (2007). *Encountering Naturalism*: Center for Naturalism.

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

Delprato, D. J. (1981). The constructional approach to behavioral modification. *Journal of Behavior Therapy and Experimental Psychiatry, 12* (1), 49–55.

Donaldson, J. (2005). *The Culture Clash*. (2nd ed.). Oakville, Ontario: James and Kenneth.

Estes, W. K. (1944). An experimental study of punishment. *Psychological Monographs, 57* (3), 1–40.

Ferster, C. B., & Skinner, B. F. (1957). *Schedules of Reinforcement*. Massachusetts: Copley Publishing Group.

Fraley (2008). *General Behaviorology: The Natural Science of Human Behavior*. Canton: ABCs.

Fraley, L. E., & Ledoux, S. F. (2002). Origins, Status, and Mission of Behaviorology. In S. F. Ledoux (Ed.), *Origins and Components of Behaviorology* (2nd ed., pp. 33–169). Canton: ABCs.

Goldiamond, I. (1974/2002). Toward a constructional approach to social problems: Ethical and constitutional issues raised by applied behavior analysis. *Behavior and Social Issues, 11*, 108–197. Retrieved September 12, 2005, from http://www.bfsr.org/BSI_11_2/11_2Gold.pdf

Hawking, S. (2010). *The Grand Design*. New York: Bantam.

Hiby, E. F., Rooney, N. J., & Bradshaw, J. W. S. (2004). Dog training methods: their use, effectiveness, and interactions with behaviour and welfare. *Animal Welfare, 13*, 63–69.

Johnston, J. M., & Pennypacker, H. S. (2009). *Strategies and Tactics of Behavioral Research* (3rd ed.). New York: Routledge.

Laraway, S., Snycerski, S., Michael, J., & Poling, A. (2003). Motivating operations and terms to describe them: Some further refinements. *Journal of Applied Behavior Analysis, 36* (3), 407–414.

Ledoux, S. F. (2017). *What Causes Human Behavior—Stars, Selves, or Contingencies?* Ottawa, Canada: BehaveTech Publishing.

Ledoux, S. F. (2014). *Running Out of Time Introducing to Behaviorology to Help Solve Global Problems*. BehaveTech Publishing: Ottawa, Canada.

Ledoux, S. F. (2015). Origins, Status, and Mission of Behaviorology. In S. F. Ledoux (Ed.), *Origins and Components of Behaviorology* (3rd ed.). Ottawa, Canada: BehaveTech Publishing.

Ledoux, S. F. (2002). Increasing tact control and student comprehension through such new postcedent terms as added and subtracted reinforcers and punishers. In S. F. Ledoux (Ed.), *Origins and Components of Behaviorology* (2nd ed., pp. 199–204). Canton: ABCs.

Lerman, D. C., & Vorndran, C. M. (2002). On the status of knowledge for using punishment: implications for treating behavior disorders. *Journal of Applied Behavior Analysis, 35*, 431–464.

London, K. B., & McConnell, P. B. (2001). *Feeling Outnumbered? How to Manage and Enjoy Your Multi-dog Household*. Black Earth: Dog's Best Friend, Ltd.

Michael, J. (2007). Motivating Operations. In J. O. Cooper, T. E. Heron, & W. L. Heward (Eds.), *Applied Behavior Analysis* (pp. 374–391). Upper Saddle River: Merril Prentice Hall.

Miltenberger, R. G. (2008). *Behavior Modification* (4th ed.). Belmont: Thomson Wadsworth.

Moore, J. (2008). *Conceptual Foundations of Radical Behaviorism*. Cornwall-on-Hudson: Sloan Publishing.

O'Heare, J. (2017a). Correct classification of conditioned punishers as added versus subtracted stimuli. *Journal of Animal Behavior Technology, 7* (1), 7–10.

O'Heare, J. (2017b). *Training Dogs*. Ottawa, Canada: BehaveTech Publishing.

O'Heare, J. (2009). The least intrusive effective behavior intervention (LIEBI) algorithm and levels of intrusiveness table: A proposed best-practices model. *Journal of Applied Companion Animal Behavior, 3* (1), 7–25.

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

Pierce, W. D., & Cheney, C. D. (2013). *Behavior Analysis and Learning* (5th ed.). Mahwah: Psychology Press.

Pryor, K. (1999). *Don't Shoot the Dog! The New Art of Teaching and Training*. New York: Bantom Books.

Sidman, M. (2001). *Coercion and its Fallout* (Revised ed.). Boston: Author's Cooperative, Inc. Publishers.

Skinner, B. F. (1957/1992). *Verbal Behavior*. Acton: Copley Publishing Group.

Skinner, B. F. (1938/1991). *The Behavior of Organisms: An Experimental Analysis*. Acton: Copley Publishing Group.

Skinner, B. F. (1968). *The Technology of Teaching*: Meredith Corporation.

Skinner, B. F. (1953). *Science and Human Behavior*. New York: The Free Press.

Terrace, H. S. (1963). Discrimination errors with and without "errors." *Journal of the Experimental Analysis of Behavior, 6* (1), 1–27.

Thorndike, E. L. (1898). Animal intelligence: An experimental study of the associate processes in animals. *Psychological Review Monograph Supplement, 2* (4), 1–8.

Vargas, J. S. (2013). *Behavior Analysis for Effective Teaching*. (2nd ed.). New York: Routledge.

Wilde, N. (2003). *It's Not the Dogs, It's the People!* Santa Clarita: Phantom Publishing

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