Sarabjeet Kaur
A Concise Textbook of Human Psychology

Reading excerpt

A Concise Textbook of Human Psychology
of Sarabjeet Kaur
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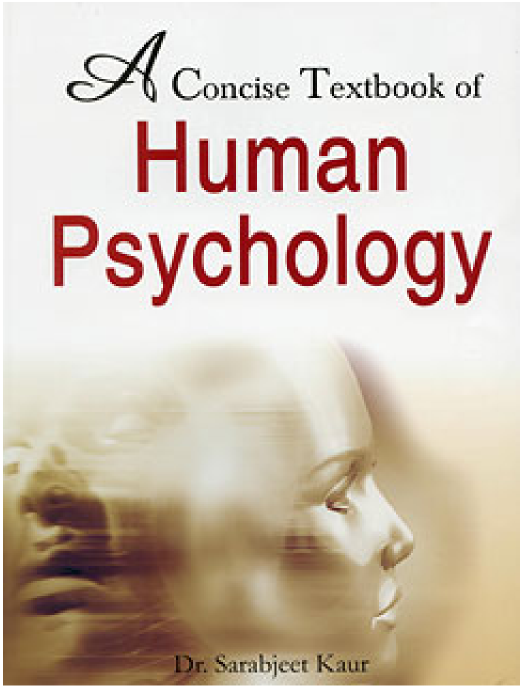

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CHAPTER 5

Learning

In humans, as in other animals, learning is central to adaptation because the environment does not stand still; it varies from place to place and from moment to moment. Knowing how to distinguish edible from inedible foods or to distinguish friends from enemies or predators is essential for survival.

Even though learning has received more attention in terms of experiments than any other object of psychology, there is no one accepted definition of the term. Nevertheless, the various attempts to define it may (without too great a degree of misrepresentation) be formulated as follows: **Learning** consists of relatively persistent changes in possible behaviour in so far as they derive from experience. This restriction of the term excludes short-term changes (adaptation, fatigue, etc.) and those which derive from certain structural alterations of the central nervous system (maturation, ageing, injuries).

Many authors replace the reference to "experience" with terms such as "repetition", "practice," "training," etc., in order to avoid terminology reminiscent of the psychology of consciousness; nevertheless, the information theory model would seem to make it possible to interpret experience (without recourse to the psychology of consciousness) as the *reception and processing of information.* The limitation of the term "learning" to *adaptive* changes of behaviour is usually rejected, since the derivation of (at least objectively) unadapted behaviour patterns (e.g., neuroses) from learning processes should not be excluded. The restriction of the definition to *behaviour* is primarily one of the method; a disadvantage is that the definition is then too far removed from everyday usage, which employs "learning" primarily in the sense of the acquisition and alternation of cognitive structures (learning in school, etc.).

Western tradition attributes learning to the establishment of associations between elements. Twenty-five hundred years ago, *Aristotle* proposed a set of **laws of association-** conditions under which one thought becomes connected, or associated, with another—to account for learning and memory. The most important was the **law of contiguity,** which proposed that two events will become connected in the mind if they are experienced close together in time (such as thunder and lighting). Another was the **law of similarity,** which states that objects that resemble each other (such as two people with similar faces) are likely to become associated. The philosophical school of thought called **associationism** built upon the work of Aristotle, asserting that the most complex thoughts—which allow humans to create airplanes, understand laws of physics, or write symphonies—are ultimately nothing but elementary perceptions that become associated and then recombined in the mind. Principles of association are fundamental to behaviourist theories of learning as well as to cognitive theories of memory, and neuroscientists have now begun to understand their neural basis—all the way down to changes at the synapse.

With the rise of experimental psychology, the association between the contents of consciousness (mental elements such as ideas and images) was

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replaced by association between signals (stimuli) and responses. Instead of the word "association", *conditioning* is now used, in the sense of conditioned responses and signals. The resulting connection is interpreted physiologically —though diversely.

The **theories of learning** tend to share three assumptions:

The first is that *experience shapes behaviour*. In complex organisms such as humans, the vast majority of responses are learned rather than innate. The migration patterns of pacific salmon may be instinctive, but the migration of college students to the hills during summer-break is not. Second, learning is adaptive. Just as nature eliminates organisms that are not well suited to their environments, the environment naturally selects those behaviours in an individual that are adaptive and weeds out those that are not. Behaviours useful to the organism (such as avoiding fights with large member of its species) will be reproduced because of their consequences (safety from bodily harm).

- A third assumption is that *careful experimentation can uncover laws of learning,* many of which apply to human and nonhuman animals alike.

CLASSICAL CONDITIONING

This theory was originally conceived by **Pavlov** (1928) in order to explain the laws of movement of nervous processes which enable the conditional—reflexive activity of the brain to occur; despite its many neurophysiological references, this is essentially a learning theory. The adaptation of behaviour to the environment occurs (according to pavlov) on the basis of the acquisition of conditioned reflexes. **Classical conditioning** (sometimes called *Pavlovian* or *respondent conditioning)* was the first type of learning to be studied systematically.

In the late nineteenth century, the Russian physiologist *Ivan Pavlov* was studying the digestive systems of dogs. During the course of his work, he noticed a peculiar phenomenon. Like humans and other animals, dogs normally salivate when presented with food, which is a simple reflex. Pavlov noticed that if a stimulus, such as a bell or tuning fork ringing, repeatedly occurred just as a dog was about to be fed, the dog would start to salivate when it heard the bell, even if food were not presented. As pavlov understood it, the dog has learned to associate the bell with food, and because food produced the reflex of salivation, the bell also came to produce the reflex.

Pavlov's model

An innate reflex such as salivation to food is an unconditioned reflex. *Conditioning* is a form of learning; hence an **unconditioned reflex** is a reflex that occurs naturally, without any prior learning. The stimulus that produces the response in an unconditioned reflex—in this case, food—is called an **unconditioned stimulus (UCS).** An unconditioned stimulus activates a reflexive response without any learning having taken place; thus, the reflex is unlearned, or unconditioned. An **unconditioned response (UCR)** is a response that does not have to be learned. In pavlov's experiment, the UCR was salivation.

Shortly before presenting the UCS (the food), Pavlov presented a *neutral stimulus—a* stimulus (in this case, ringing a bell) that normally does not elicit the response in question. After the bell had been paired with the unconditioned stimulus (the food) several times, the sound of the bell alone came to evoke a conditioned response, salivation. A **conditioned response (CR)** is a response that has been learned. By pairing the UCS (the food) with the sound of a bell, the bell became a conditioned stimulus (CS)—a stimulus that, through learning, has come to evoke a conditioned response.

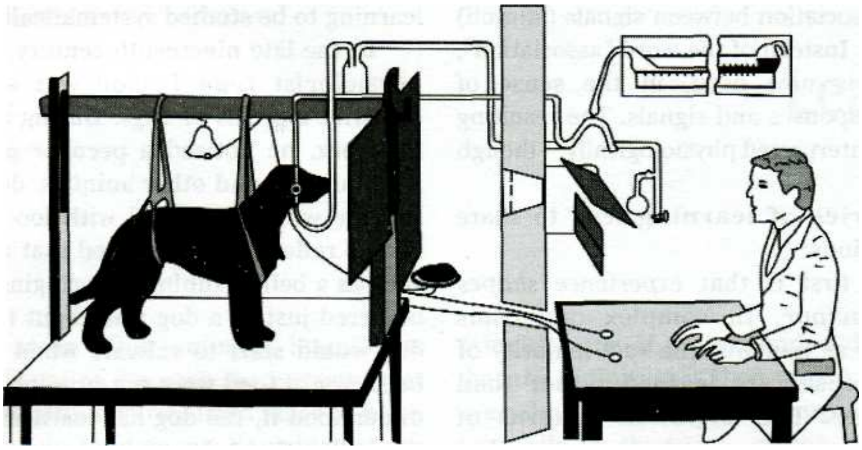


Fig. 5.1 Pavlov's apparatus for studying the conditioned salivary (drooling) response

Classical conditioning can explain a wide array of learned responses outside the laboratory as well. For example, a house cat that was repeatedly sprayed with flea repellent squinted reflexively as the repellent got in its eyes. Eventually it came to squint and meow piteously (CR) whenever its owner used an aerosol spray (CS). The same cat, like many house hold felines, also came to associate the sound of an electric can opener with the opening of its favourite delicacies and would dash to the kitchen counter and meow whenever its owner opened any can, whether cat food or green beans.

Another example is that, most of us have probably had the experience of needing to go to the bathroom but deciding to wait until they get home. Upon arriving at the front door—and worse still upon entering the bathroom—the intensity of the urge seems to intensify a thousand—fold, requiring considerable self—control. This phenomenon, too, is a straight forward example of classical conditioning: Stimuli associated with entering the house and especially the bathroom, are CSs that signal an impending eliminatory response.

Conditioned responses

Pavlov also saw how learning could produce maladaptive patterns as well. Three cases in which classical conditioning generally fosters adaptation but can also lead to maladaptive responses are: conditioned taste aversions, conditioned emotional responses, and conditioned immune responses.

Conditioned taste aversions A conditioned taste aversion is a learned aversion to a taste associated with an unpleasant feeling, usually nausea. From an evolutionary perspective, the ability to connect tastes with nausea or other unpleasant visceral ("gut") experiences is crucial to survival; learning to avoid toxic foods can mean the difference between life and death for an animal that forages (that is, scrounges or hunts) for its meals.

Although conditioned taste aversions normally protect the organism from ingesting toxic substances, anyone who has ever developed an aversion to a food eaten shortly before getting the flu knows how irrational these aversions can sometimes be. Cancer patients undergoing chemotherapy often develop aversions to virtually all food—and may lose

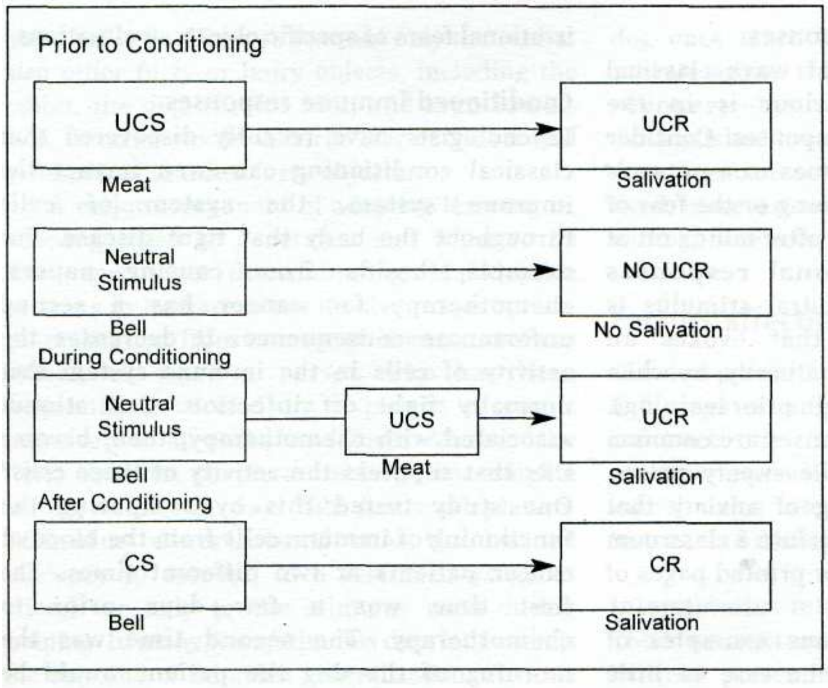
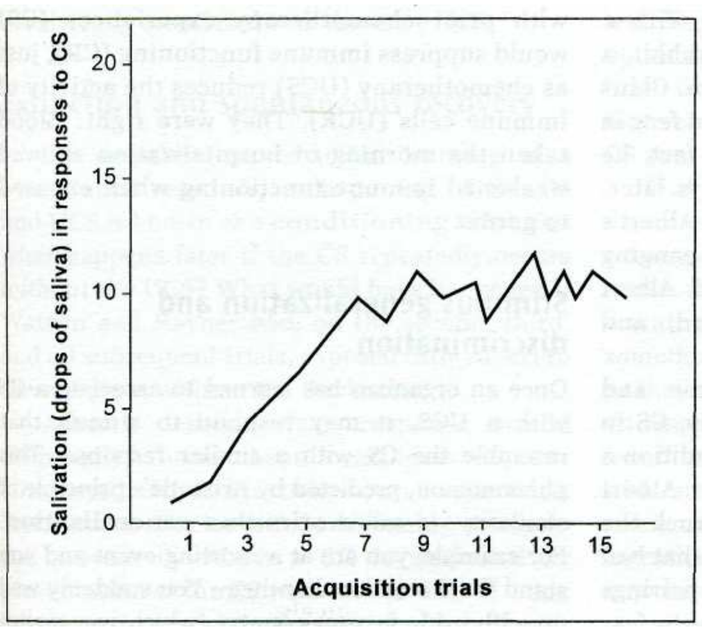


Fig. 5.2 Classical conditioning. In classical conditioning, an initially neutral stimulus comes to elicit a conditioned response



dangerous amounts of weight—because a common side effect of chemotherapy is nausea. To put this in the language of classical conditioning, chemotherapy is a UCS that leads to nausea, a UCR; the result is an inadvertent association of any food eaten (CS) with nausea (the CR). This conditioned response can develop rapidly, with only one or two exposures to the food paired with nausea. Some patients even begin to feel nauseous at the sound of a nurse's voice, the sight of the clinic, or the thought of treatment, although acquisition of these CRs generally requires repeated exposure.

*** Fig. 5.13 A learning or acquisition curve of a classically conditioned response. Initially the dog did not salivate in response to the sound of the bell. By the third conditioning trial, however, the conditioned stimulus (the bell) had begun to elicit a conditioned response (salivation), which was firmly established by the fifth or sixth trial.**

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Conditioned emotional responses

One of the most important ways classical conditioning affects behaviour is in the conditioning of emotional responses. Consider the automatic smile that comes to a person's face when hearing a special song or the fear of horses a person may develop after falling off of one. **Conditioned emotional responses** occur when a formerly neutral stimulus is paired with a stimulus that evokes an emotional response (either naturally, as when bitten by an animal, or through prior learning). Conditioned emotional responses are common in everyday life, such as the sweaty palms, pounding heart, and feeling of anxiety that arise after an instructor walks into a classroom and begins handing out a few printed pages of questions.

One of the most famous examples of classical conditioning was the case of little Albert. The study was performed by *John Watson* and his colleague, *Rosalie Rayner* (1920). When Albert was nine months old, Watson and Rayner presented him with a variety of objects, including a dog, a rabbit, a white rat, masks (including a Santa Claus mask), and a fur coat. Albert showed no fear in response to any of these objects; in fact, he played regularly with them. A few days later, Watson and Rayner tested the little Albert's response to a loud noise (the UCS) by banging on a steel bar directly behind his head. Albert reacted by jumping, falling forward, and whimpering.

About two months later, Watson and Rayner selected the white rat to be the CS in their experiment and proceeded to condition a fear response in Albert. Each time Albert reached out to touch the rat, they struck the steel bar, creating the same loud noise that had initially startled him. After only a few pairings of the noise and the rat, Albert learned to fear the rat.

Studies since Watson and Rayner's time have proposed classical conditioning as an explanation for some human **phobias,** that is, irrational fears of specific objects or situations.

Conditioned immune responses

Psychologists have recently discovered that classical conditioning can even impact the immune system, the system of cells throughout the body that fight disease. For example, beside from causing nausea, chemotherapy for cancer has a second unfortunate consequence: It decreases the activity of cells in the immune system that normally fight off infection. Can stimuli associated with chemotherapy, then, become CRs that suppress the activity of these cells? One study tested'this by comparing the functioning of immune cells from the blood of cancer patients at two different times. The first time was a few days prior to chemotherapy. The second time was the morning of the day the patient would be receiving chemotherapy, after checking into the hospital. The investigators hypothesized that exposure to hospital stimuli associated with prior chemotherapy experiences (CS) would suppress immune functioning (CR), just as chemotherapy (UCS) reduces the activity of immune cells (UCR). They were right: Blood taken the morning of hospitalization showed weakened immune functioning when exposed to germs.

Stimulus generalization and discrimination

Once an organism has learned to associate a CS with a UCS, it may respond to stimuli that resemble the CS with a similar response. This phenomenon, predicted by Aristotle's principle of similarity, is called **stimulus generalization.** For example, you are at a sporting event and you stand for the national anthem. You suddenly well up with pride in your country (which you realize now, of course, is nothing but a classically conditioned emotional response).

Similarly, in Watson and Rayner's experiment, the pairing of the rat and the loud noise led little Albert to fear not only the rat but also other furry or hairy objects, including the rabbit, the dog, the fur coat, and even Santa's face. In other words~ Albert's fear of the rat had *generalized* to other furry objects.

A major component of adaptive learning is, knowing when to generalize and when to be more specific or discriminating. Maladaptive patterns in humans often involve inappropriate generalization from one set of circumstances to others, as when a person who has been frequently criticized by a parent responds negatively to all authority figures. Much of the time, however, people are able to discriminate among stimuli in ways that foster adaptation. **Stimulus discrimination** is the learned tendency to respond to a restricted range of stimuli or only to the stimulus used during training. In many ways, stimulus discrimination is the opposite of stimulus generalization. Pavlov's dogs did not salivate in response to just *any* sound. Organisms learn to discriminate between two similar stimuli when these stimuli are not consistently associated with the same UCS.

Extinction and spontaneous recovery

In the **acquisition,** or initial learning of a conditioned response, each pairing of the CS and UCS is known as a **conditioning trial.** But what happens later if the CS repeatedly occurs *without* the UCS? What would have happened if Watson and Rayner had, on the second, third, and all subsequent trials, exposed little Albert to the white rat without the loud noise?

Albert's learned fear response would eventually have been *extinguished,* or eliminated, from his behavioural repertoire. **Extinction** in classical conditioning refers to the process by which a CR is weakened by presentation of the CS without the UCS. If a dog has come to associate the sound of a bell with food, it will eventually stop salivating at the bell tone if the bell rings enough times without the presentation of food. The association is weakened—but not obliterated. If days later the dog once more hears the bell, it is likely to salivate again. This is known as **spontaneous recovery—the** reemergence of a previously extinguished conditioned response. The spontaneous recovery of a CR is typically short-lived, however, and will rapidly extinguish again without renewed pairings of the CS and UCS.

Factors affecting classical conditioning

Classical conditioning does not occur everytime a bell rings or a baby startles. Several factors influence the extent to which classical conditioning will occur. These include the interstimulus interval, the individual's learning history, and the organism's preparedness to learn.

Interstimulus interval

The interstimulus interval is the time between presentation of the CS and the UCS. Presumably, if too much time passes between the presentation of these two stimuli, the animal is unlikely to associate them, and conditioning is less likely to occur. For most responses, the optimal interval between the CS and UCS is very brief, usually a few seconds or less. The optimal interval depends, however, on the stimulus. A CS that occurs about a half a second before a puff of air blows on the eye will have the maximum power to elicit a conditioned eyeblink response in humans. This makes evolutionary sense because we usually have very little warning between the time we see or hear something and the time, debris reaches our eyes. At the other extreme conditioned taste aversions do not occur when the interstimulus interval is *less than* ten seconds, and learning often occurs with intervals up to several hours. Given that nausea or stomach pain can develop hours after ingestion of a toxic substance, the capacity to associate tastes with feelings in the gut minutes or hours later clearly fosters survival.

The temporal order of the CS and the UCS—that is, which one comes first—is also crucial. Maximal conditioning occurs when the onset of the CS precedes the UCS—called **forward**