

Applied Behavior Analysis II

6.1 Concepts: Applied behavior analysis (ABA), previously known as behavior modification, is defined as the process of systematically applying interventions based upon the principles of learning theory to improve socially significant behaviors to a meaningful degree, and to demonstrate that the interventions employed are responsible for the improvement of behavior. Contrary to popular belief, behavior analysts emphasize that the science of behavior must be a *natural* science as opposed to a *social* science. As such, behavior analysts focus on the observable relationship of behavior to the environment, including antecedents and consequences, without resort to "hypothetical constructs". By functionally assessing the relationship between a targeted behavior and the environment, the methods of ABA can be used to change that behavior.

Methods in applied behavior analysis range from validated intensive behavioral interventions—most notably utilized for children with an autism spectrum disorder (ASD)—to basic research which investigates the rules by which humans adapt and maintain behavior. However, applied behavior analysis contributes to a full range of areas including: AIDS prevention, business management, conservation of natural resources, education, gerontology, health and exercise, industrial safety, language acquisition, littering, medical procedures, parenting, psychotherapy, seatbelt use, severe mental disorders, sports, substance abuse, and zoo management and care of animals.

Behavior

Behavior is the activity of living organisms. Human behavior is the entire gamut of what people do including thinking and feeling. Behavior can be determined by applying the Dead Man's test:

If a dead man can do it, it isn't behavior. And if a dead man can't do it, then it is behavior.

This is obviously only a simple rubric.

Behavior is that portion of an organism's interaction with its environment that is characterized by detectable displacement in space through time of some part of the organism and that results in a measurable change in at least one aspect of the environment. Often, the term behavior is used to reference a larger class of responses that share physical dimensions or function. In this instance, the term

response indicates a single instance of that behavior. If a group of responses have the same function, this group can be classified as a response class. Finally, when discussing a person's collection of behavior, repertoire is used. It can either pertain specifically to a set of response classes that are relevant to a particular situation, or it can refer to every behavior that a person can do.

Operant conditioning

Operant behavior is that which is selected by its antecedents and consequences. The conditioning of operant behavior is the result of reinforcement and punishment. Operant conditioning applies to so-called "voluntary" responses, which an organism emits and increase or decrease in frequency as a function of the consequences which follow. The term operant emphasizes this point: the organism's behavior operates upon its environment to produce some type of desirable result. For example, operant conditioning is at work when we learn that toiling industriously can bring about a raise or that studying hard for a particular class will result in good grades, in positive reinforcement.

Respondent conditioning

All organisms respond in predictable ways to certain stimuli. These stimulus–response relations are called reflexes. The response component of the reflex is called respondent behavior. It is defined as behavior which is elicited by antecedent stimuli. Respondent conditioning (also called classical conditioning) is learning in which new stimuli acquire the ability to elicit respondents. This is done through stimulus–stimulus pairing, for example, the stimulus (smell of food) can elicit a person's salivation. By pairing that stimulus (smell) with another stimulus (e.g., a light), the second stimulus can obtain the function of the first stimulus, given that the predictive relationship between the two stimuli is maintained. This is also known as "Pavlov's dog's bell".

Environment

The environment is the entire constellation of stimuli in which an organism exists. This includes events both inside and outside of an organism, but only real physical events are included. The environment consists of stimuli. A stimulus is an "energy change that affects an organism through its receptor cells."

A stimulus can be described:

- **Topographically** by its physical features.

- **Temporally** by when they occur in respect to the behavior.
- **Functionally** by their effect on behavior.

Reinforcement

Reinforcement is the most important principle of behavior and a key element of most behavior change programs. It is the process by which behavior is strengthened, if a behavior is followed closely in time by a stimulus and this results in an increase in the future frequency of that behavior. The addition of a stimulus following an event that serves as a reinforcer is termed positive reinforcement. If the removal of an event serves as a reinforcer, this is termed negative reinforcement. There are multiple schedules of reinforcement that affect the future probability of behavior.

Punishment

Punishment is a process by which a consequence immediately follows a behavior which decreases the future frequency of that behavior. As with reinforcement, a stimulus can be added (positive punishment) or removed (negative punishment). Broadly, there are three types of punishment: presentation of aversive stimuli (e.g., pain), response cost (removal of desirable stimuli as in monetary fines), and restriction of freedom (as in a 'time out'). Punishment in practice can often result in unwanted side effects. Some other potential unwanted effects include resentment over being punished, attempts to escape the punishment, expression of pain and negative emotions associated with it, and recognition by the punished individual between the punishment and the person delivering it.

Extinction

Extinction is the technical term to describe the procedure of withholding/discontinuing reinforcement of a previously reinforced behavior, resulting in the decrease of that behavior. The behavior is then set to be extinguished (Cooper, *et al.*). Extinction procedures are often preferred over punishment procedures that are frequently deemed unethical and in many states prohibited. Nonetheless, extinction procedures must be implemented with utmost care by professionals, as they are generally associated with extinction bursts. An extinction burst is the temporary increase in the frequency, intensity, and/or duration of the behavior targeted for extinction. Other characteristics of an extinction burst include a) extinction-produced aggression—the occurrence of an emotional response to an extinction procedure often manifested as aggression; and b) extinction-induced response variability—the occurrence of novel behaviors that

did not typically occur prior to the extinction procedure. These novel behaviors are a core component of shaping procedures.

Discriminated operant and three-term contingency

In addition to a relation being made between behavior and its consequences, operant conditioning also establishes relations between antecedent conditions and behaviors. This differs from the S–R formulations (If-A-then-B), and replaces it with an AB-because-of-C formulation. In other words, the relation between a behavior (B) and its context (A) is because of consequences (C), more specifically, this relationship between AB because of C indicates that the relationship is established by prior consequences that have occurred in similar contexts. This antecedent–behavior–consequence contingency is termed the three-term contingency. A behavior which occurs more frequently in the presence of an antecedent condition than in its absence is called a discriminated operant. The antecedent stimulus is called a discriminative stimulus (S^D). The fact that the discriminated operant occurs only in the presence of the discriminative stimulus is an illustration of stimulus control. More recently behavior analysts have been focusing on conditions that occur prior to the circumstances for the current behavior of concern that increased the likelihood of the behavior occurring or not occurring. These conditions have been referred to variously as "Setting Event", "Establishing Operations", and "Motivating Operations" by various researchers in their publications.

Verbal behavior

B.F. Skinner's classification system of behavior analysis has been applied to treatment of a host of communication disorders. Skinner's system includes:

- Tact (psychology) – a verbal response evoked by a non-verbal antecedent and maintained by generalized conditioned reinforcement.
- Mand (psychology) – behavior under control of motivating operations maintained by a characteristic reinforcer.
- Intraverbals – verbal behavior for which the relevant antecedent stimulus was other verbal behavior, but which does not share the response topography of that prior verbal stimulus (e.g., responding to another speaker's question).
- Autoclitic – secondary verbal behavior which alters the effect of primary verbal behavior on the listener. Examples involve quantification, grammar, and qualifying statements (e.g., the differential effects of "I think..." vs. "I know...")

For assessment of verbal behavior from Skinner's system see Assessment of Basic Language and Learning Skills.

Measuring behavior

When measuring behavior, there are both dimensions of behavior and quantifiable measures of behavior. In applied behavior analysis, the quantifiable measures are a derivative of the dimensions. These dimensions are repeatability, temporal extent, and temporal locus.

Repeatability

Response classes occur repeatedly throughout time—i.e., how many times the behavior occurs.

- **Count** is the number of occurrences in behavior.
- **Rate/frequency** is the number of instances of behavior per unit of time.
- **Celeration** is the measure of how the rate changes over time.

Temporal extent

This dimension indicates that each instance of behavior occupies some amount of time—i.e., how long the behavior occurs.

- **Duration** is the amount of time in which the behavior occurs.

Temporal locus

Each instance of behavior occurs at a specific point in time—i.e., when the behavior occurs.

- **Response latency** is the measure of elapsed time between the onset of a stimulus and the initiation of the response.
- **Interresponse time** is the amount of time that occurs between two consecutive instances of a response class.

Derivative measures

Derivative measures are unrelated to specific dimensions:

- **Percentage** is the ratio formed by combining the same dimensional quantities.

- **Trials-to-criterion** are the number of response opportunities needed to achieve a predetermined level of performance.

Analyzing behavior change

Experimental control

In applied behavior analysis, all experiments should include the following:^[50]

- At least one participant
- At least one behavior (dependent variable)
- At least one setting
- A system for measuring the behavior and ongoing visual analysis of data
- At least one treatment or intervention condition
- Manipulations of the independent variable so that its effects on the dependent variable may be quantitatively or qualitatively analyzed
- An intervention that will benefit the participant in some way^[51]

Functional analysis (psychology)

History of Functional Analysis

Prior to the seminal article on functional analytic methodology for aberrant behaviors, behavior analysts used the behavioral technology available to them at the time. Instead of treating the function of the disruptive behavior, behavior analysts would instead use potent consequences to manage disruptive behaviors. For example, in the past to decrease self-injurious behavior in an individual, behavior analysts may have delivered an aversive stimulus contingent on the response (Iwata, 1988). This type of intervention was successful to the individual, but it was not uncommon to see other variations of aberrant behavior begin to appear. Applied behavior analysis as a field favors reinforcement based interventions over punishment based intervention, but at the time the behavioral technology was not advanced enough and the individuals needing intervention had a right to an effective treatment (Van Houten et al., 1988). In 1977, Edward Carr published a paper on potential hypotheses for the occurrence and maintenance of self-injurious behaviors. This paper laid out the initial groundwork for a functional analysis of aberrant behaviors. In the paper, Carr described five potential causes for self-injurious behaviors that included (1) positive social reinforcement contingent on the response, (2) negative reinforcement in the form of removal of an aversive stimulus contingent on the response, (3) the response produced stimuli possessed reinforcing qualities (automatic reinforcement), (4) the behavior was a

byproduct of an underlying psychological condition, and (5) psychodynamic hypothesis in which the behavior was an attempt to reduce guilt. Throughout the paper, Carr cited recent research to support the first three hypotheses, and disprove the latter two hypotheses, but no formal experiment was conducted to determine the controlling variables of the problem behavior. In 1982, Iwata and colleagues conducted the first experimental analysis of the maintaining variables for self-injurious behavior. In the paper, the researchers alternated between specific conditions to examine whether or not the behavior occurred under specific environmental conditions. Through direct manipulation of the environment, the researchers could accurately identify the controlling variables of the aberrant behavior, and provide interventions that targeted the functional relationship between the behavior and the environment. Since this seminal article was published, a wide range of research has been published in the area of functional analyses of aberrant behaviors. The methodology has since become the gold standard in assessment and treatment of aberrant behaviors.

Functional behavior assessment (FBA)

Functional assessment of behavior provides hypotheses about the relationships between specific environmental events and behaviors. Decades of research have established that both desirable and undesirable behaviors are learned and maintained through interactions with the social and physical environment. Functional Behavior Assessments are used to identify controlling variables for challenging behaviors as the basis for intervention efforts designed to decrease the occurrence of these behaviors.

Functions of Behavior

Behavior serves two major functions for an individual: (1) to obtain desired events, or (2) to escape/avoid undesired events. Put another way, individuals engage in behavior to get something or to get out of something. When trying to identify the function of a behavior, it is often helpful to think, “What purpose is this behavior serving the individual.” Describe below are the common functions of behavior.

Obtain Desired Events (Positive Reinforcement)[edit]

Access to Attention (Positive Reinforcement: Social): The individual engages in the behavior to obtain attention from another person. For example, a child throws a toy because it characteristically results in mom's attention. (If this behavior results in mom looking at child and giving him lots of attention—even if she's saying "NO"—he will be more likely to engage in the same behavior in the future to get

mom's attention.) Common forms of attention include, but are not limited to, hugs, kisses, reprimands, frowns, smiles, etc.

Access to Tangibles (Positive Reinforcement: Tangible/Activity): The individual engages in the behavior to obtain a specific item or engage in a specific activity from another person. For example, a child hits mom because s/he wants the toy mom is holding. (If this behavior results in mom giving the child the toy, s/he will be more likely to engage in the same behavior in the future to get mom's attention.) Common forms of tangible items include, but are not limited to, food, toys, movies, video games, etc.

Obtain Internal Stimulation

Automatic Positive Reinforcement: The individual engages in the behavior because the response-produced stimulation possesses reinforcing characteristics. Said another way, engaging in the behavior produces reinforcing internal stimulation unique to the specific context. For example, a child hits his/her eyes because it produces the specific internal stimulation of various colors and effects. Another example includes a child spinning a bowl on a table to produce the specific auditory stimulation unique to that object. Common forms of automatic stimulation include, but are not limited to, auditory stimulation, visual stimulation, endorphin release, etc.

Escape/Avoid Undesirable Events (Negative Reinforcement)]

Escape/Removal of Attention: The individual engages in the behavior to escape aversive socially mediated attention. Put another way, social situations that are aversive to the child are removed contingent on the behavior occurring. For example, a child hits the teacher to avoid talking in front of the class. Common forms of aversive social situations include, but are not limited to, smiles, hugs, frowns, corrections, group settings, etc.

Escape/Removal of Tasks or Activities: The Individual engages in the behavior to escape aversive tasks or demands. For example, when a child is told to take a bath he begins to cry, and his mother tells him he no longer has to take a bath. Another example includes a teacher telling a student to complete a series of math problems, to which the student flips the desk and is sent to the principal's office. Being sent to the principals office reinforced the behavior of flipping the desk because it allowed the child to escape the aversive activity of completing math problems. Common forms of aversive demands/activities include, but are not limited to, difficult tasks, changes in routines, unpredictability, novel tasks, etc.

Escape/Avoid Specific Internal Stimulation

Automatic Negative Reinforcement: The individual engages in the behavior because it produces a decrease in aversive internal stimulation. Put another way, something aversive is occurring beneath the skin and engaging in the behavior decreases the level of discomfort. For example, a child bangs his head against the wall to decrease the pain experienced from a toothache. Another example includes a child scratching his arm to decrease the level of itchiness experienced from a bug bite. Common forms of aversive automatic stimulation include sinus pain, itching, hunger, etc.

Function Versus Topography

As previously stated function refers to the effect the behavior produces on the environment. The actual form of the behavior is referred to the topography. Different behaviors may serve the same function, thus describing one limitation of treating behaviors based on form alone. For example, a child may scream, hit, and cry to obtain attention from his mother. What the behavior looks like often reveals little useful information about the conditions that account for it. However, identifying the conditions that account for a behavior, suggests what conditions need to be altered to change the behavior. Therefore, assessment of function of a behavior can yield useful information with respect to intervention strategies that are likely to be effective.