PSYC 5303 – Lecture 3

Thomas J. Faulkenberry, Ph.D.

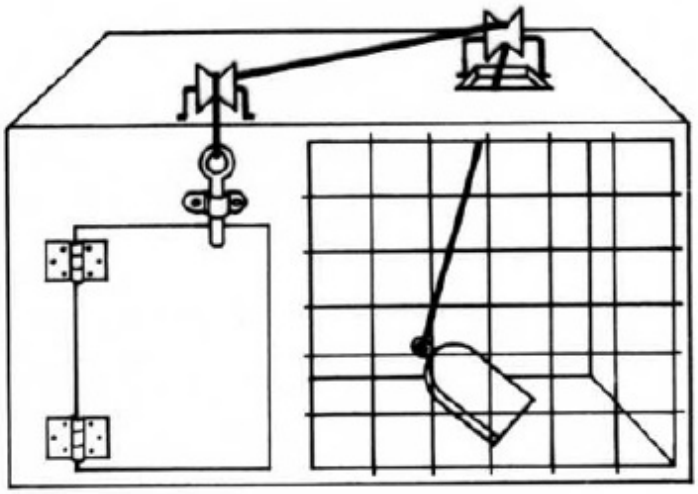
September 6, 2022

Definitions

- Classical conditioning: US always paired with CS *regardless* of whether desired response is emitted
- Instrumental conditioning: reinforcers given *only* when desired response emitted
  - behavior directly affects occurrence of reinforcer

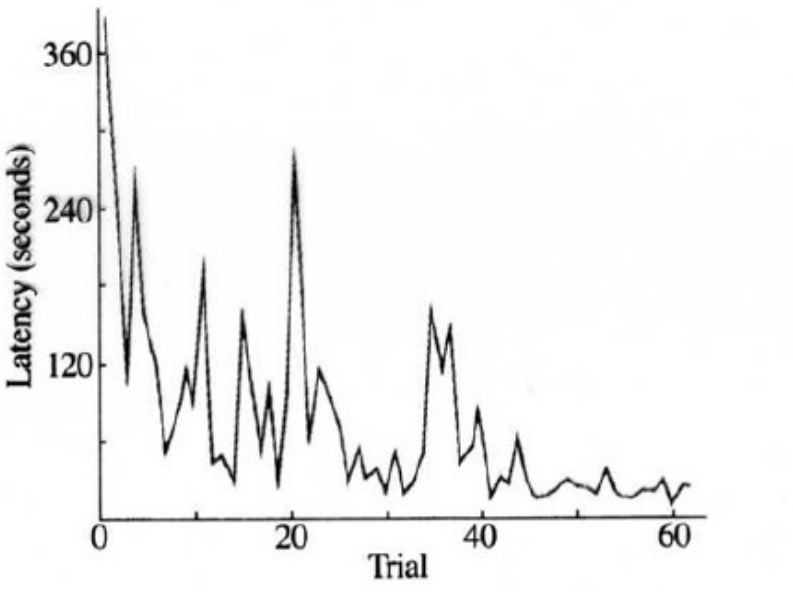
Thorndike – puzzle box

E.L. Thorndike (1998)'s puzzle box – cat had to open door by pulling latch



4.9 Puzzle box

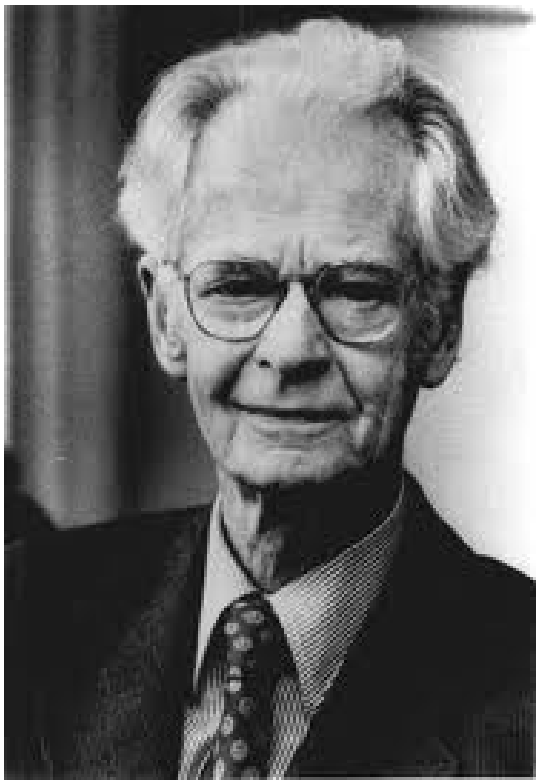
Thorndike – puzzle box



4.10 Learning curve of one of Thorndike's cats

- No US/CS – behavior shaped by *positive consequences*
- **Law of Effect** - consequence of response determines whether it is strengthened or weakened
  - Reward –> strengthens S-R connection
  - No reward –> weakens S-R connection
  - For Thorndike, the *reinforcer* is NOT part of the equation
  - **contiguity** between behavior and reinforcement is *necessary* and *sufficient* to produce learning

Skinner's operant conditioning



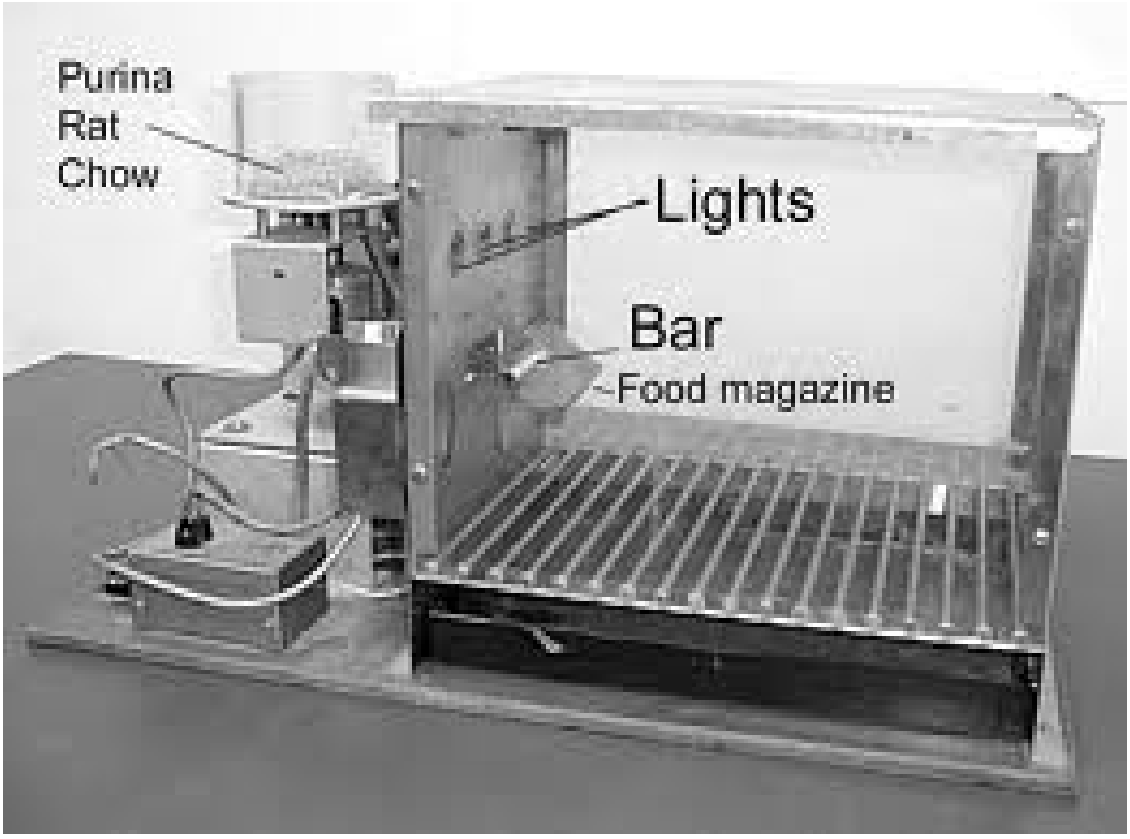
- interested in how **consequences** of behaviors influence the frequency with which those behaviors are repeated
- Reinforcement = a procedure that makes a response *more likely* to be repeated under similar circumstances in the future
- Punishment = a procedure that makes a response *less likely* to be repeated under similar circumstances in the future

Reinforcement / Punishment

- Reinforcement = a procedure that makes a response *more likely* to be repeated under similar circumstances in the future
  - A **positive reinforcer** is a stimulus whose *presentation* as a consequence of a behavior causes that behavior to occur *more frequently* under similar circumstances in the future
  - A **negative reinforcer** is a stimulus whose *removal* as a consequence of a behavior causes that behavior to occur *more frequently* under similar circumstances in the future
- Punishment = a procedure that makes a response *less likely* to be repeated under similar circumstances in the future
  - A **positive punisher** is a stimulus whose *presentation* as a consequence of a behavior causes that behavior to occur *less frequently* under similar circumstances in the future
  - A **negative punisher** is a stimulus whose *removal* as a consequence of a behavior causes that behavior to occur *less frequently* under similar circumstances in the future

Operant conditioning experiment

The classic operant conditioning experiment is teaching a rat to press a bar/lever in a Skinner box. This can be gradually taught by reinforcement with food.



Partial reinforcement

Once an operant behavior is conditioned, continuous reinforcement is no longer needed!

Partial reinforcement schedules:

- Fixed ratio (FR): reinforcement occurs after set number of responses (predictable)
- Fixed interval (FI): reinforcement occurs after set amount of time (predictable)
- Variable ratio (VR): reinforcement occurs, on average, after an arbitrary number of responses (unpredictable)
- Variable interval (VI): reinforcement occurs, on average, after an arbitrary amount of time (unpredictable)

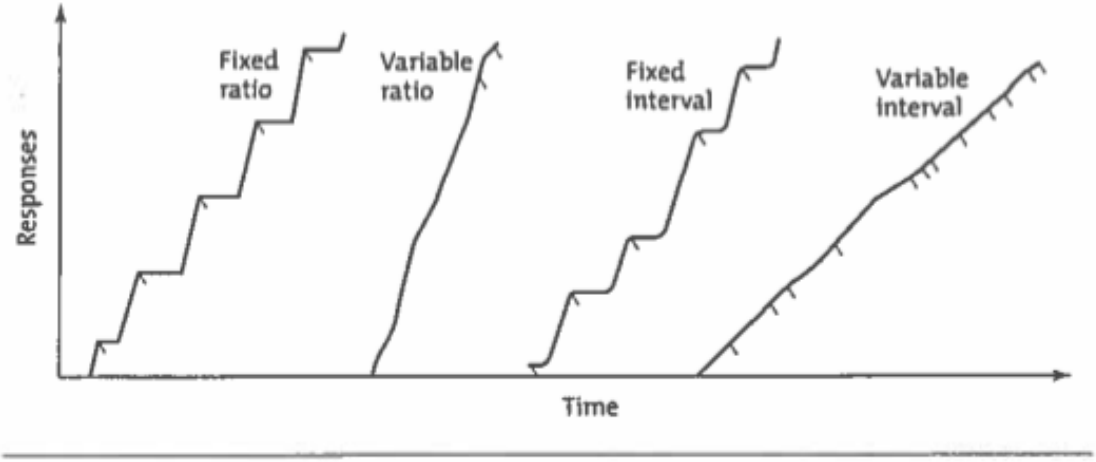


FIGURE 6.4 Operant response patterns for different reinforcement schedules. The *x* axis represents time, and the *y* axis represents the cumulative number of responses. The small marks show when reinforcements are provided.

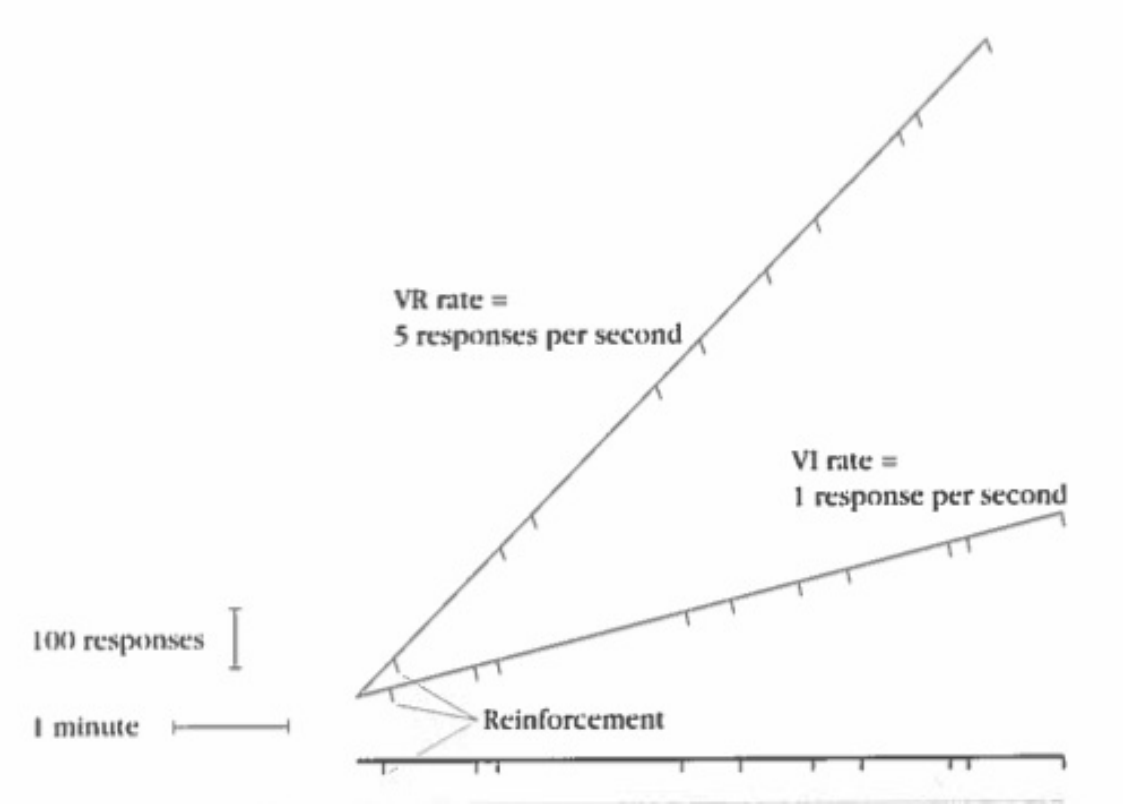
Which is better? Ratio or interval?

Reynolds (1975): Yoked pigeon experiment

- clever experiment to compare responses on VI schedule to VR schedule
- Pigeon #1 reinforced on VR schedule
- Pigeon #2 "yoked" to Pigeon #1 so that when Pigeon #1 was one response short of the VR requirement, the next response by both birds produced food.
  - this puts Pigeon #2 on a VI schedule
  - both birds received same amount of reinforcement
  - which schedule (VR or VI) produced higher rate of behavior (pecking)?

Which is better? Ratio or interval?

Results of yoked pigeon experiment:



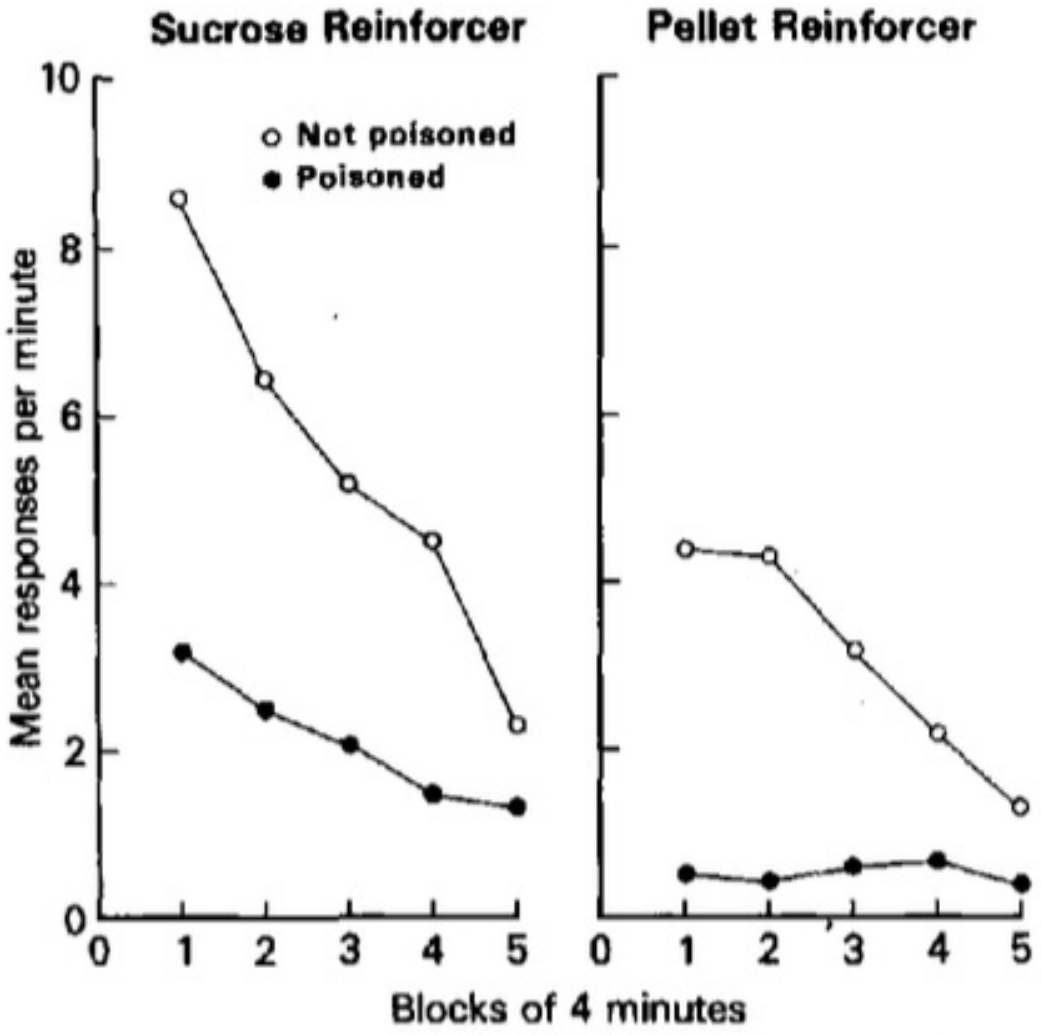
What is learned in instrumental conditioning?

Thorndike: reinforcer strengthens S-R mapping, but reinforcer is NOT associated to either (reinforcer is a catalyst *during* training, but has no function afterward)

Rescorla: reinforcer is part of the associative structure between Stimulus and Response

- Colwill & Rescorla (1985) – changing **value** of reinforcer *after* learning has direct impact on later responding
  - Rats trained to pull chain and press lever, each receiving either sucrose water or food pellet reinforcement
  - Subsequently, one reinforcer (but not other) is poisoned (devalued)
  - Afterward, rats given equal access to both string and lever

Colwill and Rescorla (1985)

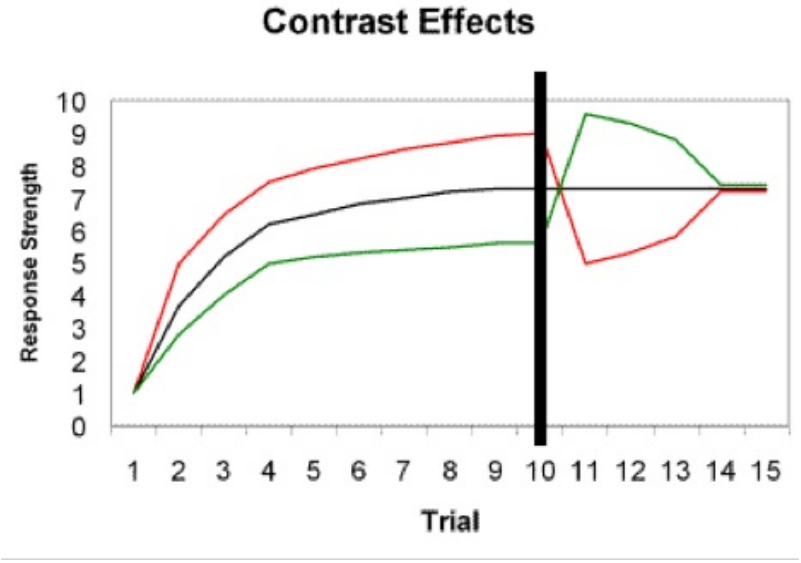


Interpretation – reinforcer must also be encoded in instrumental learning

What is learned in instrumental conditioning?

More evidence against Thorndike's S-R view – *contrast effects*

- desire for reinforcer affects the S-R contingency
- Experiment - manipulate sugar concentration in rat's water



- all rats receive "medium" concentration at trial 10
  - positive contrast effect – reward is increased, thus rate of response increases **above** the rate if the higher amount was there all the time
  - negative contract effect – reward is decreased, thus rate of response decreases **below** the rate if the lower amount was there all the time