CHAPTER 6
OPERANT LEARNING


Part 1
p. 174-192

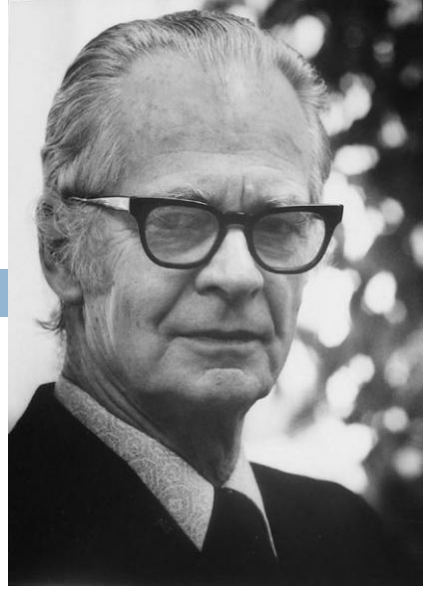
Operant Learning

- Operant learning is one of the processes of development that plays a very important role.
  - The way that learning occurs in ontogenetic development
- Understanding Operant Learning will help us understand the way new behaviors appear in a person's repertoire, how old patterns of behavior are replaced, etc.

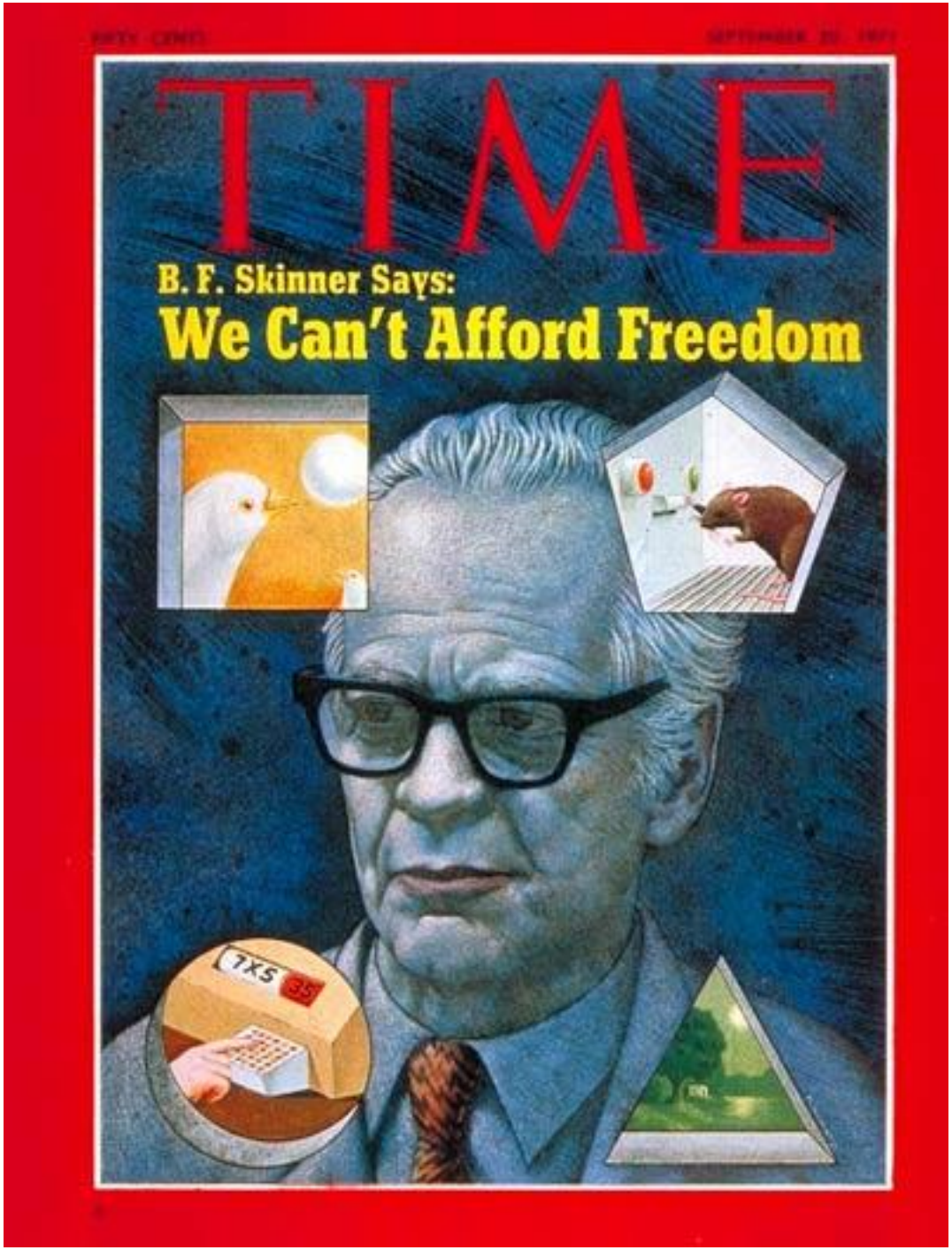
Operant vs. Respondent

- Operant:
  - Much more important to understanding learning
    - Although respondent learning processes the most basic and allow for operant conditioning
  - CONSEQUENCES! All about the consequences!
  - Most important is the principle of reinforcement

BF Skinner



- First to develop a cohesive theory of operant learning
  - Based on experimental data from nonhumans
  - Generalized to humans
  - Now a robust science of behavior
- Gets a bad rep
  - Not well understood, even in cognitive psychologies (same principles, different language)
  - Changed the way we looked at human behavior
    - People didn't like that
  - Beyond Freedom and Dignity – Time magazine cover


TIME
B. F. Skinner Says:
We Can't Afford Freedom

Some little known Skinner quotes:

- "In the traditional view, a person is free. He is autonomous in the sense that his behavior is uncaused. He can therefore be held responsible for what he does and justly punished if he offends. That view, together with its associated practices, must be re-examined when a scientific analysis reveals unsuspected controlling relations between behavior and environment." (BFD)
- "A failure in not always a mistake, it may simply be the best one can do under the circumstances. The real mistake is to stop trying"
- "I did not direct my life. I didn't design it. I never made decisions. Things always came up and made them for me. That's what life is."
- "Society attacks early, when the individual is helpless"

Some little known Skinner quotes:

- "A fourth-grade reader may be a sixth-grade mathematician. The grade is an administrative device that does violence to the nature of the developmental process"
- "At this very moment enormous numbers of intelligent men and women of goodwill are trying to build a better world. But problems are born faster than they can be solved."
- "Men build society and society builds men."
- "Better contraceptives will control population only if people will use them. A nuclear holocaust can be prevented only if the conditions under which nations make war can be changed. The environment will continue to deteriorate until pollution practices are abandoned. We need to make vast changes in human behavior.

Psychological Development

- Psychological development is a process of adapting to an environment; learning is the one that provides people the flexibility to adapt to an environment.
- B. F. Skinner contributed to "operant learning" with his theory of operant behavior and principles of learning
- He deducted that the word *operant* can be used to describe behavior that takes place in any given environment which in turn produces changing in the environment affecting the frequency and form of behavior.

Understanding Operant Behavior

- To understand operant behavior it is necessary to understand contingencies
- C*ontingency* is used to describe the relationship between response and stimulus
  - Dependent relations (if, then)
  - Flipping a light switch, eating vegetable, curfew
  - Consequence *contingent* on response
- Stimuli and responses
  - Antecedent → Behavior → Consequences

Contingencies

- Contingencies of reinforcement and punishment helps shape behavior into loosely organized patterns
- Operant behavior can be defined in terms of a four-term contingency.
  - For example: in a particular context (setting event), a particular stimulus (discriminative stimulus) can provoke a behavior (response) that produces a change in the environment (consequence).
  - The consequence determines whether behavior will be more or less likely in the future

The Four Term Contingency

S^D ------->R-------->S^{+r} (-r)

Setting Event

BUT….

- What we have depicted here is a static interaction - a still picture.
- Human interactions are moving pictures. While the four-term contingency is the critical unit of operant interaction, it is important to keep in mind that dynamic interactions are continuing streams of ever-changing four-term contingencies.
  - Complex, dynamic, continuous, nonlinear

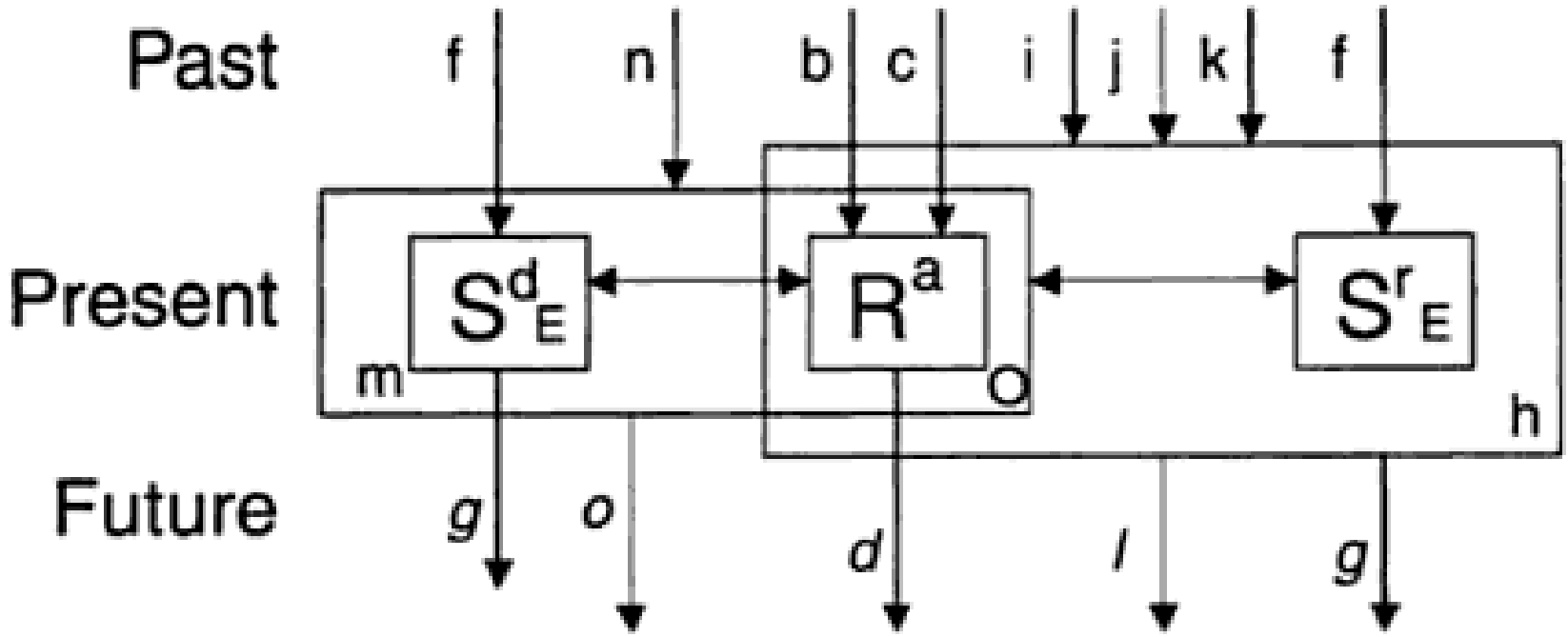


Figure 6.2 The Complexity of the Four-Term Contingency

1st Term - The Response: **R**

- Any action of a living thing – behavior!
  - "dead man's test"
    - Thinking? Not thinking? Not studying?
    - "Not _____" cannot be considered a behavior; remember for scenarios!
- Different ways to group responses into classes
  - Topographic response class
  - Functional response class
  - Based on physical location

Topographic Response Class

- Based on its form or appearance (topography), and doesn't deal with function
  - Examples
    - Running (to make a goal, to flee from a burning building, to win a race)
    - Talking (to order food, to fight, to get out of work)
    - head-banging (to get Mom's attention, to get out of cleaning room)

Functional Response Class

- Different topographies have same effect on environment
  - Examples
    - Waving hands, yelling “Stop”, writing the word “stop”
    - Lighting a match, asking someone for a match, putting your cigarette to a candle

Geographic Response Class

- Physical Location
  - Outside of our skin - Public Behavior - "Overt"
    - E.g., walking, talking, smiling, crying, fidgeting
  - Inside our skin - Private Behavior - "Covert"
    - E.g., self-talk, thinking, day-dreaming, hallucinating, dreaming

As behavior analysts…..

- We care most about function
  - THIS is the why
  - What motivates behaviors?
    - Answer found in the function!

Response Classes means Response Variability

- Variability is key to selection
  - Selection by consequences
- Individual responses in a class are NEVER exactly the same
  - Never walk, jump, imagine the same way twice
- Variability in behavior also makes it possible that a totally novel behavior, never performed by an individual before, can gradually be shaped and developed
  - Study abroad
- The **likelihood** of behaviors occurring in the future can increase or decrease because of the consequences produced by operants

2nd Term - The Consequence

- Consequence means an event that follows the response
- Consequence is defined functionally -- **by its effect on the response**
- Response (R)- Consequence relationship is a **Contingency** - an if-then relationship
- Consequence determines if a response will occur in the future
- What happens as a result of R → S (stimulus) Contingency?
  - Strengthen
  - Weaken
  - No Effect

Five Consequences

- **R------->S (Positive Reinforcement)**
  - **Response adds (+) Stimulus. Response increase**
- **R --removes--> S (Negative Reinforcement)**
  - **Response subtracts(-) Stimulus. Response increases**
- **R ---------->S (Positive Punishment)**
  - **Response adds (+) Stimulus. Response decreases**
- **R --removes-->S (Negative Punishment)**
  - **Response removes Stimulus. Response decreases**
- **R ----/--->**
  - **Response has no effect. Stimulus is withheld**

Reinforcement

- An operation that helps *strengthen* behavior is called reinforcement

- There are two types of reinforcement:
  - Positive reinforcement: It takes place when a stimulus is added
  - Negative reinforcement: It takes place when an aversive stimulus is terminated/removed.

Positive Reinforcement

- R------->S
  - Response adds/produces reinforcing stimulus → Response increases
  - Name of Operation: Positive Reinforcement
  - Name of Stimulus: Positive Reinforcer
- Examples:
  - Child squeezes toy bear and hears it laugh. The behavior of squeezing the bear occurs more frequently as the consequence of the response producing the laughter.

Positive Reinforcement

- You are trying to lose weight and you begin an exercise program. After about a week, people around you start telling you that you look great. What bx increases?
- A child really enjoys sleeping in his parent's bed. One night he has a bad dream and calls out for his parents and tells them that he's "scared." He is then allowed to sleep with his parents. What bx is more likely?
  - Not just the report, but the dream itself!!

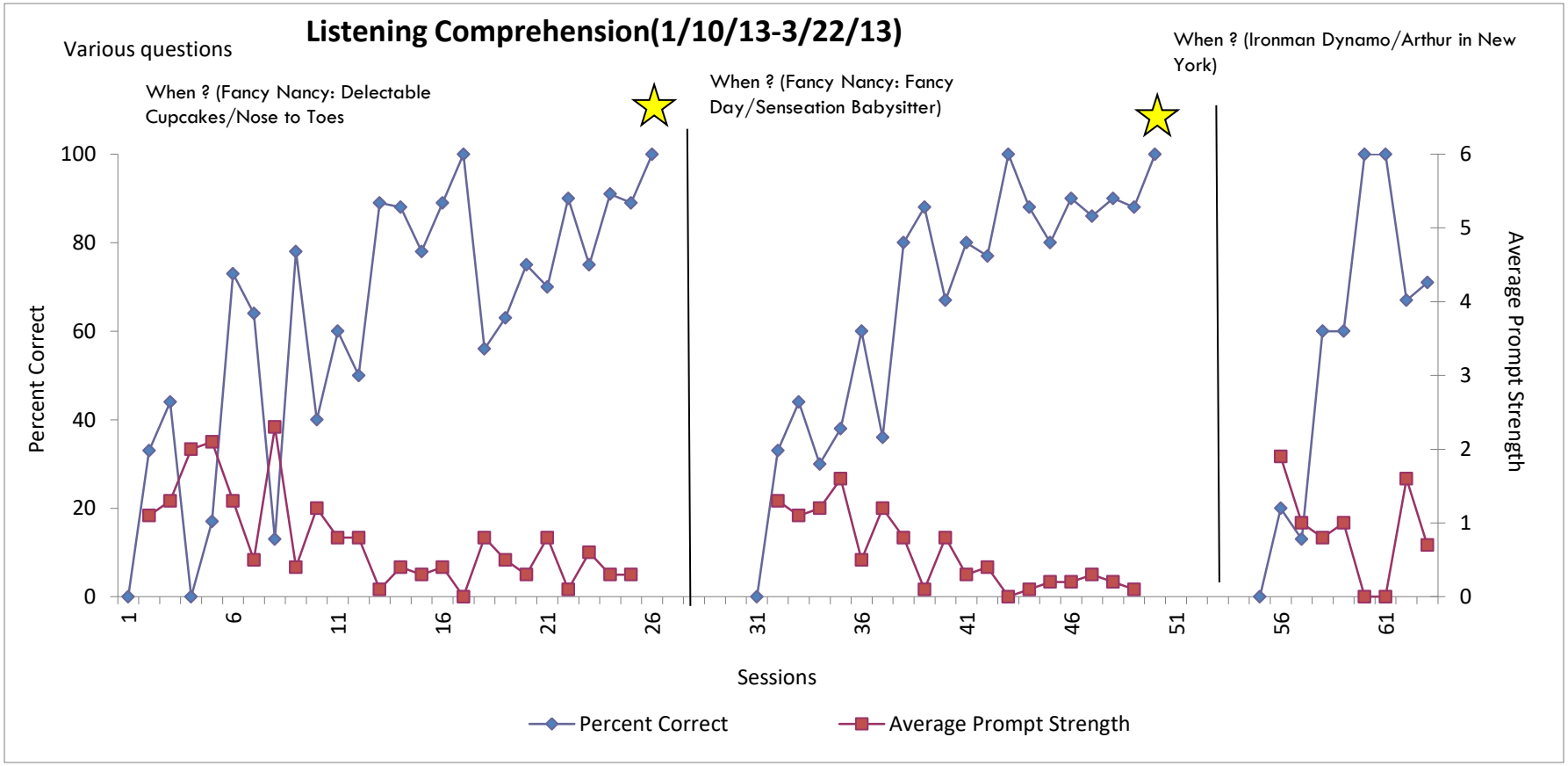
Positive Reinforcement

POSITIVE REINFORCEMENT

Behavior is followed by a desirable event or state.

$10 for an A makes it more likely a student will earn more As.

Positive Reinforcement



Negative Reinforcement

- R --removes--> S
  - Response terminates aversive stimuli → Response increases
  - Name of Operation: Negative Reinforcement
  - Name of Stimulus: Negative Reinforcer
- Examples:
  - You get in the car and close the door. A loud chiming keeps sounding so you put your seatbelt on to make it stop.
  - A mother tells her child to do the dishes. The child immediately begins tantrumming as the mother continues to present her demand to finish the chore. The mother gets frustrated and walks away. (removal of demand = negative reinforcer for child's tantrumming bx).

Negative Reinforcement

- Examples:
  - You walk out of your house in the morning and the sun is very bright. You squint your eyes and put on your sun glasses. What bx more likely?
  - You have been camping and you are covered in mosquito bites. You feel itchy all over and so you itch your arm. The unpleasant itch goes away. What bx more likely?
  - Sam is in third grade and he often stutters when he speaks to his classmates. Each time he reads out loud in class, the other students make fun of him and Sam pretends to have to use the bathroom so he can't hear the other kids teasing him. What bx increases?
    - This is huge for the development of antisocial and maladaptive behaviors in later childhood (deaf, dyslexic, articulation problems)

Negative Reinforcement

NEGATIVE REINFORCEMENT

Behavior ends an undesirable event or state.

Taking aspirin relieves headaches and makes it more likely that aspirin will be taken in the future.

Reinforcing Consequence

- **Always a *strengthening* of behavior**
  - Increase in probability of occurrence
  - Increase in magnitude, etc.
- Positive Reinforcement - Response Adds Stimulus
- Negative Reinforcement - Response Removes Stimulus

Punishment

- An operation that *weakens* behavior is called punishment
- There are two types of punishment:
  - Positive punishment: it takes place when an aversive stimulus is present.
  - Negative punishment: it takes place when a desirable stimulus is removed.
- Get away from your traditional notion of punishment!
  - Gloves

Positive Punishment (Punishment by "hurt")

- R --------->S
  - Response adds/produces aversive stimuli → Response decreases
  - Name of Operation: Positive Punishment
  - Name of Stimulus: Positive Punisher
- Examples:
  - A boy picks his nose in front of his friends. His friends glare at him and whisper. The boy is less likely to pick his nose when his friends are nearby.

Positive Punishment

- You are a teenager learning to cook and are using the oven for the very first time to heat up a pizza. You put the pizza in without using a pot holder and burn your hand. What bx decreases?
- You are speeding to work and a police officer gives you a ticket. You have recently inherited millions of dollars, so the fine isn't any big deal. You continue to speed. Is this punishment?
  - Tracy Jordan

Negative Punishment
Punishment by "Loss"

- R --removes-->S
  - Response removes reinforcing stimulus → Response decreases
  - Name of Operation: Negative Punishment
  - Name of Stimulus: Negative Punisher
- Bx followed by termination or loss of a reinforcing object, activity, person, etc.
- Examples:
  - Jenny stayed out past her curfew. Her parents have now blocked her Myspace and Facbook access from her computer and cell phone for one week. Jenny never is late again.

Negative Punishment

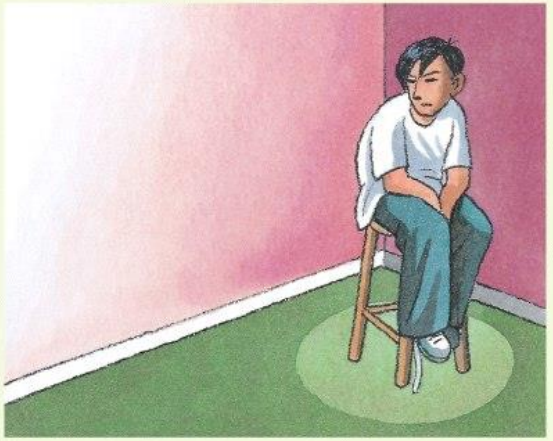
- A little boy is eating other kids' lunches and the teacher puts him in the corner for time out while the other kids are playing his favorite game. What decreases?
- Your wife is making you dinner and you come home and tell her that the house smells terrible. She stops cooking and you heat up some leftovers. What bx decreases?

TWO FORMS OF PUNISHMENT

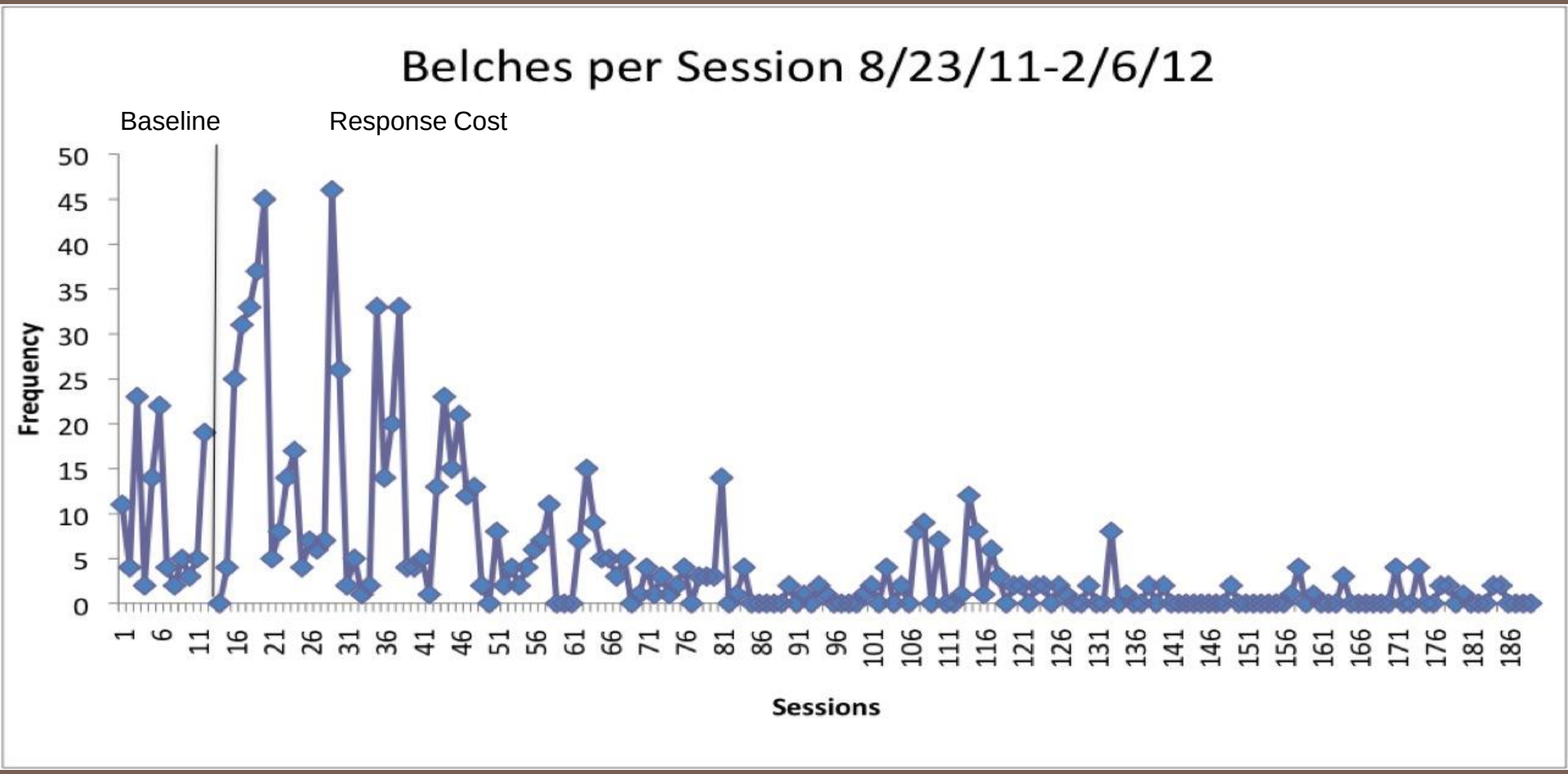
Behavior is followed by an undesirable event.

A toddler burned by a hot stove will be less likely to touch the stove again.

Behavior ends a desirable event or state.



A boy who loses his TV privileges for pulling his sister's hair will be less likely to pull her hair again.


Belches per Session 8/23/11-2/6/12
Baseline
Response Cost
Frequency
50
45
40
35
30
25
20
15
10
5
0
1
6
11
16
21
26
31
36
41
46
51
56
61
66
71
76
81
86
91
96
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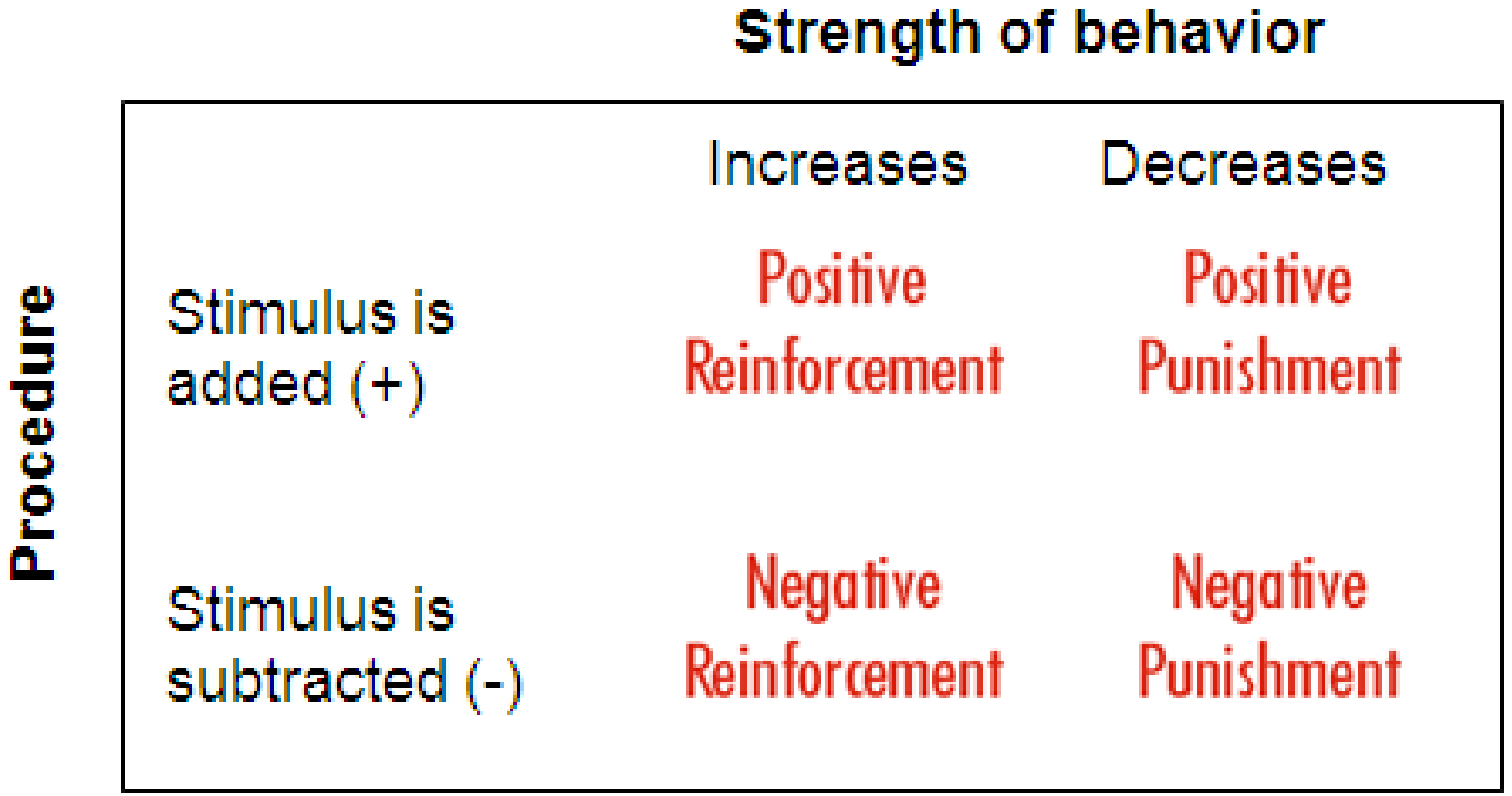
151
156
161
166
171
176
181
186
Sessions


Strength of behavior
Procedure
Increases
Decreases
Stimulus is added (+)
Positive Reinforcement
Positive Punishment
Stimulus is subtracted (-)
Negative Reinforcement
Negative Punishment

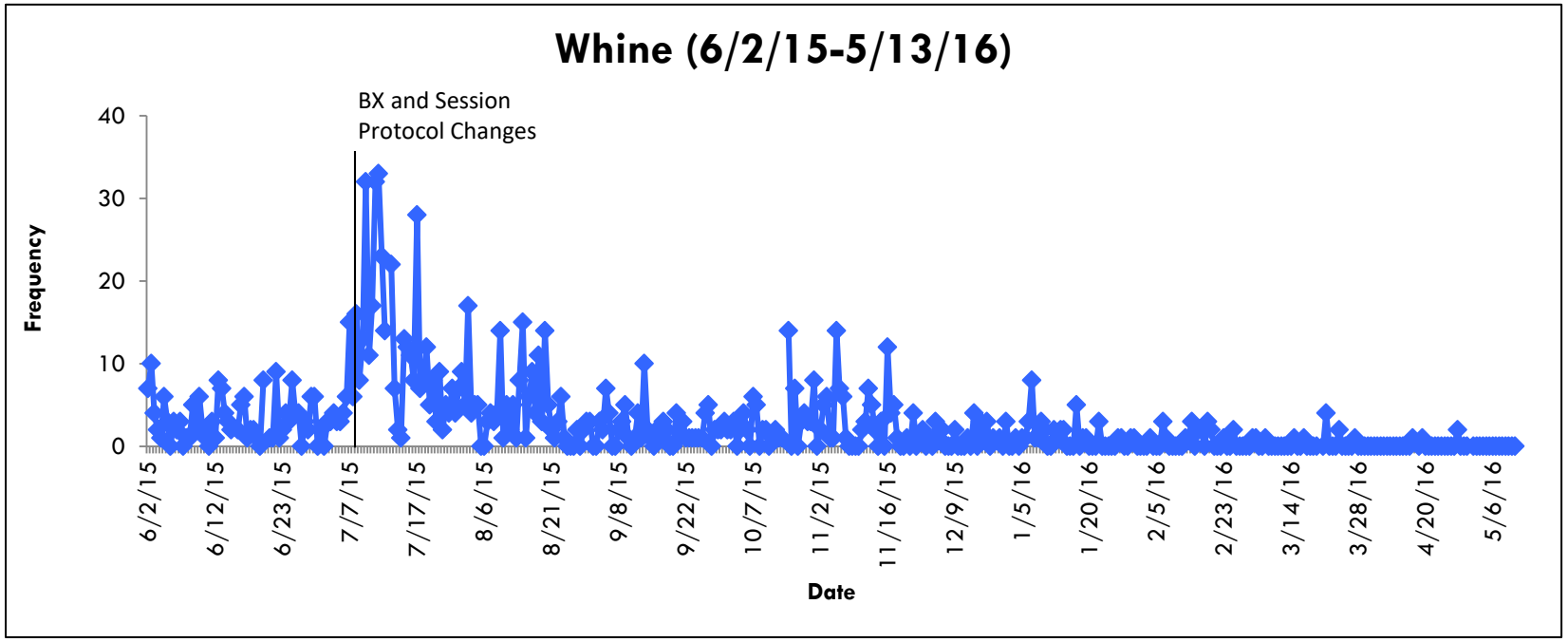
Operant Behaviors

- Operant behaviors can disappear (*extinction* takes place) when a **reinforcer is removed.**
- An *extinction burst* (a rapid increase in responding) often accompanies the withholding of reinforcement.
  - Variability – vending machine, new intervention (eye closed), crying, sleeping in own bed
- From last chapter: reinforcement creates patterns of behavior. When those reinforcers are removed variability occurs.
  - This is the process of extinction

Extinction

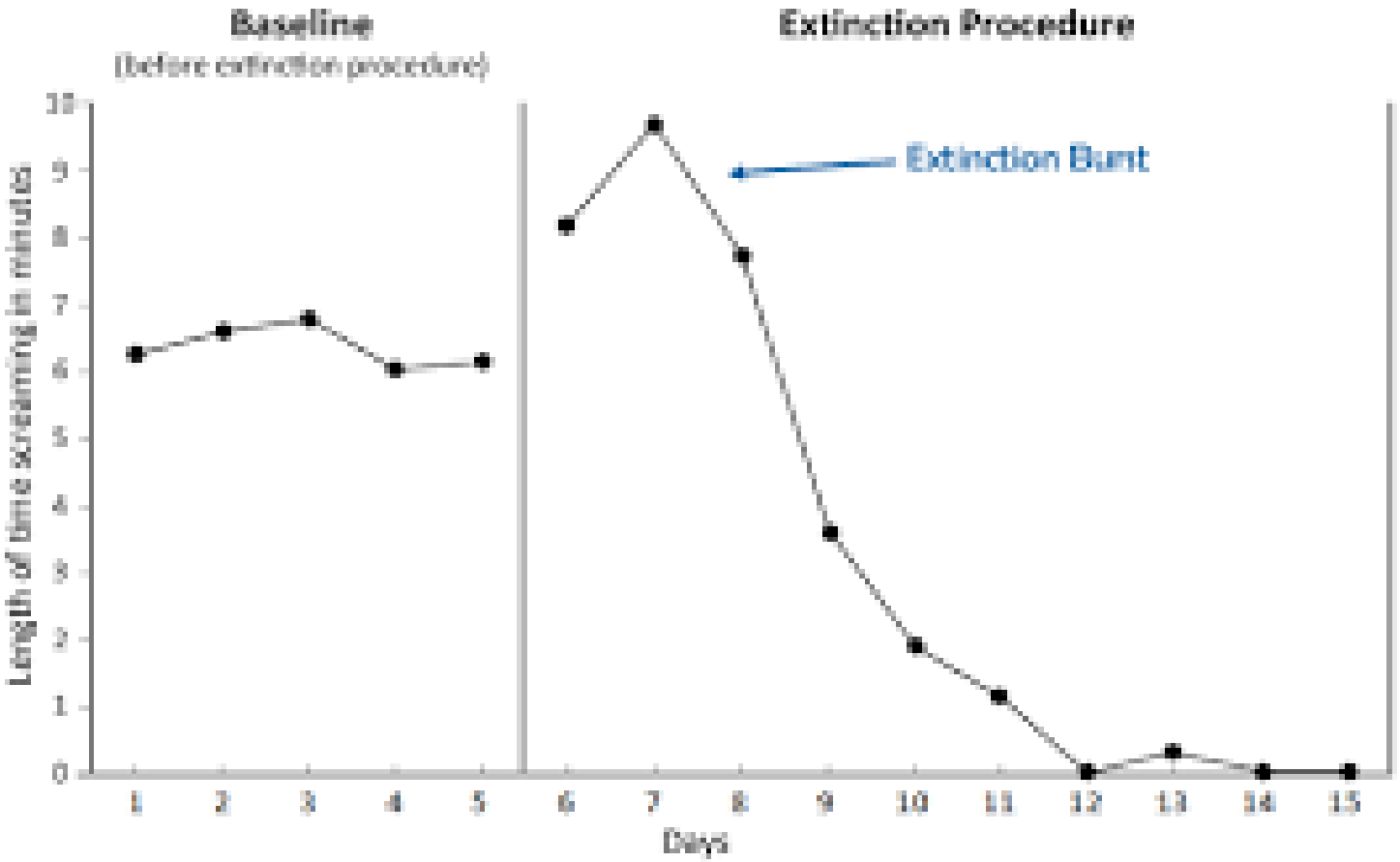
- R ----/--->
  - Response has no effect. Reinforcing stimulus is withheld
- Usually immediate effect - Extinction Burst
- Gradual decrease to Operant Level (pre-reinforcement)
- Difference with Negative Punishment
  - Neg. Punishment: Stimulus is removed
    - Time-out
  - Extinction: Reinforcing stimulus is withheld
    - Pressing a key on keyboard, calling a friend who has just been dumped, life long friend
    - Spontaneous recovery

Extinction


Whine (6/2/15-5/13/16)
BX and Session
Protocol Changes
Frequency
40
30
20
10
0
6/2/15
6/12/15
6/23/15
7/7/15
7/17/15
8/6/15
8/21/15
9/8/15
9/22/15
10/7/15
11/2/15
11/16/15
12/9/15
1/5/16
1/20/16
2/5/16
2/23/16
3/14/16
3/28/16
4/20/16
5/6/16
Date

Extinction

Example https://www.youtube.com/watch?v=5R63JKIAOY8



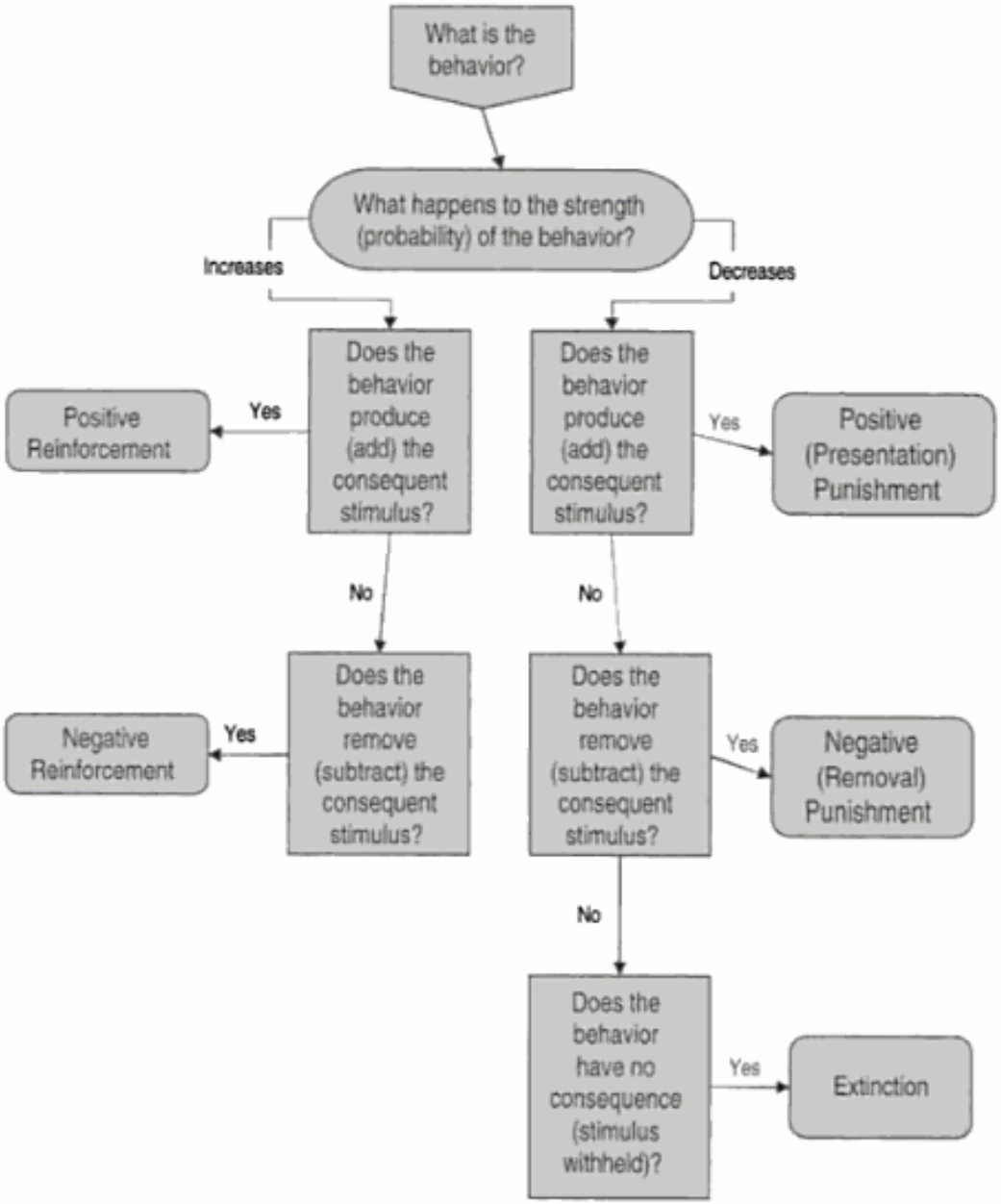


Figure 6.4 Determining the Name of the Operation

Operant Responding

- Responding is cued by a discriminative stimulus; a stimulus that is an antecedent stimulus that cues a response.
  - Wear sun glasses when it's sunny, children cry with mom (DS), red card/green card intervention, stop sign

S^D ------->R--------->S^{+r} (-r)

The Third Term: The Discriminative Stimulus (Sd)

- The response usually occurs in the Sd's presence; the Sd comes to signal reinforcement
- "Antecedent" stimulus
  - A rattle (discriminative stimulus) evokes shaking (response) that produces noise (reinforcer)
  - A teacher gives an instruction (discriminative stimulus), a boy finishes work (response), teacher smiles and nods (reinforcer)
  - You see a Wendy's sign (discriminative stimulus), you walk in and order (response), you eat a cheeseburger (reinforcer)
- Discriminative stimulus is different from CS and UCS

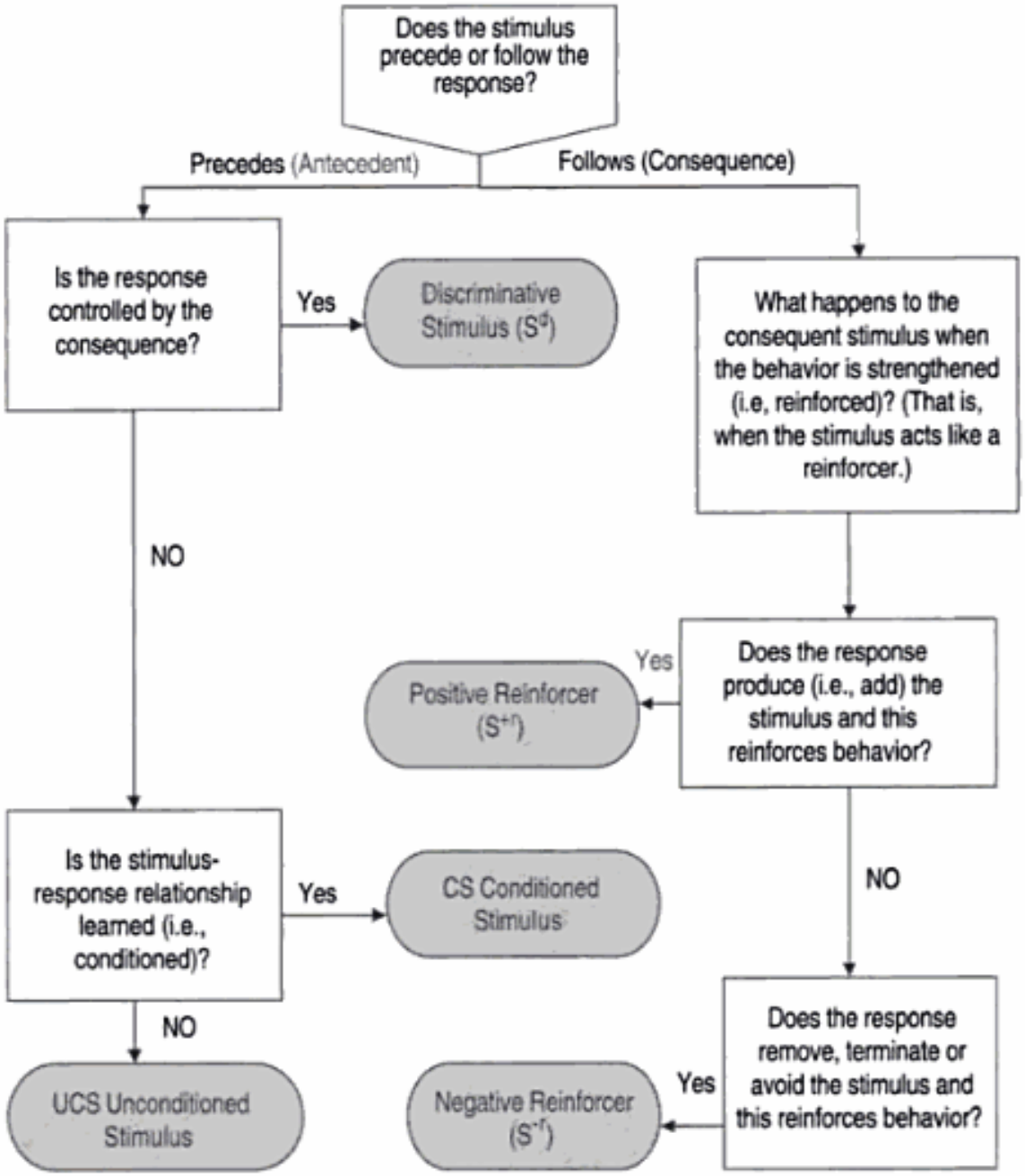


Figure 6.5 Determining the Name of the Stimulus

VIDEO!!!

HTTPS://WWW.YOUTUBE.COM/WATCH?V=S2SQKRCA1A8

Discriminative Stimulus

The Fourth Term: The Setting Event (SE) or Establishing Operation (EO)

S^D ------->R-------->S^{+r} (-r)

Setting Event

- The context in which the response occurs may establish particular consequences as more or less reinforcing/punishing
  - Getting a hug from dad may be less reinforcing in the presence of other children
- Setting events or establishing operations
  - Two ways in which they can affect the contingency: by establishing consequences as more or less powerful, and alter the behavior with respect to those consequences
    - Food deprivation, stereotypy, distance makes the heart grow fonder


Part 2
p. 192-214

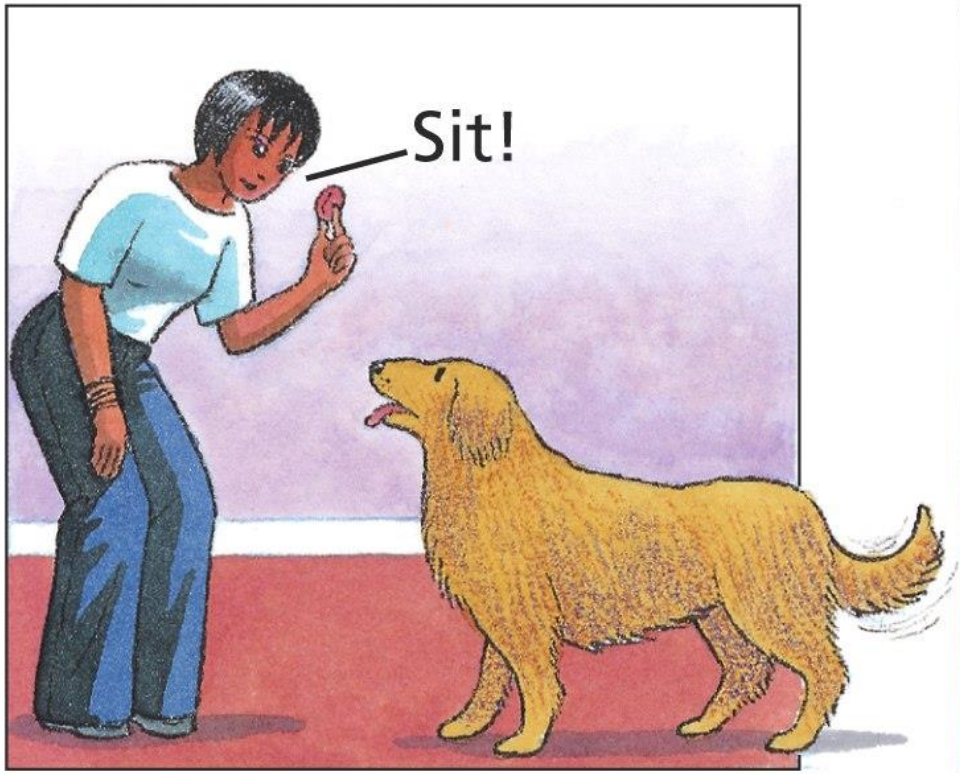
What Changes? The Development of Reinforcing Stimuli

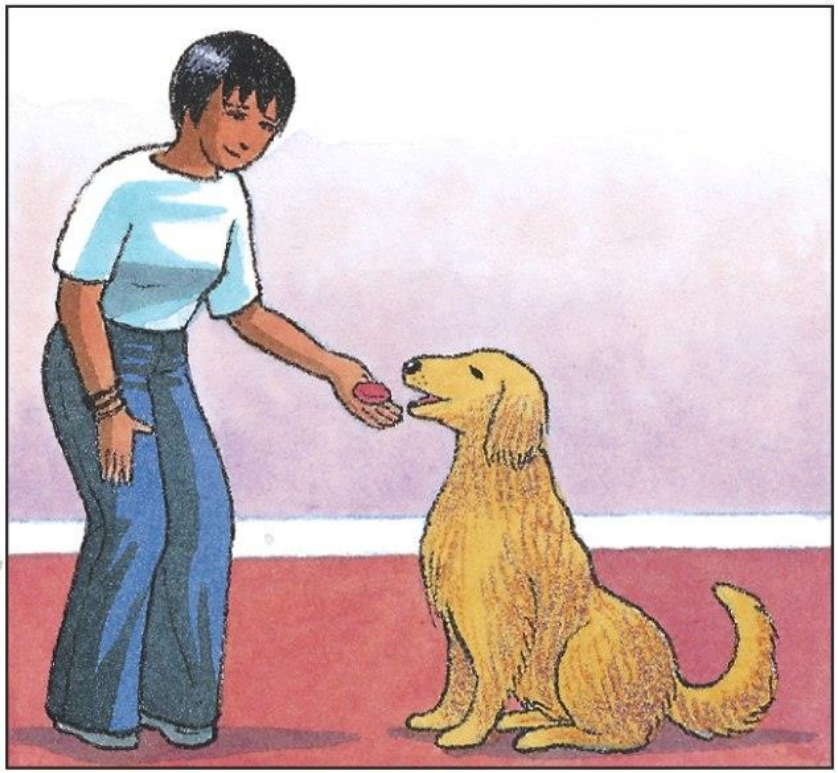
- There are two categories of reinforcers.
- Primary reinforcers
  - "universal reinforcers"
  - present at birth due to genetic inheritance (food, sex, water, skin temperature, sleep, loud noises, bright lights, touch)
- Secondary reinforcers
  - "acquired reinforcers"
  - Learned (Toys, attention, hugs, money, dancing, poker chips)
  - Autism

Primary v. Secondary

- The distinction between primary and secondary reinforcers is that primary reinforcers strengthen behavior due to the phylogenic history of the organism. They are unlearned.
- Secondary reinforcers are acquired and this is why they are also called conditioned reinforcers. They are acquired because they have been paired and are correlated with primary or other secondary reinforcers. They affect behavior in the same way
  - As adults, most of our reinforcers are “learned”

PRIMARY REINFORCEMENT





Food is a primary reinforcer for a dog.

SECONDARY REINFORCEMENT

An owner's words can become secondary reinforcement when they're associated with petting and approval.

Types of Secondary Reinforcers

- Tangible reinforcers:
  - objects that can be touched, viewed smelled or manipulated
- Edible reinforcers:
  - Foods/drinks (with little or no sugar)
- Social reinforcers:
  - reinforcers developed because of their association with primary reinforcers or previously established secondary reinforcers.
- Activity reinforcers:
  - Activities that can be reinforcing in itself
- Generalized reinforcers:
  - acquired reinforcers that become generally reinforcing because of the association with many other secondary or primary reinforcers (money, mom).

A – B – C

- You're sitting at your desk in your room with your computer in front of you. You reach down and press the power button. Your computer starts up.
- You're with your friends at a coffee shop. You tell them about your terrible blind date last night, and they all burst our laughing. You continue telling your story.
- You are walking to the Knowledge Center. As you open the door, you notice someone coming up behind you and you hold the door open. The person smiles and says, "thank you." You hold the door open for the next person too.

A – B – C

- A mother is shopping with her child. The child begins to throw a tantrum in front of everyone because she wants to go home. The mother quickly takes the child out of the store and the child stops crying. Every time thereafter, the child cries at the store.
- You're studying for a quiz in your room. The TV is on, and your favorite TV show is starting. You quit studying and watch the TV show. The next day you fail your quiz because you didn't study the night before. You never have your TV on when you study again.

Developing New Behavior

- How can we add new behaviors to an individual's repertoire, when the target behavior (e.g., desired behavior) does not yet exist?

- Shaping

- Chaining

Developing New Behavior

- How can we add new behaviors to an individual's repertoire, when the target behavior (e.g., desired behavior) does not yet exist?
- Shaping
- Chaining
- Teaching

Developing New Behavior: SHAPING

- Shaping
  - Reinforcement of successive approximations to a terminal target

1. An existing response that is closest to the desired response is reinforced on a few occasions
2. A new criterion for reinforcement is adopted, where the response must be more similar to the desired response than the previously reinforced behavior
   - Cycle of reinforcement of new approximations and extinction for old targets; variability SO important in shaping

Step #2 is repeated until the target behavior is reached

Shaping

- Example: teaching a child to say "dad." First, any vocalization is reinforced. Then, the only "da" sounds are reinforced. Prompting can be used after this step, where the parent says, "say dad" to the child, then the parent would model the correct response of "dad." Eventually, through these steps, the behavior of saying "dad" would be shaped.
- Sports
- Parents often inadvertently shape inappropriate behaviors
- Not necessarily intentional (makeup)
- Often used with animals
  - Clicker training

Shaping Videos

- https://www.youtube.com/watch?v=TtfQIkGwE2U
- https://www.youtube.com/watch?v=vGazyH6fQQ4

Benefits of Shaping

- Shaping
  - Provides generous **"positive reinforcement"** for learning new behavior.
  - ***Minimizes*** the **"risks of failure"** and **"aversive feelings"** associated with learning.

Let's try it out!

- 1. Determine what will strengthen behavior for the individual (e.g., reinforcer)
- 2. Clearly define the target behavior
- 3. Follow steps for shaping

Examples of Shaping

- Infant: vocalizations (mama, dada), smiles, orienting
- Toddler: crawling-standing-walking, vocalizations more refined, swimming (floating devices, paddle board, shallow, deeper)
- Young child: eat a variety of vegetables, write letters, drinking out of hose, skipping, catching a ball, on task behavior in class
- Early adolescent: dance movements (spins, cartwheel), sports movements (martial arts: punch, kick), driving (gear shifting, staying between the lines), studying habits (note taking), social awkwardness (talking to members of the opposite sex), gossip, dressing & grooming style, kissing

Developing New Behavior

- Chaining
  - Used to create complex patterns of behavior
  - Set of discrete behaviors that must be sequenced in a particular order
  - Each step of the sequence provides a cue for the next step of the sequence, and so on until the last step is reached that produces reinforcement

Examples of Chaining

- Must do a task analysis first! Define the behaviors that must be sequenced:
  - Reciting the alphabet
  - Eating
  - Getting dressed
  - Riding a bike

Types of Chaining Procedures

- Forward Chaining
  - First to last part of chain
  - E.g., A, AB, ABC, ABCD, ABCDE, etc
  - https://www.youtube.com/watch?v=8MAS72gvOLI

  Backward Chaining
  - Last part of chain to first
  - E.g., Assembling a puzzle
  - https://www.youtube.com/watch?v=LbBj4Tzi9CQ
  - https://youtu.be/wMVZQICUhAk?t=3m

Rules for Chaining:

- 1. Define the target behavior
  - Perform a Task Analysis
    - Break the chain down into small manageable steps
    - "Manageable" different for different people
- 2. Reinforce successive elements of the chain

Shaping and Chaining

- Similarity
  - Goal is to establish a target behavior that doesn't yet occur
- Difference
  - Shaping always moves forward; no such thing as backward shaping
  - Shaping more of an "art form"

Schedules of Reinforcement

- Many times, very complex schedules of reinforcement are in effect
  - Particularly true in our day to day lives

- In attempting to modify a behavior it is important to:
  * consider various ways in which different schedules affect behavior
  * choose a schedule that will produce the desired effect most efficiently

Schedules of Reinforcement

- Continuous reinforcement necessary when teaching new behaviors, BUT
  - Quickly fade to intermittent and variable schedules as acquisition occurs
    - Resistant to extinction
    - More mirrors real life

Schedules are Natural!

- Present in our day-to-day lives https://www.youtube.com/watch?v=I_ctJqjlrHA&feature=youtu.be
- Occur without any intended or contrived intervention
- We all respond to these contingencies based on our current and previous experiences
  - Many contingencies are complex schedules

- Our behavior is affected by these naturally occurring schedules of reinforcement, punishment, and extinction