Chapter 1

Achieving Lasting Behavior Change Through Behavior Analysis

Goals

1. Describe how human behavior influences our welfare.
2. Briefly describe the evolution of behavior analysis from its early beginnings to the present.
3. Discuss when the behavior of organisms was found to be just as lawful as other natural phenomenon and amenable to scientific investigation.
4. List and describe the philosophical concepts on which applied behavior analysis (ABA) is based.
5. Describe how ABA consists of a (a) scientific method, (b) technology, and (c) professional approach.
6. Define behavior.
7. Describe ABA in simple language.
8. Differentiate between applied and basic behavior analysis.
9. Briefly describe who protects clients’ rights.
10. List four current roles and functions of ABA participants that interest you most.
11. Review and describe each major step or element in Figure 1.1 that ABA professionals tend to follow.
12. Identify at least three of the elements in Figure 1.1 that were used with Harrison (see Box 1.2).

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INTRODUCTION

For better or worse, change is a fact of life. Change is inherent in nature and, as creatures of nature, in all of humanity’s personal and social behavior. Over the millennia, familial, tribal, social, cultural, legal, educational, business, health, and numerous other organizational systems have evolved to manage behavioral change. In modern times, civil societies attempt to manage change by creating laws, institutions, policies, and practices to provide a balance between personal and communal freedom to enable these societies to survive and flourish.

In the best of all possible worlds, if those systems were to function smoothly and effectively, all would be well. Alas, they often are imperfect and that is where trouble begins. If children fail to attain appropriate verbal, social, or self-help skills, that becomes a source of distress for their families and others in the community. When members of social, service, healthcare, business, or other organizations commit mistakes or shirk their responsibilities, others within, and perhaps outside of the group, pay the price. Personal and group (mis)actions, too, such as criminal acts, neglectful or harmful parenting, and drug, sexual, or self-abuse, certainly can take a toll on individuals and their societies.

While incredible progress has been made in our world today, much remains to be accomplished, especially within the realm of human behavior. Probably that fact explains why so many of us are fascinated by such questions as, “Why do people (and other living organisms) do the things they do and, if necessary, what can be done to change that behavior in ways that last?” During the past hundred-plus years, a science of the behavior of living organisms has been evolving in answer to these questions. As evidence of the broad interest in humane, responsible, constructive, durable behavioral change, many thousands of scientific researchers and practitioners today actively pursue those questions.

Yes, most of us recognize just how critical a role human behavior plays in determining the future survival of humankind. It is increasingly apparent that not only our own personal health and happiness, but the very continuation of homo-sapiens as a species, depends on people’s behavioral choices. To illustrate:

- Attaining/retaining good health by accessing, choosing, and consuming nutritious foods; exercising sufficiently and gaining adequate rest; having the wherewithal to function safely at work, play, and at home; and receiving essential skilled medical assistance versus damaging our health by consuming excessive quantities of marginally or non-nutritious foods or of harmful substances; participating in hazardous activities; and being unable to access essential help and support.

- Optimizing our abilities reasonably to support ourselves and our dependents through education, training, and constructive planning and detecting and capitalizing on available opportunities versus struggling barely, if at all, to survive.

- Saving and contributing to our own savings and the world’s resources versus exploiting, over-expending, or wasting them.

- Cooperating and collaborating in mutually beneficial group decisions versus competing to the advantage of the few but to the detriment of the many.

The list goes on and on. As any thinking person must agree, not only our present but our personal and collective future prospects depend upon how humans behave. That being so, one of the most profound questions anyone can pose is: “What must we as individuals and as members of the human family do to advance our survival and to permit us to live longer, healthier, and more fulfilling lives?” No one can provide an unequivocal answer because our understanding of human behavior and our ability to modify it humanely and effectively remains limited.

A BRIEF HISTORY OF THE SCIENCE OF BEHAVIOR

Addressing the overt (directly observable) and covert (within the individual—e.g., thinking, imagining) behavioral issues of individuals goes as far back as humans have lived in social groupings. From prehistoric times onward, people have struggled to
comprehend why living organisms behave the way they do, and, what, when necessary, they could do to change it. This seemingly universal inclination to comprehend and change behavior has generated numerous explanations and methods. Some have been wise; others fanciful or even cruel, though many have been well-intended: to help people meet their daily challenges and gain better control over their destinies. Over the millennia, various methods were attempted to allow people to understand and cope with such problems: belief systems, folklore, physical force, social regulation and sanctions, wars, and various other strategies. Of those, the more serious and systematic approaches eventually coalesced into the field of psychology.

Within the more recent past, though, many serious philosophers and scientists began to speculate about whether the behavior of living organisms might actually obey natural laws in ways similar to those of the operation of the physical world. In the latter part of the 19th century, experimental psychology emerged as a scientific enterprise represented by an expanding array of scientifically-oriented investigators of the “psyche” or “mind.” Many psychological scientists viewed behavior according to its structure. This structuralism, initially proposed by Wilhelm Wundt (1832–1920) and promoted by Edward B. Titchener (1867–1927), sought to understand the adult “mind” in terms of a set of simple, definable components. Wundt viewed the mind as being composed of the sum total of the individual’s experience from birth to the present time. The structural psychologists’ major tool was introspection (a careful set of observations made under controlled conditions by trained observers using a stringently-defined descriptive vocabulary). Using this technique, they attempted to discover how these components fit together into complex forms called hypothetical or imaginary constructs. These include internal mentalistic processes like attitudes, feelings, self-concepts, or motivations, or even structures like Freud’s (1856–1939) id, ego, superego or Carl Gustav Jung’s (1865–1961) concepts of the extroverted and introverted personality types, archetypes (differing but repeating patterns of thought and action that appear time and again across people, countries, and continents), and the collective unconscious, the repository of all the religious, spiritual, and mythological symbols and experiences.

Others, like John B. Watson (1878–1958) took an alternative, much more objective route toward exploring why people behave as they do. His methodological behaviorism emphasized directly observing human and animal action to study behavior. He assumed that, like other natural phenomena, behavior obeys certain basic laws. He particularly emphasized the interaction between maturing human beings and their environments, contending that he could guarantee to take “well-formed” healthy infants and a specifically organized world, and train those infants to become “any type of specialist … doctor, lawyer, artist, merchant-chief, and, yes, even beggarman” (Watson, 1930, p. 82), B. F. Skinner (1904–1990) assumed a similar, though more parsimonious (economical) perspective, endorsing the notion that the behavior of organisms is the subject matter of science.

Today, behavior analysts, along with many other scientists, agree that the behavior of organisms is as subject to the laws of nature as are any other natural phenomena. Like other natural scientists, radical behaviorists attribute what living organisms do and say overtly and covertly (as in “thinking”) to their ontogeny (the origin and development of an individual organism from embryo to adult) and to their phylogeny (those historical patterns of relationships among their genetic endowments, past experiences, and the internal and external environmental contingencies of reinforcement currently affecting them). Another way of saying this is that particular patterns of behavior evolve and persist through natural selection, in much the same way that Darwinian selectionism (Darwin, 1872/1958) works. Those qualities best suited to the organism’s physical and cultural environment (the local common code of systems of beliefs and attitudes about what is good and bad, right and wrong) are most readily selected for survival.

This deterministic perspective asserts that, like other natural phenomena, human behavior obeys the laws of nature—that it is causally determined—by preceding events and/or consequences. And, perhaps even more important for us as agents of behavioral change, we appreciate that like physical and chemi-

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1 See MacCorquodal & Meehl, 1948.
Behavioral processes, once translated into (technically, operationalized as) human actions, these behavioral phenomena lend themselves to manipulation in the form of scientific investigation. This recognition has evoked an ever-expanding experimental analysis of behavior; one directed toward producing a body of knowledge and understanding about how contingencies of reinforcement influence what people, and other living organisms, say and do.

As with other scientific information, many have pondered whether it would be possible to put the knowledge derived from the scientific analysis of behavior to use for the benefit of humankind. Or is it too late? The race between the forces supportive of healthy growth and of destruction is intense. The more we learn about the intricacies of the behavior of organisms, and the sooner we learn how to constructively and compassionately apply that knowledge, the better chance humanity has to continue to survive and thrive. Bertrand Russell, the eminent philosopher, stressed this point in 1955:

Whether men will be able to survive the changes of environment that their own skill has brought about is open to question. If the answer is in the affirmative, men will have to apply scientific ways of thinking to themselves and their institutions. They cannot continue to hope, as all politicians hitherto have, that in a world where everything has changed, the political and social habits of the eighteenth century can remain inviolate. Not only will men of science have to grapple with the sciences that deal with man, but—and this is a far more difficult matter—they will have to persuade the world to listen to what they have discovered (Russell, 1955, p. 6–7).

What Russell sagely endorsed was to scientifically examine and publicly disseminate new methods for arranging and applying effective, morally and ethically justifiable behavior-change techniques, as epitomized by applied behavior analysis. This science would

- rely on an empirical approach, one based on observational and experimental practice, to seek to discover and describe as economically or parsimoniously as possible the natural laws and principles explaining human behavior.

- convince others that they should pursue such discoveries and then establish how best to apply these findings toward the betterment of humankind.

The Early Evolution of the Field of Applied Behavior Analysis

By the 1940s, the field was well enough established that Edwin G. Boring (1950) was able to draw upon a fairly voluminous body of work in preparing his History of Experimental Psychology.

Among the greats contributing to that body of knowledge was B. F. Skinner (1938), of whom you will read more in Chapter 2. Skinner undertook to experimentally analyze basic behavioral processes both within a temporal and a biological context. This endeavor was labeled “the experimental analysis of behavior.” Then, in the late 1950s and early 1960s, Skinner and several of his students and colleagues (e.g., James Holland, Sidney Bijou, Israel Goldiamond, Nathan Azrin, Fred Keller, and others) began to explore ways to extend those processes and research procedures to behavior within a social context. With the publication of the Journal of Applied Behavior Analysis in 1968, the latter endeavor, previously labeled “behavior modification,” officially assumed the title applied behavior analysis (ABA). ABA is an evidence-based method of examining and changing what people (and other living creatures) say and do. Applied behavior analysts transfer their experimental investigations to the study and management of behavior in the real world. They examine behavior-environment relationships of relatively immediate individual, social, and cultural importance.

Among others, Holland and Skinner (1961) successfully advanced college students’ conceptual learning by programming instruction, breaking instructional content down into small parts or “steps” and requiring the student to participate actively by answering questions on the material. Meanwhile, in the mid to late sixties, Goldiamond (1968) addressed stuttering, Ayllon and Azrin (1965) psychiatric patients’ adaptive behaviors, and on various occasions, Sidney Bijou and associates
like Donald Baer, Jay Birnbrauer, and Montrose Wolf, (see references) addressed the behavioral deficits and excesses of young children with developmental delays. The unambiguous success of those early efforts unleashed a movement toward applying behavior analysis to an array of behavioral challenges previously found quite resistant to change. Well-controlled applied experimental investigations covered the gamut from coping with communication difficulties, school learning and deportment, self-management, physical well-being, and social issues, to an extensive list of methods for remedying other behavioral deficiencies and excesses. Not only did those investigators present compelling evidence of their participants’ progress, but thanks to the tightly-controlled experimental methods of ABA, they were able to support their claims convincingly with clear and objective evidence. (See Box 1.1, “Dictionary Definitions of Philosophical Concepts on which ABA is Based.”) Those features constitute the essence of applied behavior analysis. As you proceed through this text, you will increasingly recognize how successfully the field of applied behavior analysis has been in fulfilling those functions.

Another facet of behavioral analysis has focused primarily on the conceptual analysis of behavior, which verbally addresses historical, philosophical, theoretical, and methodological issues. Illustrations of the latter are found in such journals as The Behavior Analyst, Verbal Behavior, and numerous others, covering conceptual and professional issues.

As you will see by referring to our list of references, the analysis of behavior—basic, applied, and conceptual—has not only survived, but also has flourished to the extent that today many hundreds of scientific journals on the topic are published. (A search of Google Scholar yielded over 2,600,000 citations of applied behavior analysis for the year 2010.) As one prototype, ABA’s effectiveness in promoting adaptive behavior among people on the autism spectrum certainly has attracted the attention of scientists, professionals, and the lay population at large. (Autism is a syndrome associated with communicative, emotional, social and often other severe difficulties, and previously highly resistant to successful treatment.) Yet the difficulties of autism are only one set among numerous behavioral challenges. Throughout this text, you will encounter extensive experimental evidence demonstrating how behavior analysts have successfully applied established principles of behavior toward improving learning and performance in a myriad of specialty areas. The list includes education, job training, developmental and rehabilitation services, parenting, personal, family and vocational counseling, sports performance, health promotion and treatment, commercial and industrial ventures, public services, public affairs, war and peace. In fact, just about any situation involving the actions of living organisms is a potential focus for an experimental analysis.

**APPLIED BEHAVIOR ANALYSIS TODAY**

As our knowledge about how organisms learn and change their behavior grows, those practicing applied behavior analysis become increasingly able to successfully guide learning and performance in specific constructive directions. As often happens

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**Box 1 Dictionary Definitions of Philosophical Concepts on which ABA is Based**

| **Determinism:** | Doctrine that acts of the will, occurrences in nature, or social or psychological phenomena are causally determined by preceding events or natural laws. |
| **Empiricism:** | Derived from or guided by experience or experiment. |
| **Parsimony:** | The simplest theory that fits the facts of a problem is the one that should be selected. |
| **Scientific method:** | A method of research in which a problem is identified, relevant data are gathered, a hypothesis or question is formulated from these data, and the hypothesis or question is empirically tested. |
with new terms, the meaning of applied behavior analysis (ABA) has been evolving over time. Essential to its definition are that ABA is a scientific method, a technology, and/or a professional approach.

Applied Behavior Analysis as a Scientific Approach

When we speak of behavior, quite simply, we refer to what living organisms do, including what and how they communicate, aside from its value or acceptability. It is a neutral term. We do not use the term to connote “good behavior” or “misbehavior,” as teachers, parents and child-care specialists sometimes do. Behavior analysis is the experimental investigation of variables that influence the behavior of any living organism. From the beginning, applied behavior analysis (ABA) has taken an empirical, that is, an experimental, data-based, scientific approach, drawing upon observation and experience. Its aim has been to identify the variables that lawfully and meaningfully influence behavior in real-world settings, such as clinics, hospitals, schools, the home, the workplace, virtual space capsules (e.g., Hienz et al., 2005), out in the community—anywhere people (and sometimes animals, like guide dogs, work horses, and others that perform service functions) participate in their daily affairs. The meaning of “applied” in “applied behavior analysis” is that it quantitatively describes and functionally addresses socially important behavioral challenges. This is done by successfully teaching and supporting constructive, adaptive, healthy, safe, and satisfying learning and performance, and by reducing detrimental behavioral excesses and deficits. Baer, Wolf, and Risley (1968) originally defined and described applied behavior analyses as “experimental investigations of behavior conducted in real-world settings.” In so doing, they noted its essential features as follows: Within ABA, the behaviors to be changed are explicitly important and objectively and quantitatively measurable. Its experimental manipulations analyze with precision sufficient to “show clearly what arrangements were responsible for the change” (p. 97). That means that its descriptions of all procedures and contextual conditions contributing to that change are complete and technologically exact, while the effectiveness and magnitude of the change is of sufficient value to be meaningful and general (see Table 1.1).

To elaborate, when we speak of applied research, we refer to choosing as our subject matter behavior that is important and immediately beneficial to individuals and/or society. Basic research typically is not conducted in applied settings, such as homes, schools, factories, etc. Generally, it takes place in a laboratory where responses can be investigated under tight experimental control. Topics of investigation in applied behavior analytic research are pragmatic, that is, of practical value, and conducted in real-world settings, where tight experimental control is more difficult to achieve. So, investigating ways to heighten students’ ability to speak native or a foreign language, or workers’ adherence to safety guidelines, would qualify as a candidate for applied

<table>
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<tr>
<th>Characteristic</th>
<th>Definition</th>
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<tr>
<td>Applied</td>
<td>Focuses on socially significant behaviors</td>
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<tr>
<td>Behavioral</td>
<td>Focuses on observable events (what people say and do)</td>
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<tr>
<td>Analytical</td>
<td>Demonstrates functional relationships</td>
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<td>Technological</td>
<td>Defines procedures clearly and objectively</td>
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<td>Conceptually systematic</td>
<td>References and relates procedures to basic principles of behavior analysis from which the procedures are derived; ties procedures directly to the principles of behavior analysis</td>
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<tr>
<td>Effective</td>
<td>Demonstrates socially significant behavior change</td>
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<tr>
<td>Generality</td>
<td>Extends behavior change across time, setting, or other behavior</td>
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behavior analysis, while actions not ordinarily valued by them or those to whom they are responsible, such as bar presses or chain pulls in the laboratory, would apply more appropriately to experimental but not to applied behavior analysis.

Although in ABA the behavior selected for analysis and intervention is of practical value, sometimes it can be difficult to quantify. Try objectively, reliably, and validly to measure such human behavior as “being generous, affable, wise, or clever.” Not easy, but indeed possible. Baer, Wolf and Risley (1968) counseled that, to achieve a thoroughly reliable quantification of behavior, applied behavioral researchers “must try harder” (p. 93).

Twenty years after publishing their initial description of applied behavior analysis, Baer, Wolf, and Risley (1987) reviewed the history of the field. They noted that some of ABA’s elements (applied, behavioral, analytic, technological, conceptual, effective, and capable of appropriately generalized outcomes) had expanded in scope, in the sense that problems of a more complex nature were being addressed. They also recognized that novel, especially computerized, measurement and analytic strategies had emerged, and that the context in which the behavior is emitted (“expressed” or “produced”) plays a more important role in determining how a person behaves at a particular time and place. Additionally, greater attention had been paid to the particular function of unwelcome or dangerous behavior and to the complexity of interactions between antecedent circumstances and the behavior of interest.

Once an experimenter can turn behavior on and off or up and down “at will,” whether it be smiling, singing, choosing, using, solving, or whatever, the experimenter has achieved a successful behavioral analysis. Convincing parents, teachers, clients themselves, managers, and supervisors that they should be able to manage behavior similarly, however, may not be easy. But as you will discover, applied behavior analysts can also apply their methods to teaching the very application of those behavior analytic methods (as is our present intention).

In describing a particular application, we have a responsibility for identifying and completely specifying all the actions to be taken by the change agents. To meet the technological qualification, well-prepared program implementers must be able to take that description and, assuming they apply it reliably to similar participants, essentially achieve or replicate (duplicate) the results.

Applied Behavior Analysis as a Technology of Behavior Change

Behavior analysts assess behavioral concerns and formulate the most promising solutions by designing methods to apply, monitor, analyze, revise if necessary, and communicate the effects of their interventions. In general, ABA investigations involve one or more of several categories of behavior-change tactics. Examples are numerous, as in the following list:

**Increasing behavior** such as:
- communicating, reading, defining words correctly
- praising, describing an accomplishment, donning safety equipment, adhering to protocols precisely
- completing assignments according to standards
- participating in decision-making and following through on agreements
- exercising more skillfully, harder, and/or longer
- creating works of art, literature, or technological solutions to problems
- adhering to health and/or self-help routines

**Teaching and maintaining behavior** such as satisfactorily performing:
- academic skills, including reading, writing, spelling, arithmetic operations
- technical skills, such as designing an engine, a computer program, an electromechanical device
- professional skills, like performing difficult diagnostic, surgical, or engineering routines
- self-care skills, like grooming, self-feeding, preparing meals, making beds
• self-management skills, like organizing one’s time, completing assignments, controlling emotional outbursts
• choosing and conforming to healthy diets and exercise
• family, organizational, and management skills such as systematizing, choosing, and monitoring individual and group goals
• job skills, as in assembling products, providing specific services, preparing reports
• social skills, such as asking and answering questions, greeting people, excusing one’s inappropriate (rude) behavior, engaging in conversations, participating in community organizations
• leadership skills, as in defining an organization’s mission, setting objectives, defining job requirements, assessing performance, providing feedback, reinforcing positive practices
• continuing productive, proactive practices such as those in this list
• engaging in activities of civic responsibility, like voting, caring for the environment
• detecting subtle differences in one’s own or others’ behavior or the products of their behavior

Making behavior sensitive to environmental events, as in learning to label actions as correct, expert, precise, sophisticated, talented, or skillful:
• decoding letters and words: reading complex words and sentences in one’s own or a different language
• identifying and applying the correct way to solve mathematical problems: basic or advanced operations, such as adding, subtracting, multiplying, dividing, solving a range of equations or word problems
• differentiating an actual painting by Vermeer from a forgery; a benign from a malignant tumor; a fine from an ordinary wine; a designer outfit from a knock-off; a brilliant versus an amateur musical or sports performance; a cat from a jaguar; a child with autism versus one with a hearing loss; an adult with depression from one with fatigue caused by a medical problem
• selecting the most valid and reliable measurement or functional analytic system under a particular set of circumstances

Generalizing or expanding the breadth of performance to new stimuli:
• reading words written in script after seeing them in print
• using pictures to ask for food and to ask for toys
• behaving politely with all the teachers
• using addition and subtraction with word problems as well as with numerals
• choosing a healthy diet at home and in a restaurant
• using good posture while standing as well as while sitting
• listening without interrupting to one’s spouse, one’s parents, and one’s children

Reducing maladaptive, counter-productive behavior that:
• interferes with one’s own or others’ well-being, satisfaction, learning, or progress
• is dangerous or destructive, such as injuring others or making oneself ill
• create a atmosphere of fear and intimidation

Take a look at the true story of Harrison (Box 1.2), as written by his mother, who had studied applied behavior analysis with us. It describes a boy who had been diagnosed with autism spectrum disorder. Years of intensive effort by his parents, teachers, and himself are reflected in his amazing accomplishments. As we inform you about applied behavior analysis in detail, reflect back on this tale to see how many of its features may have supported this winning outcome.

Beyond its thousands of other success stories, ABA offers the distinct advantage of providing objective evidence of the effectiveness of its methods. To qualify as a true ABA program, each single-
Box 1.2  Harrison Takes Off

When Harrison was 22 months old we began to worry that he might be having trouble hearing, resulting from his many ear infections. Although his preschool teacher voiced her concerns, we saw no reason to investigate further. Five months later, though, convinced that he was significantly behind on some developmental milestones, the school did its own preliminary testing. Speech and OT (occupational therapy) services were instituted, while we awaited the professional evaluation, scheduled five months later.

During the 22 to 32 month time period, we watched Harrison more closely and noticed real discrepancies between his behavior and that of his peers. Harrison loved to spin, to follow lines using his peripheral vision, and hated to be touched, especially on his hands and feet. Meanwhile, he lost the few words he had learned earlier and became increasingly quieter, spending his time looking at the sky for airplanes, lining up his toy cars, and spinning. He was very happy and smiley, but generally silent. He loved tickles, big bear hugs, and playing in the water—and with bubbles. He also preferred playing under the playground equipment rather than on it with the other children, watching the sun through the spaces in the wood. He could swing incessantly.

When the results of the standardized tests described him as functioning within the moderate to severe range of mental retardation, I enrolled in a series of courses designed to teach parents and teachers of children on the autism spectrum how to apply behavior analysis. Soon I began to put my learning into practice, especially the importance of all players in the clients’ life using the same contingencies. In the early years of applying behavior analytic skills with Harrison, I worked to ensure that preschool teachers, his father, and really anyone who interacted with our boy did not allow him to use his ‘charm’ to avoid or escape things he did not want to do. These escape episodes could be related to anything in his daily life that he figured would be easier if someone else did it for him. We discussed what the important skills were, when it was important to ensure that Harrison practice the skill, and what type of reinforcement to use to motivate him to perform it. This was especially important in his work with the speech therapist, because he did not always like to do the work required.

Today, at age 11, our son is functioning at or above average for his age. The new community middle school he attends covers grades 5 to 8, so he has had to master changing classrooms and participating in the school’s completely new autism program. He has always been in mainstream classes except for receiving special instruction in social skills, speech and OT. With speech no longer a major problem, Harrison now only attends the social skills and OT sessions. He still has some social difficulties and a few problems with expressive and receptive language. He tends to perseverate on topics of his own personal interest, and has trouble reading nonverbal cues signaling disinterest by his listeners. He also has difficulty gaining their attention prior to speaking, and knowing when and how to change conversational topics. Nonetheless, he excels in his knowledge of geography, having earlier won his school-wide geography contest, and is talented musically. Although now a 6th grader, he has been placed in the 7th grade strings class for next year. He was the only 5th grader selected to play in the middle and high school Latin strings orchestra for the ‘Viva City’ celebration this spring at orchestra hall. He sings alto in the Madrigals choir at school; is a great swimmer and is currently working on refining his front crawl, breast stroke, and butterfly. This year he received all A’s. He serves as a model for other students in his school’s autism program and loves assisting his teachers. He has taken his first flight in a 2-seater airplane and will take more training flights this summer. He finds his interests and sets high goals for himself, but will live up to or down to whatever goals others set for him. Our intention is to keep them high, but achievable so his desire to accomplish will continue because he takes great pride in his achievements.

Proud of these achievements, Harrison and his parents have given their permission to use his real first name.

This story has a recent postscript: turn to page 677 to see for yourself.
case application must be accompanied by graphic displays of the impact of the specific intervention. Additionally, before any treatment is deemed to produce a particular result reliably, it must demonstrate that outcome in the form of multiple replications (or duplications of the treatment and effect) either across different behaviors within the same individual or across different individuals or groups. Supplying evidence that favors a particular ABA intervention helps practitioners and consumers to secure the resources essential to its implementation.

Applied Behavior Analysis as a Profession

By its nature, applied behavior analysis is conducted under conditions of daily living in homes, educational and training institutions, hospitals, clinics, works settings, dormitories, out in the community—anywhere people ordinarily spend their time. Clientele include those whose actions present both ordinary and exceptional daily challenges, such as personal problems in living, troublesome family and other social interactions, delayed developmental skills, and worrisome risks to health, safety, livelihood, and overall well-being. Because an essential feature of ABA is gathering valid evidence of behavior change over time, the method is self-correcting. By observing, recording, and graphing ongoing performance patterns, change managers can determine whether to continue with an intervention or to adjust it. Generally, they persist with those explorations until they find a mix that continues to produce solid evidence of progress. Then, to be absolutely convinced that those indications of success are indeed a function of the specific intervention and not just happenstance, they test the validity of their conclusions by using one or more experimental-analytic designs. Note that each ABA intervention is, in a sense, a single-case “experiment.” This is not to say that every problem addressed by ABA is solved; just that when success is achieved, as it often is through a course of procedural adjustments, we can feel confident that the ultimate intervention, and not some other unknown factor, was responsible.

Given the confidence inspired by its precise methodology and the confirmation of its successes, numerous commercial, educational, or service organizations have adopted ABA as their direct behavior-management strategy and have employed trained applied behavior analysts to perform professional duties. “Applied Behavior Analyst” increasingly is listed as a job title in educational, human service, commercial, and other enterprises. In fact, many states in the United States as well as governments elsewhere already have required or are in the process of requiring that people promoting their services as applied behavior analysts document the adequacy of their training and demonstrate their knowledge and skills. They do this by presenting their credentials, passing examinations covering a breadth of information of the sort contained in this text, demonstrating their ongoing ability to apply the skills deemed essential by specialists and peers in the field, and regularly upgrading their competence through continuing educational experiences.

Of course, being able to pass a written or oral examination is no guarantee that the ABA practitioner actually will consistently examine behavioral challenges skillfully, design and apply interventions and analytic strategies appropriately, or communicate the results and make useful recommendations for the future clearly. Organizations such as the Behavior Analysis Certification Board® (BACB®) have begun to address this concern by incorporating documented supervised practical experience in their list of requirements. (See the Behavior Analysis Certification Board® website—http://www.bacb.com/ for the current requirements.)

Must everyone who conducts applied behavior analysis be certified? Not if the person conducting the analysis is not directly serving the public. But in that case, the venture probably is being carried out for research purposes and will require peer approval.

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The BACB® is nonprofit corporation whose “mission is to develop, promote and implement a voluntary international certification program for behavior analyst practitioners” (http://www.bacb.com/)
Otherwise, those who offer the public their services as applied behavior analysts for a fee, who work in a jurisdiction requiring it, or who seek the reassurance of their peers that they have mastered the basic knowledge essential to practicing ABA should probably seek certification or, should it come to pass, licensure.\textsuperscript{3}

As an empirical scientific enterprise, applied behavior analysis is based on or derived from controlled observation or experiment; it is designed to produce data, or factual evidence. No one honestly can claim that ABA is a sure cure for everything that ails the human condition. On the contrary, what this science-based technology does provide is a valid and objective way of examining behavioral challenges and, by using refined investigative methods, of testing promising interventions. Then, depending on the behavioral repertoires of individual participants and change agents and accessibility of material and human resources, it tries to identify circumstances that may support or alter the behavior of interest. It also tests the feasibility of promising ethically sound change strategies.

ABA does not limit itself to any single subject matter any more than can the broad disciplines of social work, clinical or counseling psychology, biology, physics, chemistry, or engineering. Those with special qualifications in the area of interest take the lead when describing optimal performance and join the participants and/or their advocates and the change agent in setting the goals and objectives of the particular ABA intervention. (Of course, many qualified behavior analysts also have qualifications in other fields, such as specialized or general education, training, counseling, psychology, developmental and rehabilitation services, corrections, job safety, business, health, economics, animal training, medicine, commerce, industry, and so on. In such cases, they sometimes may fulfill both sets of responsibilities.)

WHO, THEN, PROTECTS CLIENT RIGHTS?

As in any responsible community, various people serve as advocates for dependent clients, by reviewing and approving (or not) the intervention goals and methods. These advocates may include members of a peer review committee who represent the perspectives of the clients; the consumers of ABA services, their parents, guardians, or designated representatives. Typically in the United States, when university faculty members plan research, whether with humans or nonhumans, their action plan must be vetted by a committee of peers before the study can begin. Professional associations, technical societies, and health and human service agencies also delegate those sorts of responsibilities, usually to a committee of peers, as do many educational and business organizations. Additionally, consumer groups, such as parents or clients with particular common interests or challenges, often organize committees to see to it that their own values and concerns are heeded. As you will see, especially in our discussion of ethics (Chapter 31), representatives of consumers’ communities are urged to review the goals and proposed procedures before endorsing and allowing particular categories of ABA plans to proceed.

\textsuperscript{4}Applied behavior analysis per se is not a moral philosophy. As you will see, ABA often has successfully addressed such goals as enabling people successfully to communicate and/or interact effectively with others; control drug abuse; decrease or eliminate problematic behaviors such as fears or phobias, enuresis, behavioral excesses, and deficiencies; master physical feats or job skills; achieve academically; parent skillfully; lead organizations successfully; humanely train and manage animals as they perform particular jobs; and so on. But as a science and technology, it imposes no value on which behavior is good or bad, right or wrong. That must be undertaken by the clients or their surrogates, behavior analysts themselves, peer review boards, ethics committees, responsible parents or advocates, or others who undertake to advocate for the participants.

\textsuperscript{3}At the time of this writing, ABA licensure is being investigated by some jurisdictions as a possible qualification for ABA professionals who provide their services for a fee.

\textsuperscript{4}This symbol of justice scales will appear throughout this text when ethical or legal issues are discussed.
As you now recognize, today, ABA is practiced worldwide. If you, as a reader, have a specific behavioral interest or concern, you are reasonably certain to find a set of peer-reviewed journal publications on the topic. In the increasingly rare event that you cannot locate any, by the time you master this book and proficiently practice its methods under supervision, you may be the one to blaze a new trail in this exciting approach to evidence-based behavior change.

Probably because the field of applied behavior analysis has been associated with striking confirmation of successes in all walks of life since its inception about half a century ago, the enterprise has continued to expand rapidly. Membership in the applied branch of its flagship organization, the Association for Behavior Analysis International (ABAI), has grown from a handful of ardent, mostly United States midwesterners, to many, many thousands world-wide. Untold numbers, whether certified by the Behavior Analysis Certification Board or not, and who do or don’t belong to the ABAI or related organizations, are practicing within the discipline. As Table 1.2 suggests, they use their skills in the community, sports, education, and human services, as well as within clinical, health, manufacturing, commercial, financial, and numerous other institutions and organizations. Sensible behavior analysts who hope to live healthy, fulfilling lives, as we ourselves try to do, also apply that knowledge to manage their own behavior, and by mutual informed consent, that of members of their households.

As we have seen, behavior analysts may combine their expertise with other roles. Whether parents, organizational behavior or performance managers, coach, clinician, trainer, consultant, teacher, counselor, psychologist, psychotherapist, social worker, vocational counselor, speech and language therapist, personnel or organizational manager, or any other descriptor related to analyzing and improving human performance, applied behavior analysts contribute by supporting improving performance. That is, they assist their consumers to function more effectively, efficiently, productively, maturely and perhaps less destructively, toward themselves or others. To succeed, applied behavior analysts must demonstrate their mastery of the concepts and methods of applied behavior analysis, plus other relevant analytic and performance skills. Additionally, organizations desiring to verify that their behavior analytic operation meets performance requirements in specialized areas (e.g., behavioral safety or autism educational programs) can seek certification from particular independent organizations, such as the Cambridge Center for Behavioral Studies (http://behavior.org). Those wanting assurance that their specialized behavioral skills meet quality standards should search for it within their professional specialty organizations. An example is qualifying as a Picture Exchange Communication System implementer or trainer. Candidates must meet mastery standards for certification set by its parent organization, Pyramid Educational Consultants (http://www.pecs.com).

If a program of behavior is to succeed, obtaining the cooperation of affected individuals is essential. You can do that within organizations and families by inviting those directors, senior managers, and/or breadwinners in charge of the rewards (reinforcers) inherent in the system (organization, neighborhood, family, etc.), to participate in the decision-making process. Sometimes the same individual occupies more than one role, as in the case of a parent, teacher, counselor, or therapist who has designed the program, observed and recorded data, and analyzed results. At other times contingency managers’ involvement is limited simply to presenting assignments, instructions, or other forms of guidance plus appropriate consequences like praise, tokens, rewards, and so on. The success of the enterprise depends on the collaboration of everyone involved. (Chapters 3 and 24 address such issues as how to facilitate changes in the contingency manager’s behavior.) Now, allow us to provide you with a brief overview of the steps applied behavior analysts take in pursuing their activities as science/practitioners.

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5An alternative or augmentative behavior-analytic-based system that enables non-speaking clients to express their wants, and observations, based on exchanging pictorial images rather than spoken words (see Chapter 19).
### TABLE 1.2  A Sample List of Current Roles and Functions of ABA Program Participants

<table>
<thead>
<tr>
<th>Category</th>
<th>Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academic task learning</td>
<td>rehabilitation services, direction-following, donating food to food banks, dropping out of school, earplug wearing, eating regulation; skills education, academic: pre-school, college, graduate, and professional, equivalent-class formation, fear of flying, fire evacuation skills, food acceptance, frequency of recording behavioral data, gang violence, goal-setting, hallucinating, exhibiting fears and phobias, obsessing, handwriting, health: care, promotion, treatment, hemodialysis, cooperating during, hyperactivity, imitating, inhalation equipment, use of by asthmatics, initiating socially, instruction-following, lifting, transferring patients, manufacturing, quality, productivity, marketing, matching-to-sample, mathematical problem solving, motor performance</td>
</tr>
<tr>
<td>Accident prevention</td>
<td>nervous habits, tics, noise, reduction in lunchroom, organizational change, over-selectivity, parenting, participation in family activities, paying attention to work assignments, pedestrian safety, peer management, peer-assisted learning, tutoring, personal, family, and vocational counseling, pivotal responses, learning, preventing cumulative trauma disorders, public affairs, public services, quality of manufactured goods, quality of services, reading, reciprocal interactions, recycling, requesting skills, residing in a virtual space capsule, safety, on-the-job, at school, in the community, school-wide student improvement, self-injury, self-monitoring, recording, separation anxiety, service friendliness, sick-leave, use of social greetings, social skills, pro-social, seat belt use by motorists, children in shopping carts, self-control behavior, social interacting, speech acquisition and other forms of communication, speech fluency, spelling, staff training, staff interactions with clients, stair-use, stereotypy, student academic performance, student deportment, student truancy, studying, stuttering, self-injury, self-monitoring, sports skills, story writing, supervisory performance, teacher praise, tantrumming, task completion, teachers greeting of students, teaching strategies, test performance, tolerance for delay, training skills, pre- and in-service skills, transition times, vandalism, verbal skills, violence, vocational, job skills, war and peace</td>
</tr>
</tbody>
</table>
WHAT PATH DOES APPLIED BEHAVIOR ANALYSIS GENERALLY FOLLOW?

While any bona fide application of behavior analysis must include the basic features described earlier (Baer et al., 1968; 1987), no standard template exists for conducting ABA programs of research and intervention. Rather, the field continues to evolve scientifically and technologically. For the moment, though, Figure 1.1 probably typifies the steps applied behavior analysts generally follow in designing and conducting their ABA programs.

Identifying and Deciding to Address a Problem or Challenge

Those who contemplate the need for behavior change generally are influenced by various factors. Perhaps it is one’s job to manage, teach, rehabilitate, or treat people. Maybe the impetus derives from our desire to support the common good, as in protecting the environment; preserving resources; encouraging public, group, and personal health practices; promoting peace; international good-will; or freedom from want, fear, oppression, or other threats to human well-being. Fairly often an ABA program is prompted by a presenting behavioral challenge, such as someone disrupting or failing to perform as expected within a family, organization, or out in the community. Sometimes the decision to intervene evolves from the interest or curiosity of the behavior analysts themselves or the organization employing them. Examples of the former might be searching for reasons why students cause disturbances or fail in school, while others survive and/or thrive; why a youngster regularly attacks a sibling at home or line workers slow down production through inefficiency or unsafe work practices; why managers berate personnel to the point that their victims retaliate by vandalizing or by leaving the organization. On occasion behavior analysts may be looking for more effective methodological refinements, such as ways to collect or validly analyze complicated data or social practices. And the list goes on. Chapter 2 surveys the building blocks essential to assessing and planning behavior change programs.

Preparing an Environment Supportive of Constructive Change

Before initiating any action, the behavior analyst needs to be aware of what human and material resources are available or easily attainable in his or her work setting. We refer to adequate funds, the skills, values, priorities and limitations of personnel, along with time, space, equipment, supplies, and so on. Identifying other contenders for these and/or other assets and the strategies for handling those likely to compete is crucial. Should adequate wherewithal be lacking in the setting, the behavior analyst must find a way to obtain or compensate for any missing pieces. Support for many of the investigations reported in this text includes line-item budgets or special allocations, government, community, or private grants or awards, insurance reimbursements, worker organizations, client fees, and pro bono or volunteer contributions of time, funds, or goods.

Social and material support by family members, local supervisors, consumers, peers, subordinates, and worker organizations also can influence the progress of an ABA program. When all interested parties back the aims and methods of a given ABA program, it has a greater likelihood of success than if there is dissent in the ranks. Such individuals can encourage or hinder progress in a myriad of ways—some obvious, such as peers voicing their approval or their condemnation; some subtle, as in their volunteering for a job like collecting data or sharing resources or “forgetting” to show up on time for a scheduled training session. This is one very important reason why wise designers and implementers of ABA programs take the time to orient those directly and indirectly affected by the planned intervention to the proposed program, probe for any possible concerns, address those, and solicit everyone’s cooperation.

Suppose personnel in a work unit worry that outside observers might distract them or pose a danger due to their unfamiliarity with the area’s intrinsic risks. Rather than insisting on adhering
Specify goals and objectives
Assess physical, social environment
Identify problem or challenge
Start

→ → → → → →

Assess behavior of concern
Select, apply valid, reliable measures
Identify effective contingencies of reinforcement and generalization
Graph baseline data

Maintain, thin intervention strategies

Success?

Apply behavior change plan

Continue graphing, assessing treatment fidelity, reliability of data collection
Assess for generalization & experimentally analyze results
Incorporate verbal behavior, if appropriate

Shift expand, or narrow stimulus control
Bring under stimulus control

Prevent or reduce behavior

Select or design behavior-change, experimental analytic, and generalization plan

Increase

Operate

Figure 1.1 Typical applied behavior analysis process
to the original plan, the behavior analyst in charge might solicit suggestions from those workers. For instance, one worker might alert the observers to be aware of potential risks (a violent client, a piece of equipment awaiting repair, a pathway that needs to be kept clear, a patient with a communicable disease, a disgruntled customer). Another might propose that outside observers team up with a member of the work unit until they become sufficiently comfortable with the setting and personnel to work alone. Fearing that the program might siphon off resources from their own units, others might take issue with the details of the intervention, such as the extra time or material resources required. In the long run, altering some aspect of the plan to gain greater support makes more sense than doggedly persisting.

Identifying, in advance, the realities of existing circumstances makes much more sense than initiating a program and having to terminate or delay it midway for lack of support. The moral of the story is “If you don’t have the wherewithal to address the problem successfully and can’t readily obtain it, set that challenge aside and move on to the next one.” Chapter 3 is devoted to more thorough ways to assess and prepare the environment for successful behavior change, while Chapter 24 compliments that material by addressing broader organizational factors affecting constructive programmatic change.

Specifying and Refining Goals and Objectives

Once enough evidence has been amassed to encourage initiating a particular program, the behavior analyst’s next step is to sharpen the program’s focus by refining its goals and objectives, about which you will read further in Chapter 4. Examples might be to “encourage personnel more successfully to identify cost-cutting methods” or “promote students’ more active involvement in a new unit of study.”

Those of us who espouse Goldiamond’s (1974) constructional approach (see Chapter 4) concentrate on selecting or designing and pursuing constructive behavioral goals through positive means. An example is the positive behavioral support approach to working with developmentally challenged young-

ers (Carr et al., 2002). Rarely, if ever, can we justify aiming solely toward terminating an unwanted behavior without finding and substituting constructive replacement objectives that will yield the client at least equivalent if not even more powerful reinforcers.

When it comes to the details of specifying behavioral objectives, we will learn of a useful technology for setting mutually beneficial behavioral objectives springing from such goals.

## Identifying Current Reinforcers

Reinforcement is the fuel that drives and supports behavior change. Regardless of the responses on which they are dependent—good, bad, or indifferent—reinforcement increases the likelihood that the individual will repeat that particular behavior. Whether the focus is on increasing current, instructing new, or reducing unwelcome behavior, reinforcement is crucial to any teaching or behavior-management plan. Change agents need to explore and identify the stimuli that presently do or can be arranged to function effectively with the individual under the circumstances of concern. You will learn more about how reinforcers work in Chapter 5 and how to develop and/or select them in Chapter 6.

## Collecting Useful Data

After clearly defining the anticipated end-point of the program, the behavior analyst returns to the here and now, assessing the current status of the behavior(s) of concern to find out what circumstances support it in its present form. To accomplish that, valid, reliable measures need to be identified.

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6“Positive behavior support (PBS) is an applied science that uses educational and systems change methods (environmental redesign) to enhance quality of life and minimize problem behavior.” It “emerged from three major sources: applied behavior analysis, the normalization/inclusion movement, and person-centered values” (Carr et al., 2002, p. 4).

7Neurobiologists are homing in on the specific mechanism(s) of reinforcement within the brain. Based on extensive experimental research, current thinking is that when a behavior is reinforced, particular chemicals, such as dopamine, are released. That, in turn, strengthens the connections (synapses) between individual neurons. (See Schultz, 2000 for a layperson’s explanation.)
and used to permit the collection of and to record useful data (Chapter 7). Those then are graphed (Chapter 8) and analyzed (Chapters 9 and 25) to identify the contingencies of reinforcement currently operating on the behavior of interest or concern (Chapter 10).

Attaining Positive Change

Once confident of having clearly specified sound, constructive objectives and reinforcers for energizing the change process, the behavior analyst selects or designs a feasible system for noting and evaluating progress, and develops a sound individual (Chapter 11) or group (Chapter 12) intervention plan. If the intention is to teach a new behavior, shaping (Chapter 13) and/or chaining (Chapter 14) would be suitable. If, instead, or in addition, bringing behavior under the control of simple or complex stimuli (e.g., rules, instructions) is of concern, Chapters 15–19 will provide the necessary guidance. When the aim is to shift or expand the breadth of responding or of the circumstances under which the change is to occur, the relevant information can be found in Chapters 20 and 21. Training and hoping that a modified behavior will maintain happily ever after is wishful thinking, though. A better solution is to turn to Chapters 22–24, which provide a set of much more promising science-based maintenance strategies.

Implementing, Monitoring, and Experimentally Analyzing the Function of the Intervention Plan

Data are collected and graphed throughout, during both baseline and treatment phases, when the change strategies are implemented. This remains ongoing until it is determined that the change is meaningful and durable. Then, as mentioned, the relation of that change to the intervention(s) is experimentally analyzed (Chapters 9 and 25). Assuming the performance patterns reverse (for instance, are now diminishing in rate toward the original baseline rather than continuing to increase) when the treatment is withdrawn, then the change agent becomes more confident of the efficacy of the strategy and reaps it to the same or to a new behavior. Otherwise, the behavior of concern is re-assessed and a new plan designed and implemented. Alternatively, after discarding the original plan for lack of demonstrated effectiveness, the behavior analyst has the choice of trying another method of intervening to address the same problem or selecting a different one.

Getting There: Keep Monitoring Behavior and Fidelity of Intervention

Data collection continues throughout all behavior analytic programs, thereby fulfilling its roles of (1) demonstrating that the program continues faithfully to be administered according to its original design (i.e., program fidelity), and (2) demonstrating the ongoing efficacy of the program of intervention or not. In the latter case, the behavior analyst and client(s) must decide whether to return to assessing the behavior anew and altering the plan of intervention accordingly, or changing the specific goals and objectives, the environment in which the intervention is being conducted, or the problem being addressed altogether.

Staying There

When, ultimately, data convincingly demonstrate that the sought-after solution has been achieved, the behavior analyst must resist the temptation to dismiss that program entirely while moving on to other pressing problems. Getting there is not the same as staying there. Rather, the basic change procedures need to remain in place under ongoing surveillance for quite a while longer. Only if, after reviewing the data, all key individuals have agreed that the change is well established and persisting at a steady state,
is it reasonable to begin to thin the reinforcers or otherwise diminish the intensity of treatment (see Chapters 22–24). Eventually, control over the now-constant rate of performance may, if appropriate, be shifted to the natural environment—within the family, organization, or other social structure. Lasting change will be compromised if contingency support is weak or lacking in these new circumstances. So, if necessary, plan ways to augment that support from the very start to ensure change that lasts.

SUMMARY AND CONCLUSIONS

After discussing the philosophical underpinnings and the conditions supporting the evolution of applied behavior analysis (ABA), as a science, a technology, and a profession, this chapter has introduced you to the characteristics of the field. During its evolution over the past half-century, ABA has undergone a tremendous expansion. Today, this evidence-based approach to behavior change has undertaken and often successfully treated performance challenges across a broad range of problem areas displayed within the physical, cognitive, emotional, and social realms.

Behavior analysts have a responsibility for incorporating the essential scientific and technological features of their assessment and change procedures within their programs of analysis and change. Scientists and practitioners in the field tend to follow similar paths to ensure that they include all the field’s essential features. While no single optimal “recipe” exists for applying behavior analysis, many follow the general sequence of actions incorporated in Figure 1.1. Perhaps as a student you will find this template useful as a guide to your own early practice in the field.