Classical Conditioning

Background: Learning vs. Memory

First of all, you may find it interesting that "learning" and "memory" make up two different chapters in the text, though the two terms seem very much related. In fact, "learning" and "memory/cognition" are also usually taught as two separate classes and represent two fairly distinct disciplines within psychology. One way to understand the distinction between the two is to consider B.F. Skinner's often quoted definition of learning, "a relatively permanent change in behavior as the result of experience." One basic difference between memory and learning is that memory is not necessarily relatively permanent. In fact, sensory memory, by definition, lasts for a few seconds at most. Second, note that the term "behavior" is an important part of Skinner's definition, with the clear implication that learning is something that is empirical, which can be observed. On the other hand, most cognitive psychologists consider memory to be an abstract construct, which can only be studied indirectly through empirical measures. It is also helpful to consider the historical roots of these two sub-disciplines. Learning grew from the behaviorist school, while the area of memory/cognition was the direct result of the cognitive school of thought. As a result, these two areas share many of the characteristics of the historical behaviorist and cognitive movements. As mentioned, those who study learning are more concerned with observable measures, as opposed to unobservable constructs. Further, research in learning often involves non-human animals as subjects, while cognitive/memory research usually involves humans, or computer simulation. With these distinctions in mind, we now turn our attention to the study of learning.

The Model

We will discuss the oldest (within the modern study of psychology) and, one of the most often cited models of learning, **classical conditioning**. The researcher with which classical conditioning is most often associated is **Ivan Pavlov**. In fact, classical conditioning is sometimes referred to as "Pavlovian" conditioning. Pavlov was a Russian physician and researcher who did a lot of important work studying the digestive system, for which he won a Novel prize in 1904. He's best known however, for his development of a model for describing a basic non-conscious instinctual type of learning.

The "classic" classical conditioning experiment conducted by Pavlov goes as follows: A dog is hooked to a mechanism that measures the amount that the dog salivates. A tone is sounded just before a dog is given meat powder. This occurs several times. Eventually, conditioning occurs in that the dog salivates just to the bell alone. Of course, the dog salivates instinctively in response to the food, but "learns" to salivate to the sound of the bell, much as you might find your mouth watering at the site, smell, or even memory of your favorite food. Pavlov used this relatively simple experiment as a model for describing much of the automatic/nonconscious learning that occurs in everyday life. In any case where you have "learned" to respond automatically to some sort of stimulus with fear, joy, excitement, or anticipation you have become classically conditioned. In fact, a basic characteristic of classical conditioning, in comparison to another popular model, operant conditioning, is that the learning is automatic and non-conscious. Pavlov identified four basic components in this classical conditioning model.

The **unconditioned stimulus** is the stimulus that naturally and instinctively elicits the target response, which, in the case of his classic experiment is the meat powder. **The conditioned stimulus** is the stimulus that comes to elicit the target response, which was the tone in Pavlov's experiment. The **unconditioned** and **conditioned responses** are a little trickier to identify in that they are often the exact same behavior. For example in Pavlov's experiment they are both salivation. The fundamental difference is that the unconditioned response occurs as a result of the unconditioned stimulus, and the conditioned response occurs in response to the conditioned stimulus. In the Pavlov experiment, the unconditioned response is salivation in response to the meat powder, and the conditioned response is salivation in response to the tone. (See Figure 1)
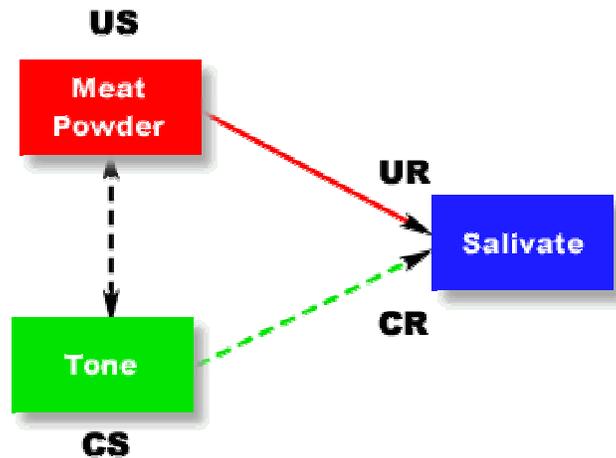

Figure 1. Variables in Pavlov's Dog Experiment

One special and very powerful example of classical conditioning is **taste aversion**. Taste aversion is a case where an organism learns to have an aversion to the taste or smell or other characteristics of some food or drink. For example, after consuming too much alcohol, it's not unusual for someone to associate the smell or even sight of the alcohol with the sickness that resulted from consuming the alcohol (Figure 2).
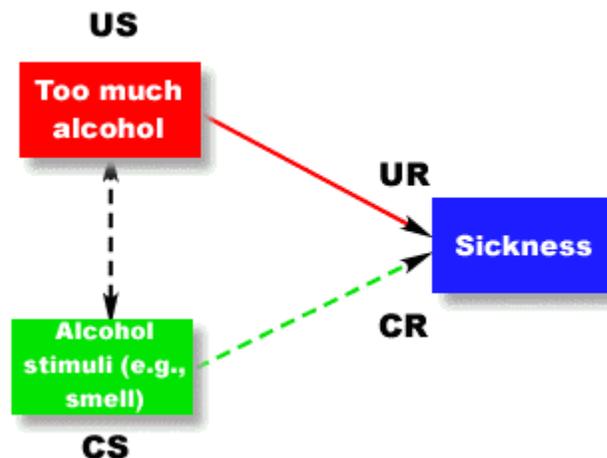

Figure 2. Variables in Taste Aversion Example

Another example that's legendary in psychology circles involves the story of John B. Watson, the father of behaviorism and "**Little Albert**". John B. Watson carried out a classical conditioning experiment with a child (Little Albert) by making a loud noise behind the child's head (smashing two bars together) as the child was playing with a rabbit. Though the child was quite happy playing with the rabbit up until that time, he came to be terrified of the rabbit (Figure 3).
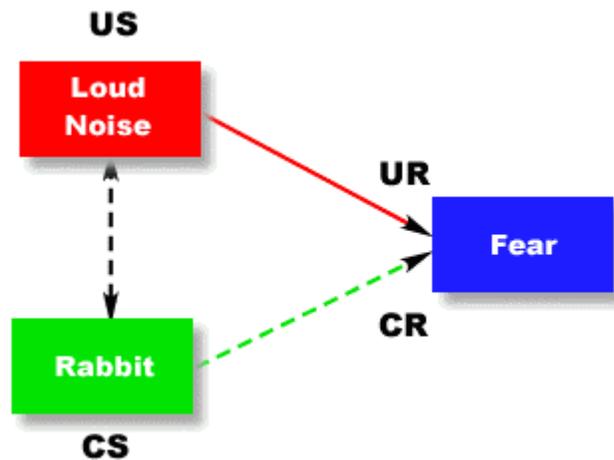

Figure 3. Variables in Watson's "Little Albert" Experiment

Finally, let's consider a hypothetical example involving a college student. Let's start with the assumption that college student's instinctively fear tests. Let's then imagine that the student is taking a general psychology class, and that the instructor always wears a Hawaiian shirt on test day. Thus, the shirt eventually comes to serve as a conditioned stimulus in that it elicits fear in the student, independent of the test (Figure 4). For the record, this last example is actually "second order" classical conditioning in that in "pure" classical conditioning, the unconditioned stimulus – unconditioned response contingency should be basic and instinctive. Students don't actually have an instinctual fear of tests; rather, this is something that is itself classically conditioned at an earlier age. However, note one important thing about all these examples, which is that they all involve a target/learned behavior that is non-conscious and basic, usually involving some response of the autonomic nervous system (e.g., fear, sadness, anxiety, excitement, or joy).
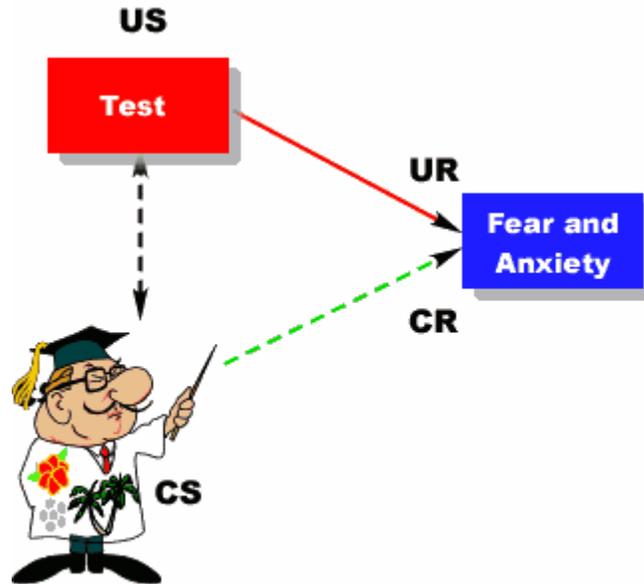
Figure 4. Variables in the Professor/Hawaiin Shirt/Test Example

Other Characteristics of Classical Conditioning

There are, of course, many variables that can effect the degree to which classical conditioning will or will not occur in different situations. As you might have suspected the study of classical conditioning can become quite complex through the consideration of these different variables, and learning researchers have examined many over the years. In this section we will briefly consider some of these variables that have received the most attention.

The time difference between the conditioned stimulus and the unconditioned stimulus is referred to as **latency**. First of all, note that the conditioned stimulus must come first. For example, if Pavlov always sounded the tone after the dog got meat powder, the tone, in the absence of the meat powder, would signal was that the dog somehow missed getting it's meet powder so, in fact, it might as well **not** salivate. Given that the conditioned stimulus does precede the unconditioned stimulus, the general rule of thumb is that the shorter the latency the more likely it is that the conditioning will occur. Another interesting phenomenon that Pavlov identified was a phenomenon that's come to be known as "**spontaneous recovery**". This is the re-occurrence of a classically conditioned response after extinction has occurred. **Extinction** refers to the fact, that, if the conditioned and unconditioned stimuli are not paired for a given number of trials an organism will stop exhibiting the conditioned response. For example, the student mentioned above will, perhaps, some day come to really like Hawaiian shirts again. However, after the student has officially gotten over the fear of Hawaiian shirts, the fear may suddenly reappear. This would be spontaneous recovery. A final important characteristic of classical conditioning is referred to as **generalization**. This is the case where stimuli that are like the conditioned stimulus come to elicit the same response. A classic example is that Little Albert allegedly became fearful of other animals and even his Mother's fur coat.