

Learning and Behavior Modification

Dr. Rawan Masri

Learning

Subjective impressions, and unconscious processes are not relevant. All that matters is the objective data, i.e., only what can be seen, observed, and measured.

The behaviorist definition of learning: a relatively permanent change in behavior, brought about by experience not due to fatigue, drugs, or maturation.

The two main types of learning paradigms are classical conditioning and operant conditioning.

Classical Conditioning

Classical conditioning is a term used to describe learning, which has been acquired through experience. A type of learning in which an organism responds to a neutral stimulus that normally does not bring about that response. In order to do this he first showed them food, the sight of which caused them to salivate. Later Pavlov would ring a bell every time he would bring the food out, until eventually, the dogs started to salivate just by ringing the bell and without giving the dogs any food.

Classical Conditioning

- Neutral stimulus
prior to conditioning, has no effect on the desired response
- Unconditioned Stimulus (UCS)
a stimulus that brings about a response without having been learned
- Unconditioned Response (UCR)
a response that is natural and needs no training (e.g. salivation at the smell of food)
- Conditioned Stimulus (CS)
a once-neutral stimulus that has been paired with a UCS to bring about a response formerly caused only by the UCS
- Conditioned Response (CR)
a response that, after conditioning, follows a previously neutral stimulus

Classical Conditioning

Classical Conditioning

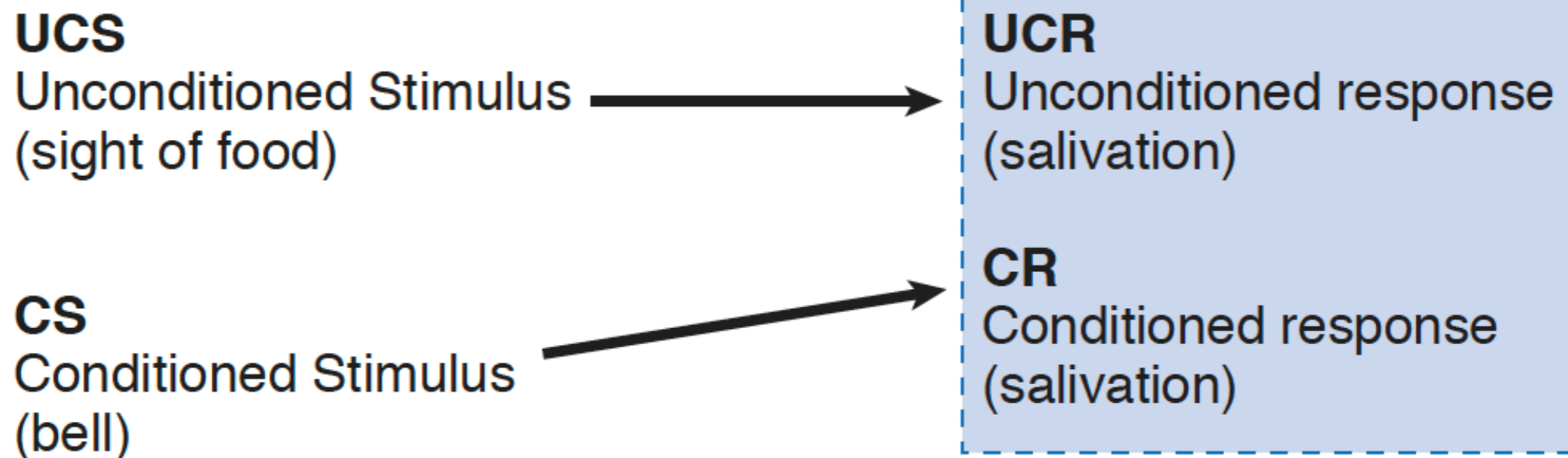
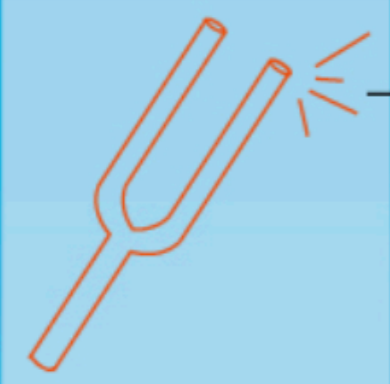


Figure 6-1. Classic (or Respondent or Pavlovian) Conditioning

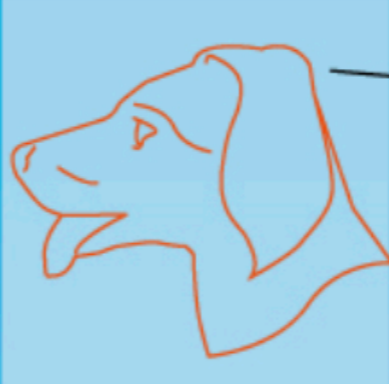
a. Before conditioning

Neutral stimulus



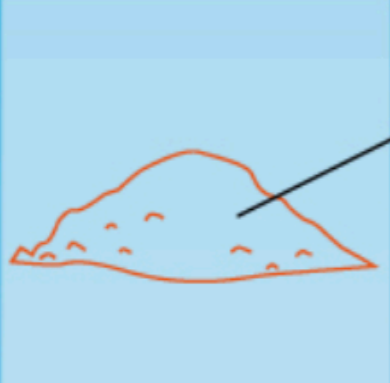
Sound of tuning fork

Response unrelated to meat powder



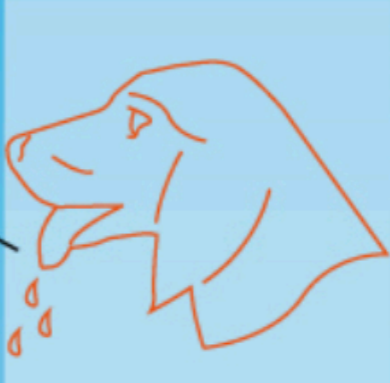
Pricking of ears

Unconditioned stimulus (UCS)



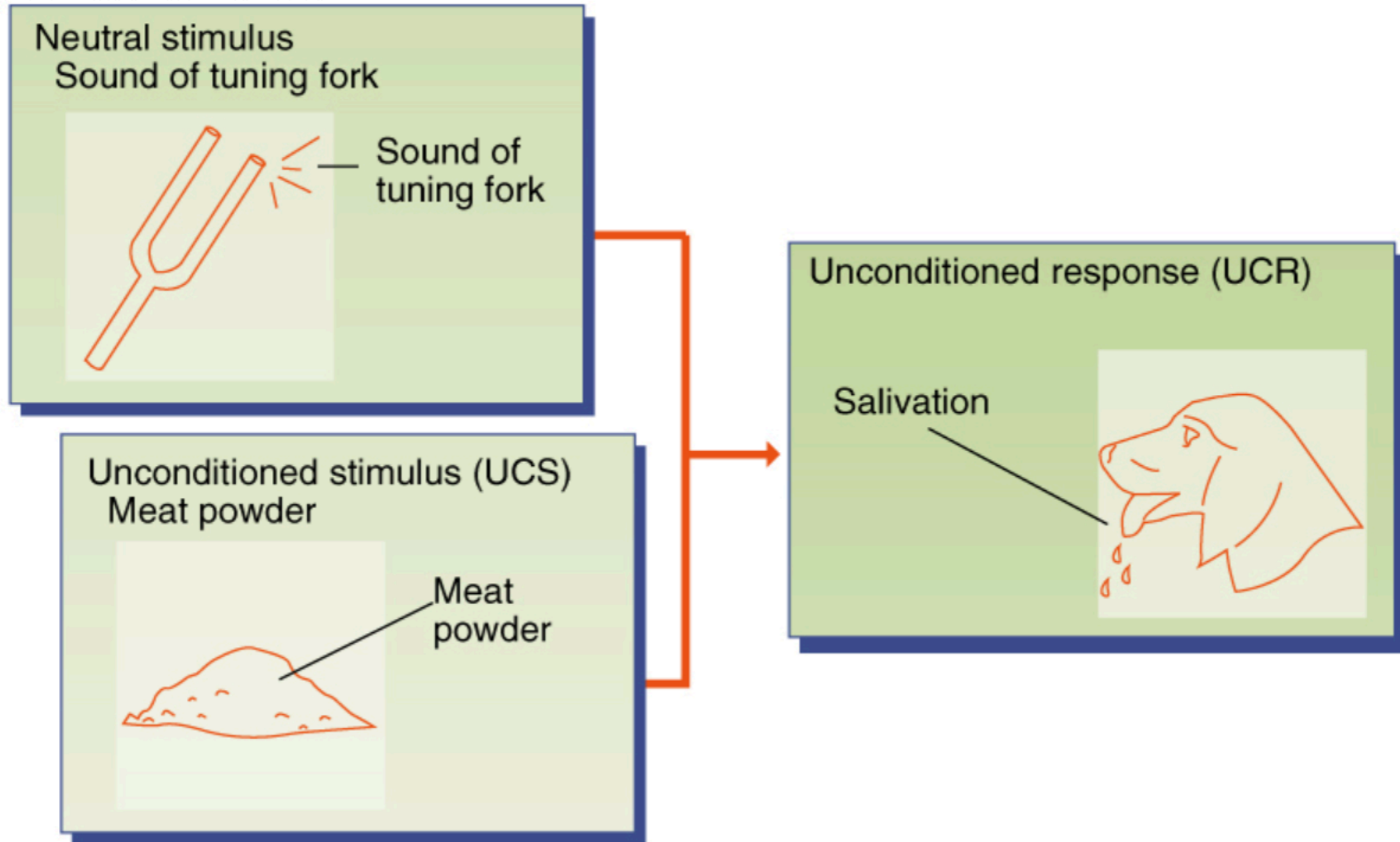
Meat powder

Unconditioned response (UCR)

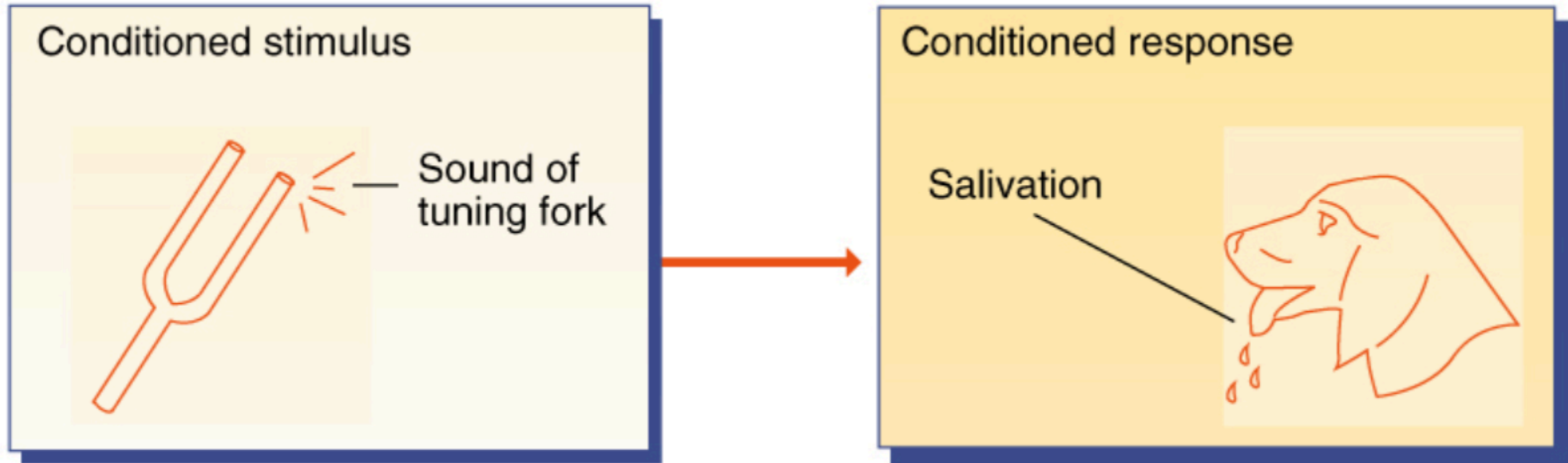


Salivation

b. During conditioning



c. After conditioning



Classical Conditioning

1. In classical conditioning, the conditioned response is elicited by the conditioned stimulus after repeated pairings of the UCS and CS.
 - a. The Pavlovian experiment paired the ringing of a bell with the bringing of food so that, eventually, the sound of the bell elicited the salivatory response, which previously occurred only with the sight of the food.
 - b. Or, for example, a patient receives chemotherapy (UCS), which induces nausea (UCR). Eventually, the sights and sounds of the hospital alone (CS) elicit nausea (now a CR).
2. A new stimulus elicits the same behavior. Note that the triggering stimulus (CS) occurs before the response.

Classical Conditioning

3. Stimulus generalization: the tendency for the conditioned stimulus to evoke similar responses after the response has been conditioned. If a salivation response had been conditioned to a tone of 1,000 CPS, an 800 CPS tone will elicit a similar response. Or, in the second example, generalization will have occurred if any hospital, or even meeting a physician, comes to elicit nausea from the patient.
4. Extinction: after learning has occurred, removal of the pairing between the UCS and the CS results in a decreased probability that the conditioned response will be made. For example, breaking the pairing between chemotherapy and the medical setting by giving chemotherapy at home. The nausea-eliciting properties of hospitals will be extinguished.

Operant or Instrumental Conditioning

Skinner's Operant Conditioning

- Operant conditioning (*instrumental conditioning*) is a method of learning that occurs through rewards and punishments for behavior.
- Through operant conditioning, an association is made between a behavior and a *consequence* for that behavior.

Skinner used the term *operant* to refer to any "*active behavior that operates upon the environment to generate consequences*"

- Skinner introduced a new term- Reinforcement. Behavior that is reinforced tends to be repeated (i.e. strengthened); behavior that is not reinforced tends to die out-or be extinguished (i.e. weakened).

Operant or Instrumental Conditioning

1. In operant conditioning, a new response is emitted, perhaps randomly at first, which results in a consequence.
 - a. The consequence acts as reinforcement and changes the probability of the response's future occurrence.
 - b. In the Skinner experiment, The Skinner box involved placing an animal (such as a rat) into a sealed box with a lever that would release food when pressed. If food were released every time the rat pressed the lever, it would press it more and more because it learnt that doing so gives it food. Because it changed behavior, the food is a reinforcing event. Pressing the lever is the operant behaviour, because it is an action that results in a consequence. The food that is released as a result of pressing the lever is known as a reinforcer, because it causes the behaviour (lever pressing) to increase.
2. A new response occurs to an old stimulus. Note the triggering stimulus (reinforcement) occurs after the response.

Operant or Instrumental Conditioning

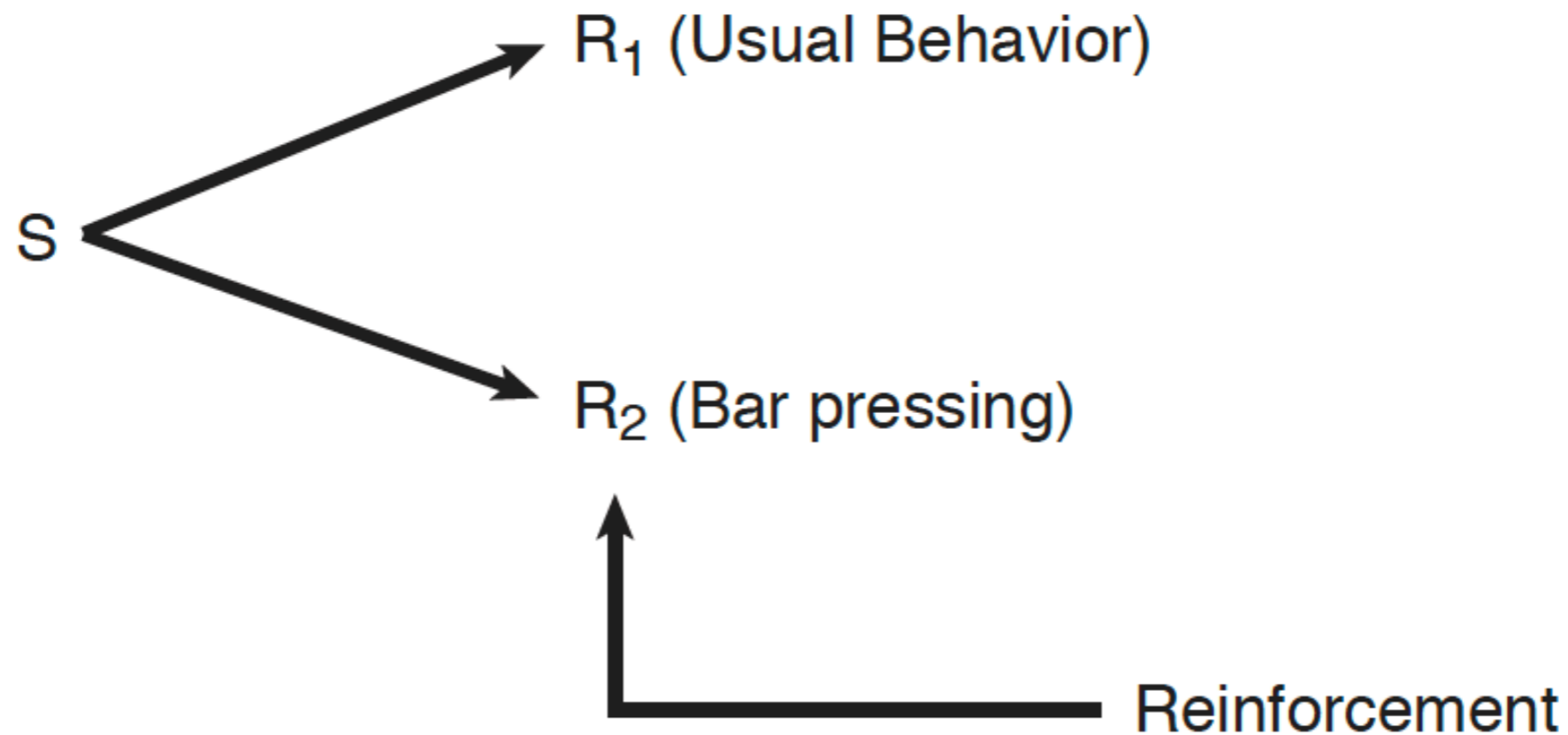


Figure 6-2. Operant or Instrumental Conditioning



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Operant or Instrumental Conditioning

3. Reinforcement is delivery of a consequence that increases the likelihood that a response will occur. A reinforcer is defined by its effects. Any stimulus is a reinforcer if it increases the probability of a response.

4. Types of reinforcers

a. A positive reinforcer is a stimulus that, when applied following an operant response, strengthens the probability of that response occurring.

i. E.g., increased pay leads to increased work from an employee

ii. E.g., increased complaining leads to increased attention from the nursing staff

b. A negative reinforcer is a stimulus that, when removed following an operant response, strengthens the probability of that response occurring.

i. E.g., a child learns that he can stop his parents' nagging by cleaning up his room.

ii. Aversive stimuli such as a loud noise, bright light, shock, can often be negative reinforcers

Operant or Instrumental Conditioning

- d. Punishment, like negative conditioning, usually uses a noxious stimulus.
 - i. However, this stimulus is imposed to weaken response.
 - ii. Ordinarily, punishment should be paired with positive reinforcement for alternative behaviors.
 - iii. E.g., physical punishment of a child will suppress naughty behavior, but may fade when the punishment is removed and may model aggressive physical behavior for the child.
- e. Extinction refers to the disappearance of a response when it is no longer being reinforced.
 - i. E.g., a nurse who is bombarded by constant complaints from a patient stops paying attention to the patient whenever he complains.
 - ii. E.g., a child is ignored by the parents when he throws temper tantrums.
 - iii. If successful, the unwanted behavior will stop.

Note: A behavior is something that is done. A stimulus is something in sensory impression (sight, sound, smell, feeling).

Operant or Instrumental Conditioning

Shaping

the process of teaching a complex behavior by rewarding closer and closer approximations of the desired behavior

Chaining:

Teaching complex behaviors by breaking them down into simple components. Each component is reinforced once acquired.

Table 6-1. Types of Reinforcement

		Stimulus: (S)	
		Add	Remove
Behavior: (R)	Stops	Punishment	Extinction
	Increases	Positive reinforcement	Negative reinforcement

Reinforcement Schedules

- a. Continuous reinforcement: every response is followed by a reinforcement.
 - i. Results in fast learning (acquisition)
 - ii. Results in fast extinction when reinforcement is stopped

- b. Intermittent (or partial) reinforcement: not every response is reinforced
 - i. Learning is slower
 - ii. Response is harder to extinguish
 - iii. E.g., a child throws a tantrum and the parents ignore it for long periods of time in the hope that the child will stop. They don't want to reinforce such behavior with attention. However, if their patience wears thin and, after a long spell of ignoring, they attend to the baby, they are putting the child on an intermittent reinforcement schedule and will find it harder to extinguish the tantrums.
 - iv. Extinction of intermittent reinforcement often requires a change back to continuous reinforcement.

Interval Schedules

Interval schedules: based on the passage of time before reinforcement is given

- Fixed interval schedule reinforces the response that occurs after a fixed period of time elapses. Responses are slow in the beginning of the interval and faster immediately prior to reinforcement.

- Response pattern: on and off

- Animal or person learns to delay response until near end of time period
E.g., cramming before an exam or working extra hard before bonus at the holidays

- Variable interval schedule delivers reinforcements after unpredictable time periods elapse

- Higher, steadier rate of responding

- Cannot learn when next response will be reinforced, leading to a steadier response rate

E.g., pop quizzes or surprise bonuses at work

Ratio schedules

Ratio schedules: based on the number of behaviors elicited before reinforcement is given

- Fixed ratio schedule delivers reinforcement after a fixed number of responses.
 - Produces high response rate
 - Rewards a set of behaviors rather than a single behavior, e.g., paying workers on a piecework basis.
- Variable ratio schedule delivers reinforcement after a changing number of responses.
 - Produces the greatest resistance to extinction
 - For example, in gambling, a large number of responses may be made without reward. Since any response may be the lucky one, person keeps on trying.
 - Slot machines.

6. Spontaneous recovery: after extinction, the response occurs again without any further reinforcement.

7. Secondary reinforcement: a symbol or a token gains reinforcement value because of its association with a real reinforcer (e.g., money is not valuable in itself but because of what you can do with it).

Table 6-2. Reinforcement Schedules

		Contingency	
		Time	Behaviors
Schedule:	Constant	Fixed interval (FI)	Fixed ratio (FR)
	Changing	Variable interval (VI)	Variable ratio (VR)

Social Learning

Modeling, Observational, or Social Learning

1. Watching someone else get reinforcement is enough to change behavior
2. Follows the same principles as in operant conditioning
3. Correlating the effects of watching violence on television with committing violence “in the real world” stems from this concept.
4. Part of why group therapy works
5. Other applications: assertiveness training, social skills training, preparing children for various frightening or painful medical or surgical procedures

Therapy/Modification Based on Classical Conditioning

1. Systematic desensitization—usually begins with imagining oneself in a progression of fearful situations and using relaxation strategies that compete with anxiety.

a. Often used to treat anxiety and phobias

b. Based on the counterconditioning or reciprocal inhibition of anxiety responses

Step 1: Hierarchy of fear-eliciting stimuli is created, building from least to most stressful.

Step 2: Therapist teaches the technique of muscle relaxation, a response that is incompatible with anxiety.

Step 3: Patient is taught to relax in the presence, real or imagined, of each stimulus on the hierarchy from least to most stressful.

c. When the person is relaxed in the presence of the feared stimulus, objectively, there is no more phobia.

d. Note that this works by replacing anxiety with relaxation, an incompatible response

Therapy/Modification Based on Classical Conditioning

2. Exposure

- a. Simple phobias can sometimes be treated by forced exposure to the feared object.
- b. Exposure maintained until fear response is extinguished
- c. E.g., fear of heights treated by having patient to ride up elevator
- d. In more extreme form, called “flooding” or “implosion” therapy

3. Aversive conditioning

occurs when a stimulus that produces deviant behavior is paired with an aversive stimulus.

- a. Key properties of the original stimulus are changed
 - i. E.g., Pavlov’s dog being presented with spoiled meat upon ringing bell. The dog does not salivate, but instead recoils as the spoiled meat is presented.
- b. Used in the treatment of alcoholism and some forms of sexual deviance
 - i. E.g., an alcoholic is given a nausea-inducing drug (disulfiram) whenever he drinks so that drinking eventually comes to elicit unpleasant rather than pleasant events; chili peppers and thumb-sucking

Therapy/Modification Based on Operant Conditioning

1. Shaping (or successive approximations)

- a. Achieves final target behavior by reinforcing successive approximations of the desired response
- b. Reinforcement is gradually modified to move behaviors from the more general to the specific responses desired.
- c. E.g., an autistic boy who won't speak is first reinforced, perhaps with candy, for any utterance. From those utterances, the appropriate phonemes are selected and reinforced until the child utters the sought-after sounds. Eventually, reinforcement is contingent on his using speech correctly in the proper context.

2. Extinction

- a. Discontinuing the reinforcement that is maintaining an undesired behavior
- b. E.g., if complaining results in a patient receiving a lot of attention, stopping the attention will eventually stop the undesired behavior.
- c. E.g., instituting a "time out" with children who are acting inappropriately or test-takers who are anxious

Therapy/Modification Based on Operant Conditioning

3. Stimulus control

- a. Sometimes stimuli inadvertently acquire control over behavior. When this is true, removal of that stimulus can extinguish the response
- b. E.g., a person's eating behavior is tied to a particular stimulus, such as television watching. Reducing the time watching television should reduce the amount eaten.
- c. E.g., an insomniac is permitted in his bed only when he is so tired that he falls asleep almost at once.

4. Fading

- a. Gradually removing the reinforcement without the subject discerning the difference
- b. E.g., promoting smoking cessation by reducing the nicotine content of the cigarettes gradually and “silently” over a period of time
- c. E.g., gradually replacing postoperative painkiller with a placebo

Therapy/Modification Based on Operant Conditioning

5. Biofeedback (neurofeedback)

- a. Using external feedback to modify internal physiologic states
- b. Used to be thought that certain functions of the autonomic nervous system (heart rate, blood pressure, body temperature) were beyond the deliberate control of a person. We now know that both animals and humans can attain a measure of control over some of their own bodily functions through the technique of biofeedback.
 - i. Often uses electronic devices to present physiologic information, e.g., heart monitor to show heart rate
- c. Biofeedback involves providing the person with information about his internal responses to stimuli and methods to control and/or modify them.
- d. Biofeedback works by means of trial-and-error learning and requires repeated practice to be effective.
- e. Uses: treatment of hypertension, migraine and muscle-contraction headaches, Raynaud syndrome, torticollis, cardiac arrhythmias, and anxiety
- f. Galvanic skin response: reduced skin conductivity = anxiety reduction
- g. Most biofeedback affects the parasympathetic system.

The End