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Identifying Applied Behavior Analysis Interventions

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This white paper was approved by the Board of Directors of the Association of Professional Behavior Analyts (APBA) on July 25, 2016 and updated in May 2017. It represents the position of APBA, a non-profit membership organization whose mission is to promote and advance the science-based practice of applied behavior analysis (ABA), and is intended to serve as a resource for those with an interest in that practice. Electronic and/or hard copies may be made for personal, educational, or policymaking purposes, but not for commercial use. All copies must include this notice on the first page. Any other use or distribution requires advance written permission from APBA; requests should be sent to info@apbahome.net or APBA, 3443 Camino del Rio South, Suite #210, San Diego, CA 92108.

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Executive Summary

Demand for applied behavior analysis (ABA) services has accelerated rapidly since the early 1990s. Although it is only one of many areas of application, much of the increase has been in the realm of interventions for individuals diagnosed with autism spectrum disorder (ASD). Families of people with ASD have played a major role in advocating for public policies to increase the availability of – and funding for – ABA services. Those efforts have produced many benefits; however, the increased demand and funding have also spawned widespread confusion, misunderstandings, and misrepresentations regarding behavior analysis, its applications, and qualifications for practicing ABA professionally.

This white paper aims to dispel some of the most common misconceptions about behavior analysis and to help consumers, members of various professions, funders, and policymakers differentiate ABA interventions from others. It presents key facts about the defining features of the discipline with supporting documentation:

- Behavior analysis is a natural science with concepts, research methods, and principles (natural laws of behavior) that distinguish it from the social sciences.

- The applied branch of the discipline – ABA – originated as a blend of the experimental analysis of behavior and information about human development. From the beginning, ABA incorporated naturalistic as well as structured intervention techniques implemented in a variety of everyday settings.

- Abundant scientific research documents the effectiveness of a large array of ABA procedures for building useful skills and reducing problem behaviors in people with and without specific diagnoses.

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[1] The term "intervention" is used throughout the paper to mean any procedures that are designed to change behavior. In some contexts (such as healthcare), "treatment" is often used in place of "intervention."

Executive Summary *continued*

- The features of ABA interventions have been defined since 1968.

- The practice of ABA is a profession. Well-established, accredited credentialing programs for practitioners of ABA are managed by the nonprofit Behavior Analyst Certification Board (BACB). Results of extensive job analysis studies conducted by the BACB over the past 15+ years, together with case law and best practices in professional credentialing, have served as the basis for the competencies, degrees, coursework, supervised experience, and professional examinations required to obtain BACB credentials. The requirements parallel those of many other professions. The BACB credentials are recognized in many laws and regulations as qualifications for practicing ABA.

- Genuine ABA interventions have all the defining features of ABA and are designed and overseen by appropriately credentialed professionals.

Underlying Scientific Concepts and Methods

Behavior analysis is a natural science of behavior first developed by B.F. Skinner and colleagues starting in the 1930s (Skinner, 1938, 1945, 1953; also see Morris, Altus, & Smith, 2013). Skinner's conceptual model focuses on how behaviors (anything done by living organisms) affect and are affected by environmental events that precede and follow them closely in time (termed antecedents and consequences, respectively). Skinner and other behavior analysts developed research methods that are uniquely suited for studying behavior, which occurs only at the level of the individual and involves continuous interactions between actions and various aspects of the environment. In general, those methods involve selecting one or a few observable behavior(s), measuring occurrences of the behavior(s) directly and repeatedly in the presence and absence of specific environmental events that may affect the behavior(s), graphing the resulting data, and analyzing the graphed data visually to determine if behavior changed and if that change was due to the environmental events (Johnston & Pennypacker, 2009; Sidman, 1960).

Behavior analytic researchers employ the methods of the basic science – the **experimental analysis of behavior** – to address specific research questions in experiments that are replicated (repeated) with multiple individual participants. (The *Journal of the Experimental Analysis of Behavior* was founded in 1958 as an outlet for publishing findings of that new and unique science. It continues to be the discipline's flagship basic research journal). Data aggregated across many experiments with many different participants are used to infer the existence of **functional (causal) relations** between environmental variables and behavior. Figure 1 presents one example of the application of these distinctive research methods.

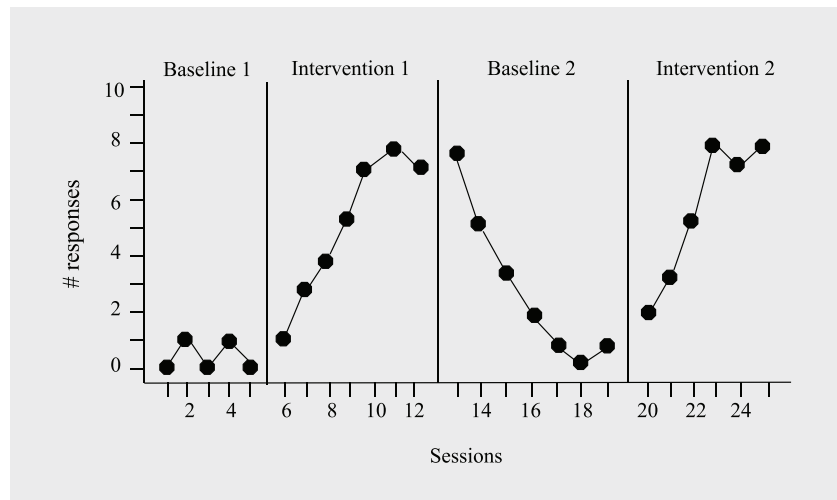# Underlying Scientific Concepts and Methods *continued*

Figure 1. An illustration of behavior analytic research methods using one of several types of single-case research designs. Each dot (data point) represents the number of times a defined, observable behavior of an individual – say, a two-word vocal utterance by a young child – was observed and recorded during each of 25 designated time periods (sessions), indicated on the horizontal axis of the graph. During the sessions labelled "baseline," no specific environmental events that might influence the behavior were present. Events arranged systematically to potentially change that behavior – e.g., an adult giving the child a favorite toy for a few seconds immediately following every two-word utterance – are labelled "intervention." The data points in Baseline 1 show that few two-word utterances occurred in any of those 5 sessions (reference the vertical axis of the graph). The data points under Intervention 1 show that shortly after intervention began (session 6), two-word utterances increased and continued to do so throughout that first intervention phase. Starting in session 13 the intervention was removed, and over the next 6 sessions (Baseline 2) the number of two-word utterances decreased to the original low level. When intervention was again put in place in session 20, the numbers of two-word utterances increased until they stabilized (did not change much) over the last 3 sessions of the second intervention phase. In sum, the picture of the behavior that is represented in the graph shows that the child did not make two-word utterances very often during either baseline phase when the intervention was absent, but that behavior increased markedly when the intervention was present. That allows a logical conclusion that the increase over baseline was likely due to the intervention and not something else, such as practice or other events the child experienced at the same time. In most behavior analytic studies, the processes just described are repeated with other participants, behaviors, settings, materials, and/or interventionists to permit multiple comparisons of data from baseline (no treatment or control) conditions and intervention (treatment or experimental) conditions. That is, studies using single-case research designs are controlled experiments rather than anecdotal "case reports" (a common misconception).

Underlying Scientific Concepts and Methods *continued*

Principles of Behavior Analysis

Because many interventions are now said to be based on the principles of behavior analysis, it is essential to understand that in this science, "principles" does not have the everyday meaning of doctrines, beliefs, values, or rules that govern one's actions. Instead it refers to **natural laws** of behavior, or facts about how behavior works – like the natural laws of physics, biology, and other natural sciences. Behavior analytic principles describe causal relations between behavior and environmental variables that have been shown to hold across many individual organisms, species, settings, and behaviors.

The principles of behavior analysis are relatively few in number, but countless studies have shown that each principle has multiple elements. For example, one principle is reinforcement: If occurrences of a behavior are followed closely in time by an environmental event (consequence) with the result that the behavior is strengthened (occurs more frequently) over time, reinforcement has occurred. Hundreds of experiments have shown that the way this principle operates is influenced by the timing, frequency, nature, and quantity of the consequences as well as characteristics of the particular behavior involved, the contexts in which the behavior occurs, and the consequences available for competing behaviors (see Figure 2).
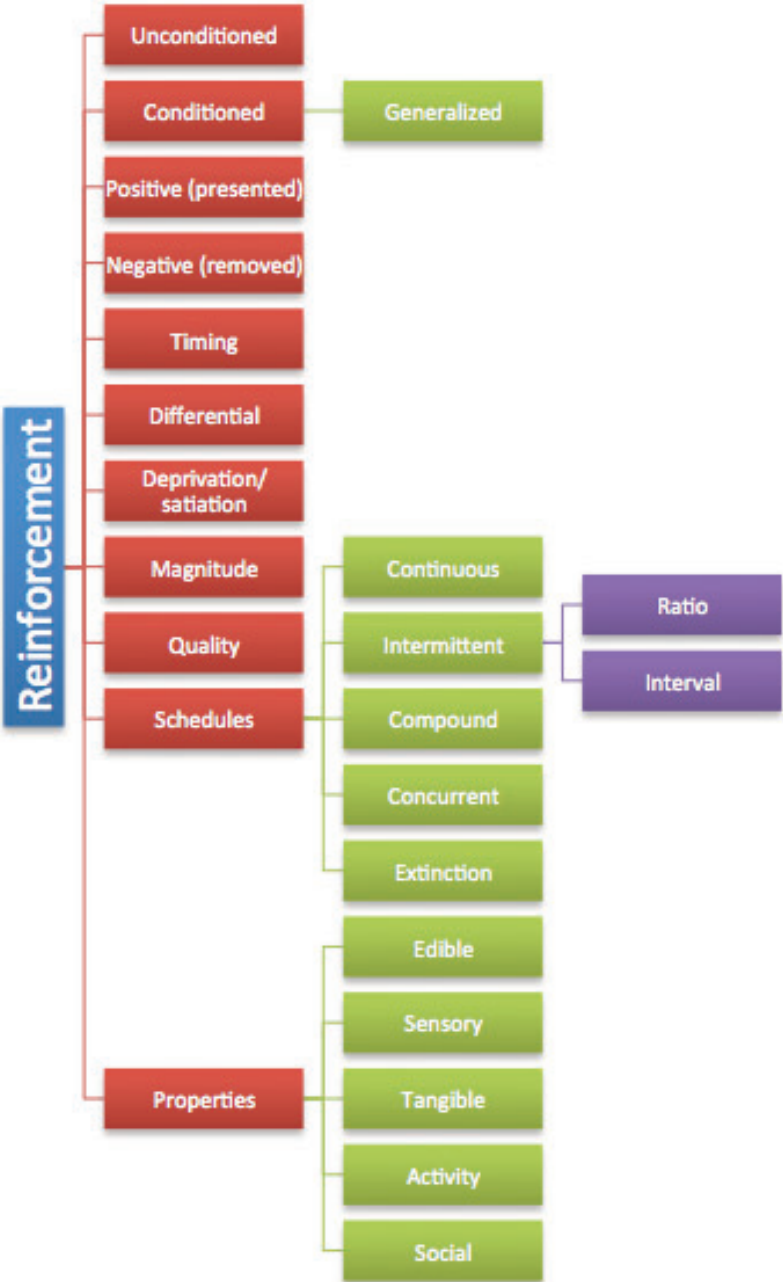
Figure 2. Some of the elements of the principle of reinforcement.

Underlying Scientific Concepts and Methods *continued*

Procedures

Myriad different **procedures** for changing behavior can be derived from each principle, but procedures and principles are not the same. Procedures are actions taken by an interventionist to arrange environmental events in order to see if those events influence a particular behavior, or to try to change the behavior. For instance, based on an understanding of the principle of reinforcement, an interventionist might present a particular consequence (e.g., a spoken word of praise, a preferred object) to a client following occurrences of a behavior that is to be strengthened (e.g., the client orienting his head and shoulders towards a person who is speaking). The interventionist would also need to understand the corollaries of the principle of reinforcement and other principles of behavior analysis (e.g., stimulus control, extinction) as well as facts about the behavior and the client in order to select the consequence and decide exactly when it is to be delivered relative to each occurrence of the behavior, after how many occurrences, and other details of the procedures. All of the other principles of behavior analysis also have multiple elements, many potential applications, and large bodies of underlying research.

Some things that are often described as ABA principles are actually procedures. Examples include breaking skills into small components or steps (sometimes called "task analysis" or incorrectly, "discrete trial training"); delivering praise after a desired behavior occurs (which may or may not result in reinforcement); and presenting a series of trials or learning opportunities that each consist of an antecedent (cue, instruction, prompt), an opportunity to respond, and depending on the response, a consequence.

Underlying Scientific Concepts and Methods *continued*

In everyday practice, most ABA interventions involve procedures derived from more than one principle, and address multiple behaviors that occur in many different situations (see Behavior Analyst Certification Board, 2014; Cooper, Heron, & Heward, 2007; Ivy & Schreck, 2016). It follows that substantial training and competence in the principles and procedures are required to practice ABA professionally – that is, to design, deliver, train others to deliver, oversee, and revise ABA interventions (more on this later).

Behavior analysis is a natural science with concepts, research methods, principles (natural laws), and procedures that differ from the social sciences.

Origins of Applied Behavior Analysis

Much of the early research that led to the discovery of the principles of behavior analysis was conducted in animal laboratories. In a few studies published in the 1940s and 1950s, some of Skinner's colleagues and students showed that procedures like those used in laboratories could be used to build useful skills in people with developmental disabilities and psychiatric disorders in structured settings (e.g., Ayllon & Michael, 1959; Fuller, 1949; Lindsley, 1956). Major foundational work in what came to be known as applied behavior analysis (ABA) was conducted in the late 1950s – early 1960s, much of it at the University of Washington Institute of Child Development under the direction of Sidney Bijou. Some facts about that work are worth noting because they counter some common misperceptions about ABA:

- Bijou and his colleagues and protégés blended the experimental analysis of behavior with information about human development to create methods for studying and changing the behavior of typically developing people and people with developmental disorders (Bijou, 1996, 2001; Morris, Altus, & Smith, 2013; Risley, 2001, 2005). Early on, Bijou and Donald Baer published extensively on development from a behavior analytic perspective (e.g., Bijou, 1957; Bijou & Baer, 1961, 1962, 1965). Therefore, contentions that behavior analysts have begun to pay attention to research on typical human development only recently, if at all, are unfounded (e.g., Prizant & Wetherby, 1998; Schreibman et al., 2015).

- Betty Hart and Todd Risley conducted foundational work on methods for studying and building children's communication skills, including the development of incidental teaching procedures (Hart & Risley, 1968, 1974, 1975; also see Risley, 2001, 2005). In incidental teaching an adult

might hold an item chosen by a child (e.g., a favorite toy or a treat) in front of the child, wait for the child to initiate some type of communication (e.g., saying "truck"), provide a cue or prompt for the child to produce a slightly more elaborate communication (e.g., "Say red truck" or "Say truck, please"), and if that occurs, give the item to the child immediately (often called a "natural" reinforcement or motivational procedure). Such unstructured, child-initiated, "naturalistic" techniques have been an essential part of ABA from its very beginning. Contrary to some assertions (e.g., Koegel, Koegel, & Carter, 1999; Prizant & Wetherby, 1998; Rogers & Dawson, 2010; Schreibman et al., 2015), they were not just discovered recently or developed to make up for the alleged shortcomings of more structured, adult-directed techniques.

- Many ABA interventions were first developed and delivered in natural settings with caregivers trained to serve as behavior change agents: a preschool that was part of the Institute of Child Development (e.g., Allen et al., 1964; Bijou, 1958; Wolf et al., 1967), a school for people with developmental disabilities (e.g., Birnbrauer, Bijou, Wolf, & Kidder, 1965), and family homes (e.g., Hawkins, Peterson, Schweid, & Bijou, 1966; Wolf, Risley, & Mees, 1964; Wolf et al., 1967). That focus has been a hallmark of ABA research and practice ever since the early days.

Origins of Applied Behavior Analysis *continued*

• The first to document the application of behavior analysis to improving the behaviors of a young child with autism were Montrose Wolf, Todd Risley, and Hayden Mees (1964; but see the early learning laboratory research by Ferster & DeMyer, 1961). Wolf and colleagues used positive reinforcement procedures in multiple environments (preschool, home) to teach a young boy with autism and a visual impairment to wear glasses, to build communication, self-care, and social skills, and to reduce self-injury and tantrums. Ivar Lovaas worked at the Institute for Child Development from 1958 to 1961, but did not become interested in autism until later, after he accepted a position at UCLA (Lovaas, 1993; Smith & Eikeseth, 2011). He ultimately made substantial contributions to research on behavioral intervention for autism, including the first large studies documenting the effects of early, comprehensive, intensive behavioral intervention; however, he was neither the founder of ABA nor the originator of ABA intervention for autism.

From its beginnings in the 1950s-60s, applied behavior analysis incorporated

- *information from research on human development as well as the experimental analysis of behavior*
- *an emphasis on positive reinforcement to build useful skills*
- *the use of natural reinforcers*
- *unstructured, naturalistic as well as structured interventions*
- *learner choice and initiations*
- *interventions delivered in everyday situations*
- *training caregivers as behavior change agents*

Origins of Applied Behavior Analysis *continued*

Many other applications of Skinner's science for building skills and reducing problem behaviors were developed and studied during the 1960s (Cooper, Heron, & Heward, 2007; Morris, Altus, & Smith, 2013). In 1968, the first journal devoted to research on such applications was founded: the *Journal of Applied Behavior Analysis*. One article in the first issue of that journal was an articulation of the dimensions of ABA by Donald Baer, Montrose Wolf, and Todd Risley, who worked with Bijou at the University of Washington and then moved to the University of Kansas where they established the first graduate training program in ABA and expanded on the early work. The dimensions laid out by Baer, Wolf, and Risley (1968) still hold today; in fact, they define ABA interventions (see the next section). In the decades since, many scores of effective behavior change procedures derived from the principles of behavior analysis have been documented in thousands of studies published in the *Journal of Applied Behavior Analysis* and numerous other professional journals. A partial list of areas in which ABA interventions have been shown to be effective includes general and special education (all levels); autism spectrum disorders, intellectual and developmental disabilities, attention deficit disorder, movement disorders, brain injuries and diseases, behavior disorders, substance abuse disorders, dementia, and feeding disorders; home and workplace safety; vehicular and pedestrian safety; organizational behavior management; animal welfare and training; conservation; parenting; child welfare; sports; and health and fitness.

Defining Features of ABA

Baer, Wolf, and Risley (1968, 1987) defined ABA as the use of the principles and methods of behavior analysis to bring about meaningful changes in socially important behaviors. They also specified the dimensions that distinguish ABA interventions from others. To be characterized accurately as ABA, an intervention must be

- **Applied –** addresses behaviors that are important to the client and his/her significant others.

- **Behavioral –** focuses on the client behavior(s) in need of improvement and direct measurement of those behaviors (as opposed to measuring the behavior of others who interact with the client, measuring client behavior indirectly by asking others about it, etc.).

- **Analytical –** consistently produces change in a measured aspect of the target behavior(s) when the intervention is in place vs. when it is not (see Figure 1 for an illustration).

- **Technological –** described with sufficient detail and clarity that a reader has a reasonable chance of replicating the intervention.

- **Conceptually systematic –** grounded in the conceptualization that behavior is a function of environmental events and described in terms of behavior analytic principles.

- **Effective –** improves target behaviors to a practical degree.

- **Generalized –** produces changes in target behaviors that last over time, occur in situations other than those in which the interventions were implemented initially, and/or spread to behaviors that were not treated directly.

Professional Practice of ABA

Definition of Practice

For regulatory purposes like professional credentialing and laws, the practice of ABA is defined as:

> …the design, implementation, and evaluation of instructional and environmental modifications by a behavior analyst to produce socially significant improvements in human behavior. It includes the empirical identification of functional relations between behavior and environmental factors, known as functional assessment and analysis. Applied behavior analysis interventions are based on scientific research and the direct observation and measurement of behavior and environment. They utilize contextual factors, establishing operations, antecedent stimuli, positive reinforcement, and other consequences to help people develop new behaviors, increase or decrease existing behaviors, and emit behaviors under specific environmental conditions (Behavior Analyst Certification Board, 2012)

A complete description of the concepts, principles, and procedures involved in the professional practice of ABA can be found in the Behavior Analyst Certification Board (BACB) Task List at **https://bacb.com/wp-content/uploads/2017/01/170113-BCBA-BCaBA-task-list-5th-ed-english.pdf**

Generally speaking, in everyday practice the design and delivery of ABA services to clients has these essential components:

- Development of an individualized intervention plan by a professional behavior analyst. That entails reviewing records, interviewing the client and his/her caregivers, and conducting assessments to determine the client's current (baseline) levels of adaptive and maladaptive behaviors,

preferences, strengths, and needs; working with the client, caregivers, and other members of the intervention team to select behaviors to be improved ("target behaviors" or "intervention targets"); and developing written procedures (protocols) for directly observing, measuring, and improving all target behaviors. Intervention may be **comprehensive** (addressing many target behaviors) or **focused** on a small number of behaviors.

- Implementation and management of the intervention plan by the professional behavior analyst. That includes

    - Training interventionists (behavior technicians, caregivers, and others) to carry out selected aspects of protocols with the client in everyday settings. The behavior analyst may implement protocols as well.

    - Ongoing supervision and monitoring of interventionists.

    - Ongoing, frequent direct observation and measurement of target behaviors and review and analysis of graphed data.

    - Adjusting protocols and targets based on the data, and training interventionists to implement the revised protocols

    - Periodically reviewing progress with the client, caregivers, intervention team, and funders (where applicable).

(Behavior Analyst Certification Board, 2014)

The contemporary professional practice of ABA involves a large array of scientifically tested procedures and requires specialized training.

Professional Practice of ABA *continued*

Credentials

The increasing demand for ABA services that began in the early 1990s underscored the need for uniform, objective, verifiable standards and procedures for determining who is qualified to practice ABA professionally. The Behavior Analyst Certification Board (BACB) was established in 1998 to develop such standards and procedures (Johnston, Carr, & Mellichamp, 2017). It is an independent, nonprofit organization whose behavior analyst credentialing programs are accredited by the National Commission for Certifying Agencies (NCCA) of the Institute for Credentialing Excellence. The NCCA's rigorous standards are grounded in case law and best practices in professional credentialing.

The BACB has developed competencies for practicing ABA and standards for credentialing practitioners based on several extensive job analysis studies involving thousands of professional behavior analysts from around the world (Carr & Nosik, 2017; Johnston, Mellichamp, Shook, & Carr, 2014; Shook & Favell, 2008; Shook, Johnston, & Mellichamp, 2004). The standards include degrees, coursework, supervised experiential training, and passage of a professionally designed and managed examination in behavior analysis. The BACB is required to conduct a job analysis periodically and to use the results to ensure that the credentialing requirements reflect new developments in research, policies, and social and cultural norms. In short, the BACB requirements represent empirically supported international standards for practicing ABA that have been developed by the profession. Those standards parallel requirements for obtaining credentials (certifications, registrations, or licenses) to practice most recognized professions.

At present the BACB is the only entity whose programs for certifying professional practitioners of ABA are accredited and internationally recognized, and it administers the only psychometrically and legally validated professional examinations in the practice of ABA. For those and other reasons, BACB

Professional Practice of ABA *continued*

credentials have been incorporated in many licensure and other laws specifying qualifications to practice ABA professionally (but note that ABA practitioners who work in a few areas, such as organizational behavior management and applied animal behavior, are exempt from licensure in many U.S. states at present).

The BACB certifies professional practitioners at two levels. Current requirements for certification as a **Board Certified Behavior Analyst ®(BCBA®)** are: at least a master's degree in applied behavior analysis or a closely related field from an accredited institution; completion of 270 classroom hours of graduate-level instruction in specified behavior analysis topics; completion of specified hours of supervised experiential training in applied behavior analysis; and passage of the BCBA examination. Individuals who teach behavior analysis in full-time university faculty positions and those with doctorates and at least 10 years' experience in behavior analysis may also qualify to take the BCBA examination. In addition, BCBAs with doctoral degrees can apply for the designation Board Certified Behavior Analyst – Doctoral® (BCBA-D®). Current requirements for certification as a **Board Certified Assistant Behavior Analyst® (BCaBA®)** are: at least a bachelor's degree from an accredited institution; completion of 180 classroom hours of instruction in specified behavior analysis topics; completion of specified hours of supervised experiential training in applied behavior analysis; and passage of the BCaBA examination.

The BACB also issues a credential for paraprofessionals, the **Registered Behavior Technician™ (RBT™)**. Again, the requirements for obtaining and maintaining all of the BACB credentials change periodically. Details, including current credentialing and ethical standards, are available at www.bacb.com.

Summary

Behavior analysis is a scientific discipline. It has theoretical, experimental, and applied branches; distinct research methods, scientific journals, textbooks, scholarly and professional organizations, and university training programs; and well-established, widely recognized professional practitioner standards and credentials. Applied behavior analysis (ABA) is the application of the science to produce meaningful improvements in socially significant behaviors, and the practice of ABA is a profession.

Regardless of client or service recipient, competently designed and delivered ABA programming (a) comprises many scientifically proven techniques or procedures for developing useful skills, building relationships, and reducing behaviors that impede healthy, successful functioning; (b) stresses positive reinforcement and scientific evaluations of effectiveness; (c) is highly individualized and client-centered; (d) involves active engagement of clients and their significant others; (e) is flexible and dynamic, with intervention adjusted continuously based on data representing repeated measurement of target behaviors over time; (f) is often intricate and complex; (g) may be carried out in a variety of settings (homes, schools, clinics, hospitals, nursing homes, group homes, universities, offices, factories, etc.) and (h) requires specialized training.

Among other things, ABA is not:
- Just a theory
- Just a therapy, methodology, or set of techniques
- Just one of many therapies or treatments for autism (Dillenburger & Keenan, 2009)
- A packaged, "cookbook" intervention or program
- Discrete trial training (discrete trials are just one of many procedures for arranging learning opportunities)
- A "one size fits all" approach

Summary *continued*

- Entirely or mostly highly structured

- Unnatural, artificial, or contrived

- Behavior modification (although many behavior modification methods arose from behavior analysis, there is much more to ABA today than techniques for modifying behavior)

- Simple or simplistic

- The product or property of any individual(s)

Genuine ABA interventions have the seven defining features described previously. ***Interventions that do not have all of those features cannot be characterized accurately as ABA.*** Nor can interventions that may incorporate some ABA procedures along with some non-behavior analytic procedures (e.g., Prizant, Wetherby, Rubin, & Laurent, 2003; Rogers & Dawson, 2010; also see Smith & Iadarola, 2015), because such interventions do not meet the criterion of being **conceptually systematic**, that is, thoroughly grounded in the concepts and principles of behavior analysis.

Additionally, ***genuine ABA interventions are designed and overseen by professional behavior analysts*** (i.e., BCBAs or Licensed Behavior Analysts where government licensure is in place), perhaps assisted by BCaBAs or Licensed Assistant Behavior Analysts. Some individuals with credentials in other professions may be able to document that they have formal and experiential training comparable to that required for BACB certification and have passed a professional examination in behavior analysis. Members of other professions as well as laypersons may utilize some ABA techniques and information about behavior analysis that is in the public domain, but that is not the same as practicing ABA professionally.

Summary *continued*

If an intervention is actually based on ABA principles, it follows logically that those who design and oversee the intervention must have undergone training and demonstrated competence in those principles and their applications. That is most reliably documented by meeting BACB certification standards.

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