

## Learning through Schedules of Reinforcement

- Pavlov

### 10.1 What Is Reinforcement?

#### Answer:

Reinforcement is a term used in operant conditioning to refer to anything that increases the likelihood that a response will occur. Note that reinforcement is defined by the effect that it has on behavior - it increases or strengthens the behavior.

For example, reinforcement might involve presenting praise (the reinforcer) immediately after a child puts away her toys (the response). By reinforcing the desired behavior with praise, the girl will be more likely to perform the same actions again.

#### Types of Reinforcement

Reinforcement can include anything that strengthens or increases a behavior, including stimuli, events and situations. In a classroom setting, for example, types of reinforcement might include praise, getting out of unwanted work, token rewards, candy, extra playtime and fun activities.

There are two major categories of reinforcement:

- **Primary reinforcement**, sometimes referred to as unconditional reinforcement, occurs naturally and does not require learning in order to work. Primary reinforcers often have an evolutionary basis in that they aid in the survival of the species. Examples of primary reinforcers include food, air, sleep, water and sex. Genetics and experience may also play a role in how reinforcing such things are. For example, while one person might find a certain type of food very rewarding, another person may not like that food at all.

- **Secondary reinforcement**, also known as conditioned reinforcement, involves stimuli that have become rewarding by being paired with another reinforcing stimulus. For example, when training a dog, praise and treats might be used as primary reinforcers. The sound of a clicker can be associated with the praise and treats until the sound of the clicker itself begins to work as a secondary reinforcer.

In operant conditioning, there are two different types of reinforcement:

- Positive reinforcement involves the addition of something to increase a response, such as giving a bit of candy to a child after she cleans up her room.
- Negative reinforcement involves removing something in order to increase a response, such as canceling a quiz if students turn in all of their homework for the week. By removing the aversive stimulus (the quiz), the teacher hopes to increase the occurrence of the desired behavior (completing all homework).

### **The Strength of the Response**

How and when reinforcement is delivered can affect the overall strength of a response. This strength is measured by the persistence, frequency, duration and accuracy of the response after reinforcement is halted.

In situations when the presentation of reinforcement is controlled, such as during training, the timing of when a reinforcer is presented can be manipulated. During the early stages of learning, continuous reinforcement is often used. This schedule involves reinforcing a response each and every time it occurs.

Once a behavior has been acquired, it is often a good idea to switch to a partial reinforcement schedule. The four main types of partial reinforcement are:

- Fixed-ratio schedules: Reinforcing a behavior after a specific number of responses have occurred.
- Fixed-interval schedules: Reinforcing a behavior after a specific period of time has elapsed.

- Variable-ratio schedules: Reinforcing the behavior after an unpredictable number of responses.
- Variable-interval schedules: Reinforcing the behavior after an unpredictable period of time has elapsed.

## What Is Secondary Reinforcement?

### Answer:

In operant conditioning, secondary reinforcement refers to a situation in which a stimulus reinforces a behavior after it has been associated with a primary reinforcer. The primary reinforcers occur naturally and do not need to be learned. Examples of primary reinforcers include things that satisfy basic survival needs such as water, food, sleep, air and sex.

Money is one example of secondary reinforcement. Money can be used to reinforce behaviors because it can be used to acquire primary reinforcers such as food, clothing, shelter and other such things.

Animal trainers sometimes use clickers as a type of secondary reinforcement. After pairing the sound of a clicker with praise or treats, the sound of the clicker alone can eventually work as a reinforcer.

Secondary reinforcement is also known as conditioned reinforcement.

**Reinforcement** is the means by which behavior is increased. Also known as "consequences," positive reinforcement adds something that will make it more likely the behavior will occur. Negative reinforcement is when something is removed, it is more likely to continue.

## The Reinforcement Continuum

Reinforcement happens all the time. Some reinforcement occurs because the item or activity is naturally reinforcing. At the highest end of reinforcement, reinforcers are social or intrinsic, such as praise or self-esteem. Young children, or children with low cognitive or social functioning, may require primary reinforcers, such as food or preferred items. During the course of instruction primary reinforcers should be paired with secondary reinforcers.

**Primary Reinforcers:** Primary reinforcers are things that reinforce behavior that provide immediate gratification, such as food, water or a preferred activity. Often very young children or children with severe disabilities need primary reinforcers in order to be engaged in an educational program.

Food can be a powerful reinforcer, especially preferred food, such as fruit or candy. Often young children with severe disabilities or very low social functioning are started with preferred foods, but they need to be paired with secondary reinforcers, especially praise and social interaction.

Physical stimulation, like piggy back rides or "airplane rides" are primary reinforcers that pair the therapist or teacher with the reinforcer. One of the principal goals of a therapist or teacher is for the therapist or teacher to become a secondary reinforcer for the child. When the therapist becomes a reinforcer for the child, it becomes easier for the child to generalize secondary reinforcers, like praise, across environments.

Pairing primary reinforcers with tokens is also a powerful way to replace primary reinforcers with secondary reinforcers. A student earns tokens toward a preferred item, activity or perhaps food as part of their educational or therapy program. The token is also paired with secondary reinforcement, like praise, and moves the child toward appropriate behavior.

**Secondary Reinforcers:**Secondary reinforcers are learned reinforcers. Awards, praise and other social reinforcers are all learned. If students have not learned the value of secondary reinforcement, such as praise or rewards, they need to be paired with primary reinforcers: a child earns a preferred item by earning stars. Soon the social status and attention that go with stars will transfer to the stars, and other secondary reinforcers like stickers and awards will become effective.

Children with autism spectrum disorders lack an understanding of social interaction and do not value praise or other secondary reinforcement because they lack Theory of Mind (ToM) , the ability to understand that another human has emotions, thoughts and is motivated by personal self-interest. Children with Autism Spectrum Disorder need to be taught the value of secondary reinforcers by having them paired with preferred items, food, and preferred activities.

**Intrinsic Reinforcement:** The final goal of reinforcement is for students to learn to evaluate themselves and reward themselves with intrinsic reinforcement, the

feeling a person gets from a job well done, for successfully completing a task. Still, we need to remember that people do not spend 12 years in college, medical school and residency just for the honor of being addressed as "doctor." They are also hoping to earn the big bucks, and rightly so. Still, when intrinsic rewards accompany employment, as in being a special education teacher, they may compensate for some of the lack of status and income. The ability to discover intrinsic reinforcement in many activities that lead to the big bucks does however bode well for future success.

### **Socially Valid Reinforcers**

Socially valid reinforcers refer to reinforcement schedules that are "age appropriate." Seeking reinforcers that do not set students apart from typically developing peers in their age group is really part of providing FAPE, a Free, APPROPRIATE Public Education, a legal underpinning of the Individuals with Disabilities Education Improvement Act of 1994 (IDEIA.) For students in middle school or high school, putting Super Mario stickers on the backs of their hands is not age appropriate. Of course students with the most difficult behavior, or those who do not respond to secondary reinforcement need to have reinforcers that can be paired with social reinforcement and faded as more socially acceptable reinforcement can take its place.

Socially valid reinforcement can also help students understand what is "cool" or acceptable to typical peers. Rather than letting middle school aged students watch a Tella Tubbies video as a reinforcer, how about a National Geographic video about bears? Or perhaps anime cartoons?

### **Identifying High Preference Reinforcers**

In order for reinforcement to be effective, it has to be something the student or students find reinforcing. Stars on a chart might work for typical 2nd graders, but not for second graders with a severe disability. They certainly won't work for high school students, unless they get to trade them for something they really want. There are several ways to discover reinforcers.

**Ask Parents:** If you teach students who are not communicating, students with severe cognitive disabilities or autism spectrum disorders, you should be sure to interview parents before the students come to you, so you have some of their

favorite things. Often offering a favorite toy for a brief period is a strong enough reinforcer to keep a young student on task.

**An Informal Preference Assessment:** Lay a number of things that children of the same age enjoy playing with and watch what a student shows the most interest in. You may seek similar toys. Also, other items that have shown to be of interest, like toys that light up when you squeeze them, or accordion tubes that make noises when you pull them can be shown and modeled to students to see if they gain their attention. These items are available through catalogs that specialize in providing resources for children with disabilities, such as Abilitations.

**Observation:** What does a child choose to use? What activities do they seem to prefer? I had a child in an early intervention program who had a pet turtle. We had a nicely painted model turtle of vinyl, and he would work for an opportunity to hold the turtle. With older children, you will find they may have a Thomas the Tank Engine lunch bag, or a Cinderella Umbrella that they cherish, and Thomas and Cinderella may be good partners for reinforcement.

**Ask the Students:** Find out what they find the most motivating. One way to do that is through Reinforcement Menus that offer students things they can choose. When you collect them from a group, you can decide which items seem to be the most popular and arrange to make them available. A choice chart with the choices they have made can be very helpful, or you can create individual choice charts as I have for middle school students on the Autism Spectrum. If you want to control or limit the number of times they can make each choice (especially computer time, when you have limited computers for a large group) you could also make tickets with strips at the bottom to tear off, a little like the postings for used cars at the Laundromat.

**10.2 schedules of reinforcement** are an important component of the learning process. When and how often we reinforce a behavior can have a dramatic impact on the strength and rate of the response.

A schedule of reinforcement is basically a rule stating which instances of a behavior will be reinforced. In some case, a behavior might be reinforced every time it occurs. Sometimes, a behavior might not be reinforced at all. Either positive reinforcement or negative reinforcement might be used, depending on the situation. In both cases, the goal of reinforcement is always to *strengthen* the behavior and increase the likelihood that it will occur again in the future.

In real-world settings, behaviors are probably not going to be reinforced each and every time they occur. For situations where you are purposely trying to train and reinforce an action, such as in the classroom, in sports or in animal training, you might opt to follow a specific reinforcement schedule. As you'll see below, some schedules are best suited to certain types of training situations. In some cases, training might call for starting out with one schedule and switching to another once the desired behavior has been taught.

Certain schedules of reinforcement may be more effective in specific situations. There are two types of reinforcement schedules:

### 1. Continuous Reinforcement

In continuous reinforcement, the desired behavior is reinforced *every single time* it occurs. Generally, this schedule is best used during the initial stages of learning in order to create a strong association between the behavior and the response. Once the response is firmly attached, reinforcement is usually switched to a partial reinforcement schedule.

In partial reinforcement, the response is reinforced only *part of the time*. Learned behaviors are acquired more slowly with partial reinforcement, but the response is more resistant to extinction.

There are four schedules of partial reinforcement:

1. **Fixed-ratio schedules** are those where a response is reinforced only after a specified number of responses. This schedule produces a high, steady rate of responding with only a brief pause after the delivery of the reinforcer. An example of a fixed-ratio schedule would be delivering a food pellet to a rat after it presses a bar five times.
2. **Variable-ratio schedules** occur when a response is reinforced after an unpredictable number of responses. This schedule creates a high steady rate of responding. Gambling and lottery games are good examples of a reward based on a variable ratio schedule. In a lab setting, this might involve delivering food pellets to a rat after one bar press, again after four bar presses, and a third pellet after two bar presses.

3. **Fixed-interval schedules** are those where the first response is rewarded only after a specified amount of time has elapsed. This schedule causes high amounts of responding near the end of the interval, but much slower responding immediately after the delivery of the reinforcer. An example of this in a lab setting would be reinforcing a rat with a lab pellet for the first bar press after a 30 second interval has elapsed.
  
4. **Variable-interval schedules** occur when a response is rewarded after an unpredictable amount of time has passed. This schedule produces a slow, steady rate of response. An example of this would be delivering a food pellet to a rat after the first bar press following a one minute interval, another pellet for the first response following a five minute interval, and a third food pellet for the first response following a three minute interval.

### **Choosing a Schedule**

Deciding when to reinforce a behavior can depend upon a number of factors. In cases where you are specifically trying to teach a new behavior, a continuous schedule is often a good choice. Once the behavior has been learned, switching to a partial schedule is often preferable.

Realistically, reinforcing a behavior every single time it occurs can be difficult and requires a great deal of attention and resources. Partial schedules not only tend to lead to behaviors that are more resistant to extinction, they also reduce the risk that the subject will become satiated. If the reinforcer being used is no longer desired or rewarding, the subject may stop performing the desired behavior. For example, imagine that you are trying to teach a dog to sit. If you are using food as a reward, the dog might stop performing the action once he is full. In such instances, something like praise or attention might be a more effective reinforcer.