

Learning

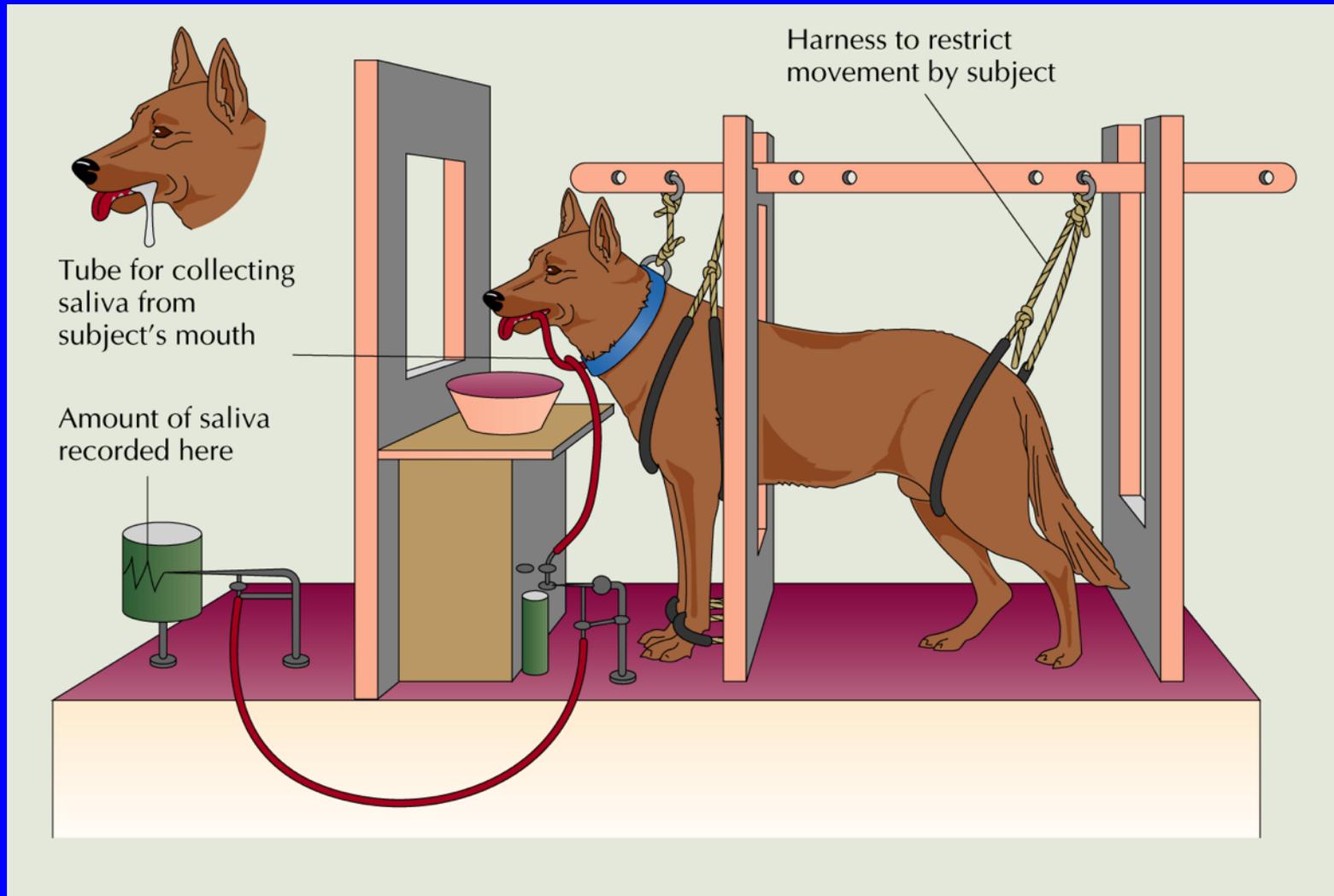
Learning

- **Learning** refers to relatively permanent changes in behavior resulting from practice or experience
 - Learning can be unlearned
 - Observation can lead to learning
 - Learning requires an operational memory system

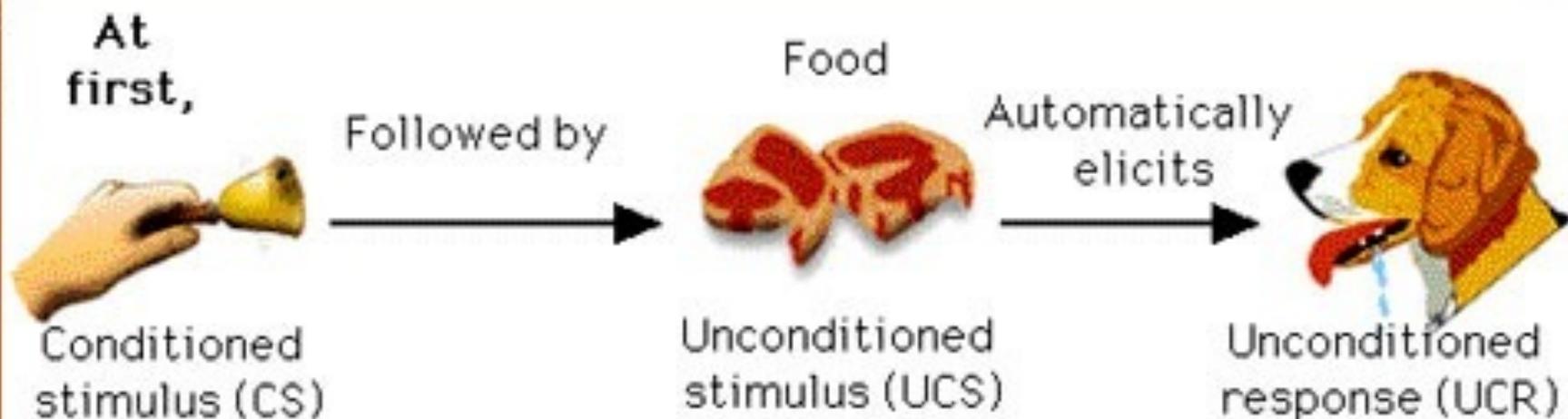
Classical Conditioning

- Classical condition is learning by association
 - it is sometimes called “reflexive learning”
 - it is sometimes called respondent conditioning
- The Russian physiologist, Ivan Pavlov, and his dogs circa 1905
 - discovered classical conditioning by serendipity
 - received the Nobel Prize in science for discovery

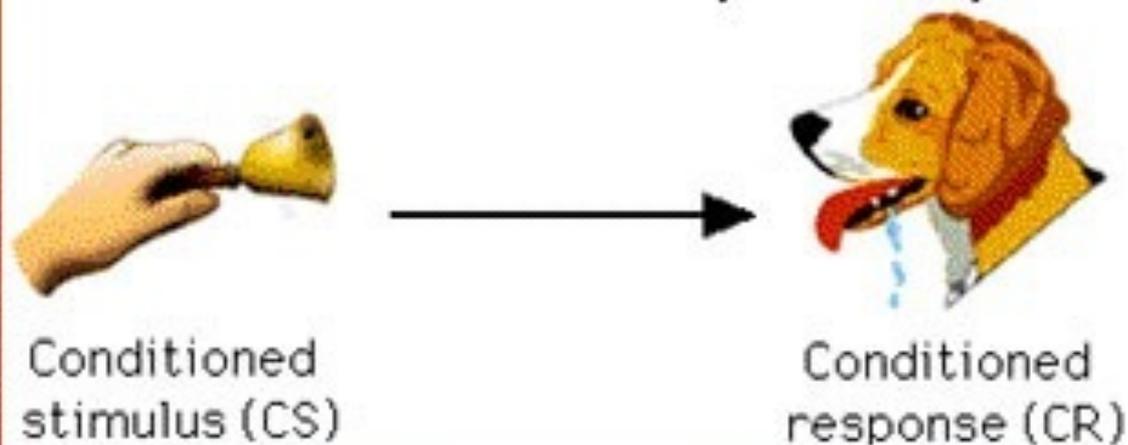
Pavlov's Experiment



Analysis of Pavlov's Study



After some number of repetitions,



Ketchum
2-21



"I think Mom's using the can opener."

Classical Conditioning

- Association: the KEY element in classical conditioning
 - Pavlov considered classical conditioning to be a form of learning through association, in time, of a neutral stimulus and a stimulus that incites a response.
 - Any stimulus can be paired with another to make an association if it is done in the correct way (following the classical conditioning paradigm)

Classical Conditioning

- Terminology of Classical Conditioning
 - **Unconditioned Stimulus** (UCS): any stimulus that will always and naturally ELICIT a response
 - **Unconditioned Response** (UCR): any response that always and naturally occurs at the presentation of the UCS
 - **Neutral Stimulus** (NS): any stimulus that does not naturally elicit a response associated with the UCR

Classical Conditioning

- Terminology of Classical Conditioning (continued)
- **Conditioned Stimulus (CS)**: any stimulus that will, after association with an UCS, cause a conditioned response (CR) when present to a subject by itself
- **Conditioned Response (CR)**: any response that occurs upon the presentation of the CS

Classical Conditioning

- Certain stimuli can elicit a reflexive response
 - Air puff produces an eye-blink
 - Smelling a grilled steak can produce salivation
- The reflexive stimulus (UCS) and response (UCR) are unconditioned
- The neutral stimulus is referred to as the conditioned stimulus (CS)
- In classical conditioning, the CS is repeatedly paired with the reflexive stimulus (UCS)
 - Conditioning is best when the CS precedes the UCS
- Eventually the CS will produce a response (CR) similar to that produced by the UCS

Classical Conditioning

- The Classical Conditioning “paradigm”
 - “paradigm” is a scientific word similar to using the word “recipe” in a kitchen, I.e., this is how you do it
 - UCS----->UCR
 - NS----->UCS----->UCR
 - CS----->CR
 - That’s all there is to it. I’ll show you a fleshed-out example on the next slide

Classical Conditioning

- Here's a fleshed out example:

- UCS----->UCR
– (food powder) -----> (salvating)
- NS----->UCS----->UCR
– (bell)--->(food powder) -----> (salvating)
- CS----->CR
– (bell)-----> (salvating)

Classical Conditioning

- Here's another example:

- UCS----->UCR
– (onion juice) -----> (crying)
- NS -----> UCS ----->UCR
– (whistle)-->(onion juice)-----> (crying)
- CS ----->CR
– (whistle)-----> (crying)

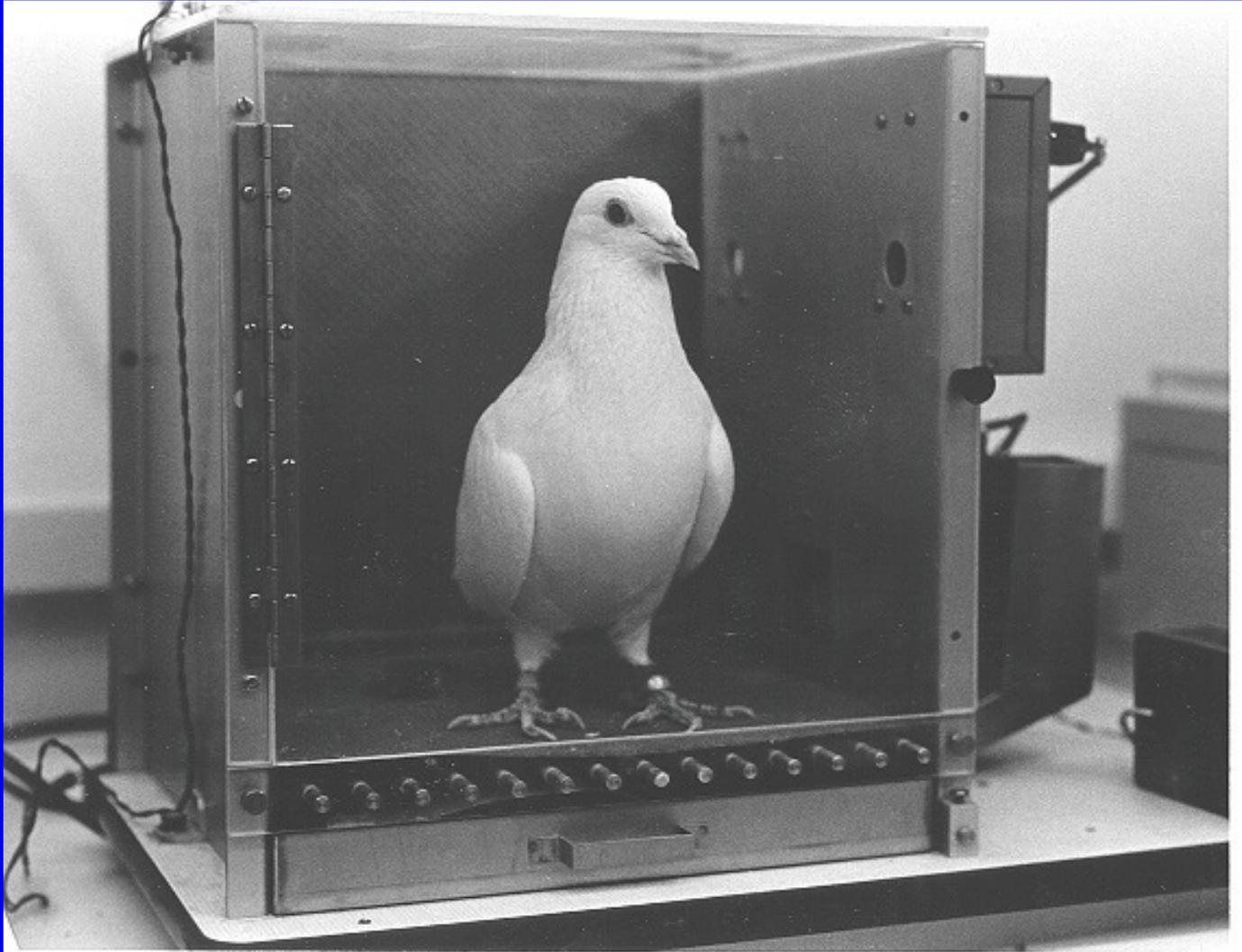
Importance of Classical Conditioning

- Classical conditioning is involved in many of our behaviors
 - wherever stimuli are paired together over time we come to react to one of them as if the other were present
 - a particular song is played and you immediately think of a particular romantic partner
 - a particular cologne is smelled and you immediately think of a romantic partner

Classical Conditioning

- Some pointers on effective conditioning
 - NS and UCS pairings must not be more than about 1/2 second apart for best results
 - Repeated NS/UCS pairings are called “training trials”
 - Presentations of CS without UCS pairings are called “extinction trials”
 - Intensity of UCS effects how many training trials are necessary for conditioning to occur

Operant Conditioning: Skinner Box



Operant Conditioning

- Organisms make responses that have consequences
 - The consequences serve to increase or decrease the likelihood of making that response again
 - The response can be associated with cues in the environment
 - We put coins in a machine to obtain food
 - But we refrain when an **Out of Order** sign is placed on the machine



Operant Conditioning

- Operant conditioning is simply learning from the consequences of your behavior
 - the “other side” of the psychologist’s tool box, operant conditioning is a form of learning in which the consequences of behavior lead to changes in the probability of a behavior’s occurrence.

Key Aspects of Operant Conditioning

- In operant conditioning, the stimulus is a cue, it does not elicit the response
- Operant responses are voluntary
- In operant conditioning, the response elicits a reinforcing stimulus, whereas in classical conditioning, the UCS elicits the reflexive response

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Key Terms of Operant Conditioning

- **Reinforcement** is any procedure that increases the response
- **Punishment** is any procedure that decreases the response
- Types of reinforcers:
 - Primary: e.g. food or water
 - Secondary: money or power



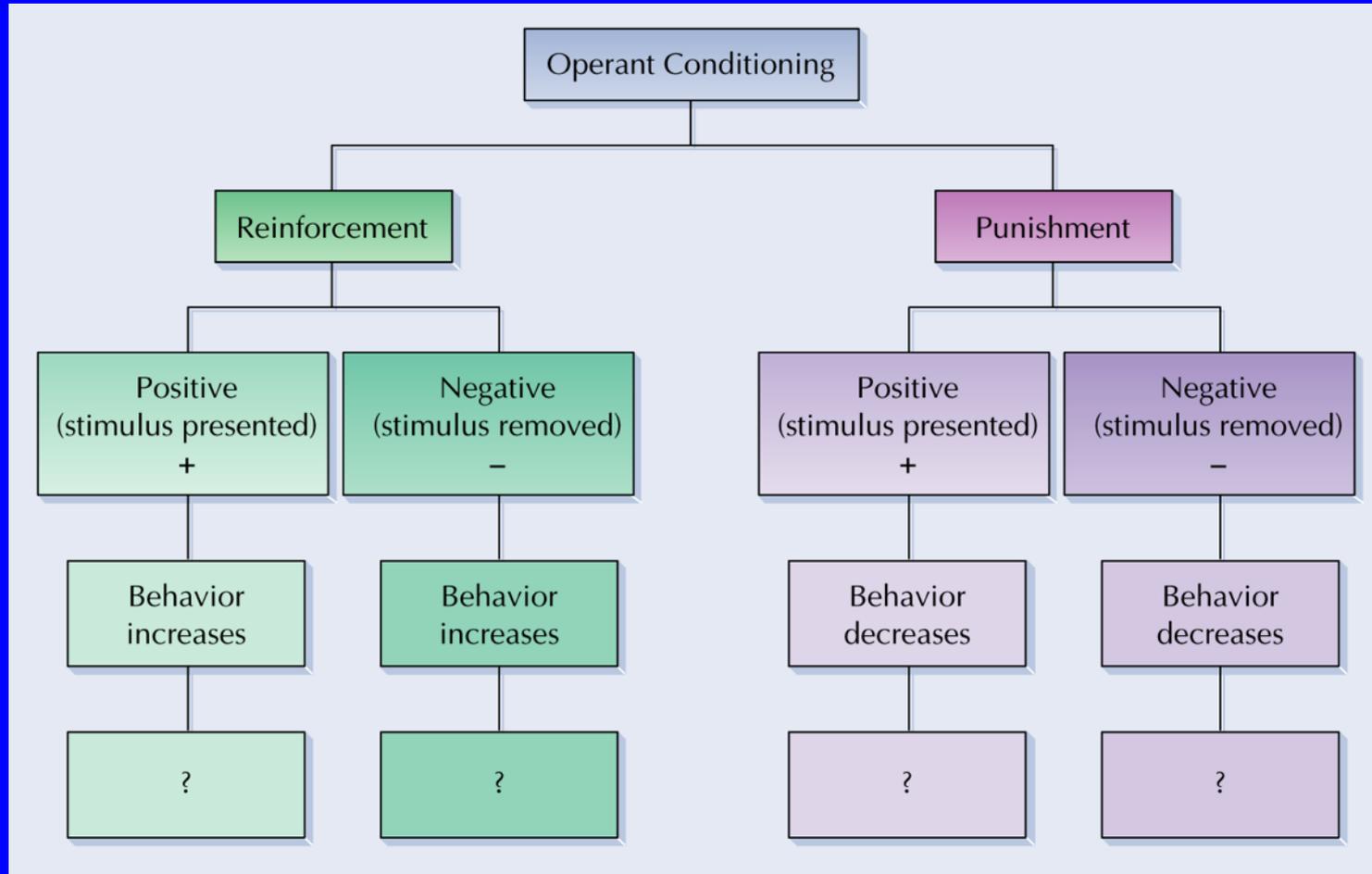
Operant Conditioning

- The Operant Conditioning paradigm:
- SD -----> Response -----> Consequence
 - where “SD” is the “discriminative stimulus”
 - where “Response” is the subject’s behavior
 - where “Consequence” is what happens to the subject after EMITTING the response
- What consequences can follow a subject’s response?

Operant Conditioning

- Consequences to behavior can be:
 - nothing happens: extinction
 - something happens
 - the “something” can be pleasant
 - the “something” can be aversive
- Consequences include positive and negative reinforcement, time out, and punishment. We’ll examine each of these now.

Reinforcement/Punishment



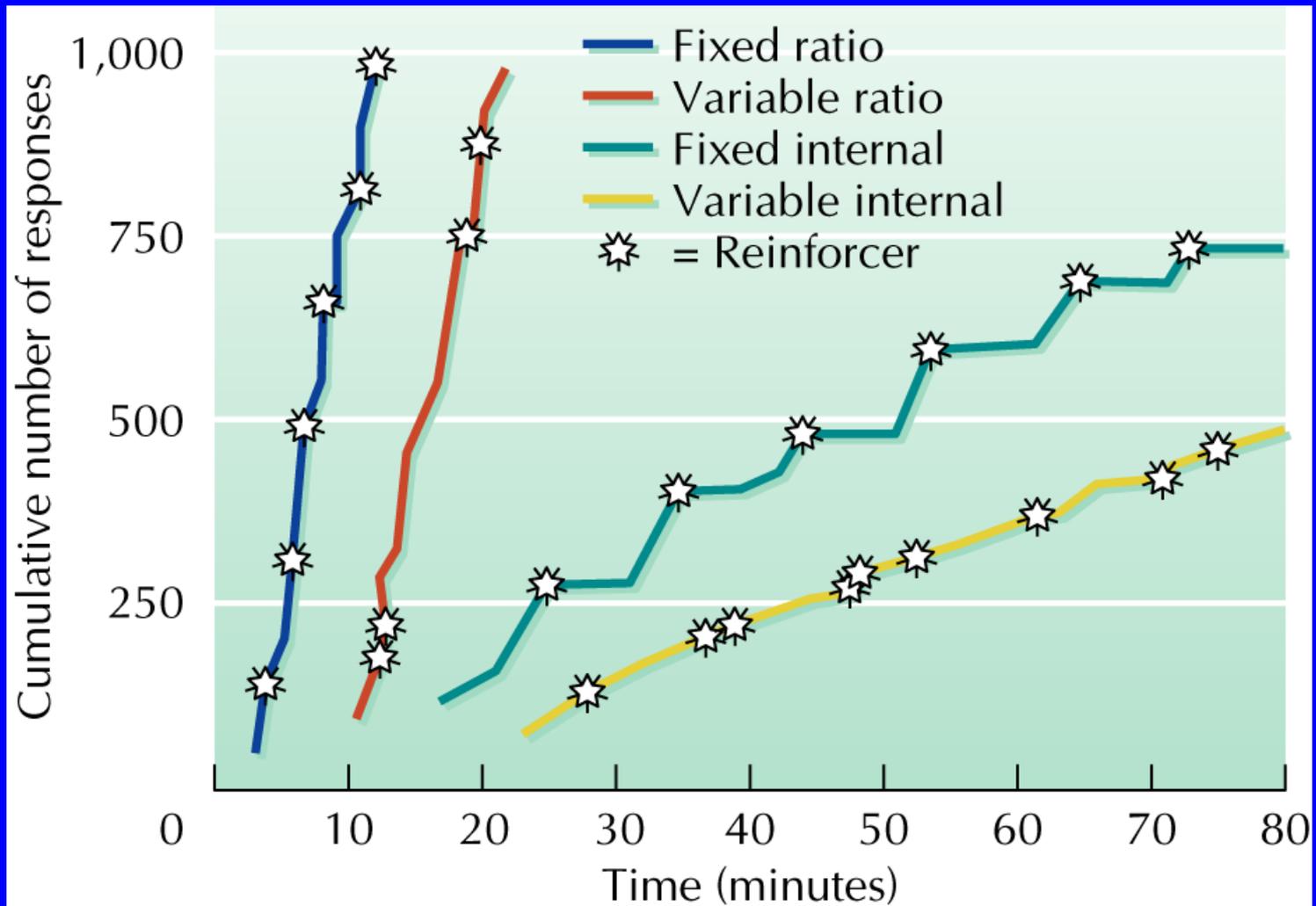
Schedules of Reinforcement

- **Continuous:** reinforcement occurs after every response
 - Produces rapid acquisition and is subject to rapid extinction
- **Partial:** reinforcement occurs after some, but not all, responses
 - Responding on a partial reinforcement schedule is more resistant to extinction

Partial Reinforcement Schedules

- **Ratio:** every nth response is reinforced
 - Fixed: every nth response
 - Variable: on average, every nth response
- **Interval:** first response after some interval results in reinforcement
 - Fixed: interval is x in length (e.g. 1 min)
 - Variable: the average interval is x

Reinforcement Schedules



Positive Reinforcement

- What is a reinforcer?
 - Definition: a reinforcer is any stimulus which, when delivered to a subject, increases the probability that a subject will emit a response.
 - Primary reinforcers, e.g., food
 - Secondary reinforcers, e.g., praise
 - One can only know if a stimulus is a reinforcer based on the increased probability of occurrence of a subject's behavior

Money: a secondary reinforcer



Positive Reinforcement

- What is positive reinforcement?
 - a procedure where a pleasant stimulus is delivered to a subject contingent upon the subject's emitting a desired behavior
- Schedules of reinforcement
 - reinforcement schedules may be used to decrease the probability that a response pattern in a subject will extinguish

Positive Reinforcement

- Schedules of reinforcement
 - there are 4 types of reinforcement schedules
 - fixed ratio schedule of reinforcement
 - fixed interval schedule of reinforcement
 - variable ratio schedule of reinforcement
 - variable interval schedule of reinforcement
 - each of these schedules will produce different response patterns in subjects; the variable ratio schedule best for most resistant to extinction

Positive Reinforcement

- Shaping behaviors
 - the use of positive reinforcement in the differential reinforcement of successive approximations is called “shaping”
 - shaping can be used to create a new response pattern in a subject
 - shaping must be done carefully and one must rely on the differential reinforcement of successive approximations to the target behavior

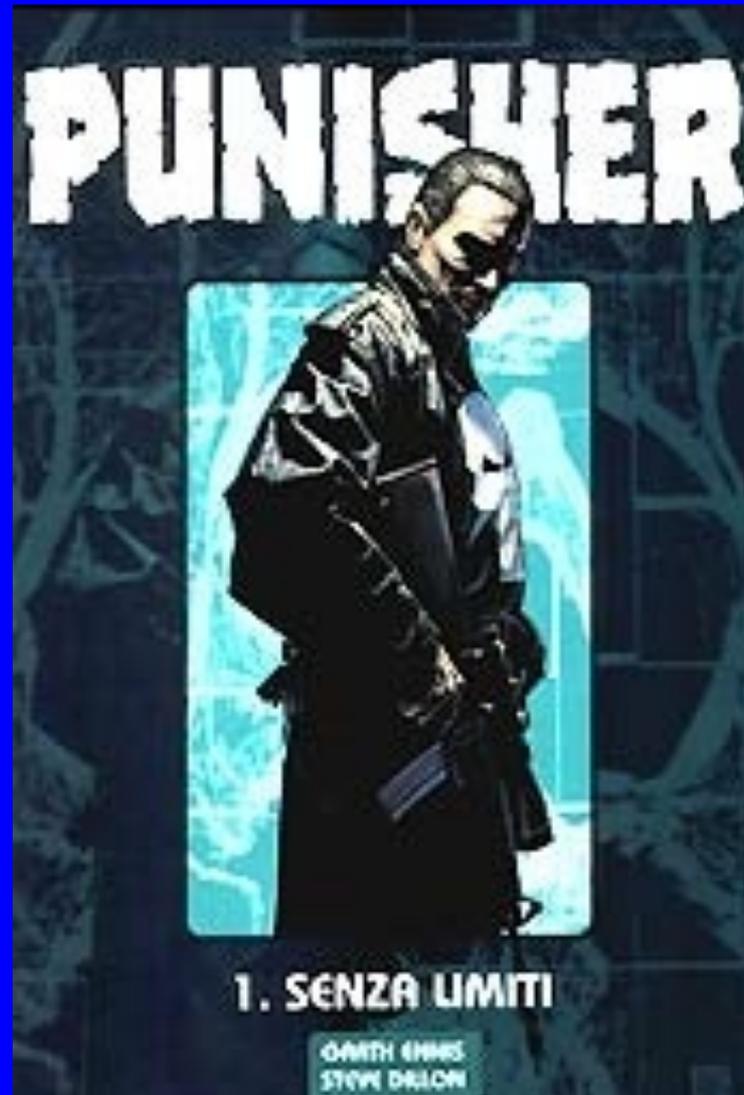
Negative Reinforcement

- Negative reinforcement
 - a procedure where an aversive stimulus is removed from a subject contingent upon the subject's emitting a desired behavior
 - the reinforcing consequence is the removal or avoidance of an aversive stimulus
 - Escape conditioning: the behavior is reinforced because it stops an aversive stimulus
 - Avoidance conditioning: behavior reinforced because aversive stimulus is prevented

Negative Reinforcement

- Examples of negative reinforcement in the real world include:
 - taking out the trash to avoid your mother yelling at you
 - taking an aspirin to get rid of a headache
 - paying your car insurance on time to prevent cancellation of your policy

Punishment



Punishment

- Punishment defined
 - a procedure where an aversive stimulus is presented to a subject contingent upon the subject emitting an undesired behavior.
 - punishment should be used as a last resort in behavior engineering; positive reinforcement should be used first
 - examples include spanking, verbal abuse, electrical shock, etc.

Punishment

- Dangers in use of punishment
 - punishment is often reinforcing to a punisher (resulting in the making of an abuser)
 - punishment often has a generalized inhibiting effect on the punished individual (they stop doing ANY behavior at all)
 - we learn to dislike the punisher (a result of classical conditioning)

Punishment

- Dangers in use of punishment
 - what the punisher thinks is punishment may, in fact, be a reinforcer to the “punished” individual
 - punishment does not teach more appropriate behavior; it merely stops a behavior from occurring
 - punishment can cause emotional damage in the punished individual (antisocial behavior)

Punishment

- Dangers in use of punishment
 - punishment only stops the behavior from occurring in the presence of the punisher; when the punisher is not present then the behavior will often reappear and with a vengeance
 - the best tool for engineering behavior is positive reinforcement

Punishment

- Guidelines for the effective use of punishment
 - use the least painful stimulus possible; if you spank your child, do it on the child's bottom with an open hand never more than twice and NEVER so hard as to leave any marks on your child. That would be classified as child abuse.
 - reinforce the appropriate behavior to take the place of the inappropriate behavior

Punishment

- Guidelines
 - make it clear to the individual which behavior you are punishing and remove all threat of punishment immediately as soon as the undesired behavior stops.
 - do not give punishment mixed with rewards for a given behavior; be consistent!
 - once you have begun to administer punishment do not back out but use punishment wisely

Contrasting Classical and Operant Conditioning

- Classical conditioning usually involves reflexive behavior (eliciting a response) whereas operant condition involves instrumental behavior (emitting a response)
- Classical conditioning elicits a response whereas operant conditioning manipulates the probability that a given response will be emitted by the subject.

Extinction: the process of unlearning

- Extinction is the process of unlearning a learned response because of a change on the part of the environment (reinforcement or punishment or stimulus pairing contingencies)
- Removing the source of learning
 - in CC, not pairing the NS with the UCS will result in extinction
 - in OC, not providing consequences causes ext.

Summary of Conditioning

	Classical Conditioning	Operant Conditioning
Other Names	Respondent conditioning Pavlovian conditioning	Instrumental conditioning Law of Effect (Thorndike) Skinnerian conditioning
Pioneers	Ivan Pavlov John B. Watson	Edward Thorndike B.F. Skinner
Example	Sound of bell (CS) begins to produce salivation	Baby cries and parents pick up baby
Major Terms	Unconditioned stimulus (UCS) Conditioned stimulus (CS) Unconditioned response (UCR) Conditioned response (CR) Conditioned emotional response (CER)	Reinforces (primary and secondary) Reinforcement (positive and negative) Punishment (positive and negative) Shaping Reinforcement schedules (continuous and partial)
Shared Terms	Extinction Spontaneous recovery Generalization Discrimination	Extinction Spontaneous recovery Generalization Discrimination
Major Differences	Involuntary (subject is passive)	Voluntary (subject is active)
Behavior Order	CS must come <i>before</i> the UCS	Reinforcement comes <i>after</i> the behavior