Cognition: Methods and Models

PSYC 2040

L4: Behaviorism

Part 2

how are you feeling today?

logistics: class survey (February: 1 point)

- https://forms.gle/8KSgcRyE7o2h4VLU8
  - link also on Canvas (under class surveys)
- due Feb 26 (**Sunday**, so we can talk about it in class on Feb 28)
- 1 point that counts towards your final points/grade
  - submit on Canvas (it's an "assignment" on Canvas)
- I value your feedback
- anonymous survey! please be honest and reflective
- you will get a code at the end of the survey (on the thank you screen)
  - copy-paste this code on Canvas to get credit

recap: Feb 21, 2023

- what we covered:
  - the precursors to behaviorism
  - Watson and Tolman's behaviorism
- your to-dos were:
  - *finish:* L5 (behaviorism) chapter
  - *fill out*: class survey
    - https://forms.gle/8KSgcRyE7o2h4VLU8
  - *start finding*: project research articles (milestone #3)
  - *explore:* L5 quiz and/or writing assignment

conceptual questions #behaviorism

- I'm having trouble understanding the difference between mentalists and physicalists. Mentalists wanted to study the mental processes contributing to behavior and physicalists wanted to explain behavior through the physiological processes occurring in the body/brain. However, how can they decipher between mental processes and physiological processes? Pavlov's conditioning is studying salivation which is physical but isn't that also connected to the mental process of understanding reward? I guess in my head everything is a mental process somewhat because even if it can be seen physically there has to be something mental for it to be carried out.
- How would a behaviorist perspective account for other types of learning beyond those that use reinforcement and punishment?
- How was Tolman's research on rats with his eugenics-based approach to breeding presented? Were the results for the second generation cited as detracting from the eugenicist ideology which he supported or were the results misconstrued to continue the flawed messaging of the movement?
    - E.C. Tolman The inheritance of maze-running ability in rats, *J. Comp. Psychol*., 4 (1924), pp. 1-18
    - Tolman likely did not make much of these findings at the time...nonsignificant results don't get as much attention although this is slowly changing!

conceptual questions #latentlearning

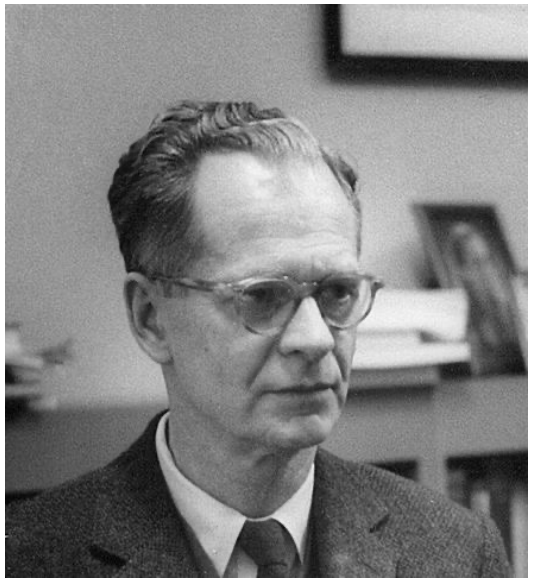
- Tolman's findings in latent learning seem to suggest that learning is less effective when it is not contextualized; until there were stakes, in this case, when a reward was introduced, the number of errors made only slowly decreased. I wonder if this study could be used as evidence to support experiential learning-- do animals learn better when there is more at stake rather than when they take in information passively?
- What are the implications of latent learning with language? How could this be connected to experiences like immersion programs which force people to communicate in a language they may not be proficient in to get by? Could the need to communicate be considered a reward of sorts causing a rapid increase in language ability in a short period of time even if non-immersed language learning has been taking place?

today's agenda

- other forms/flavors of behaviorism
  - Hull and Skinner
- project milestone #3 (QALMRI)
  - finding empirical research articles
  - Beth Hoppe!

Skinner's behaviorism: operant conditioning

- Skinner distinguished between Pavlovian conditioning (type-S) vs operant conditioning (type-R)
  - type-S: S-R relationship is already established before conditioning begins
  - type-R: S-R relationship does not exist or may not be known prior to conditioning
- the main idea was that there may be a range of behaviors that an animal can perform (operants), each with some baseline probability (e.g., walking, sitting, licking, etc.)
- The goal of type-R learning was to be able to manipulate the operant behavior such that its frequency (when it happens) and occurrence (whether it happens) was predictable
- type-R learning was based on *reinforcement,* i.e., reward- and punishment-based learning



activity: type-S vs. type-R

- in pairs, come up with one example of type-S and type-R conditioning

Skinner's behaviorism: Skinner box

- Skinner's work on operant conditioning was based on his experiments with rats using a "Skinner box"
- a lever could be pressed to obtain a food reward (controlled by experimenter)
- but lever pressing is not an already conditioned response, i.e., it is an operant behavior that exists, but there is no systematic relationship between any "stimulus" and "response" (lever pressing)
- this type of behavior is therefore ideal for type-R/operant conditioning

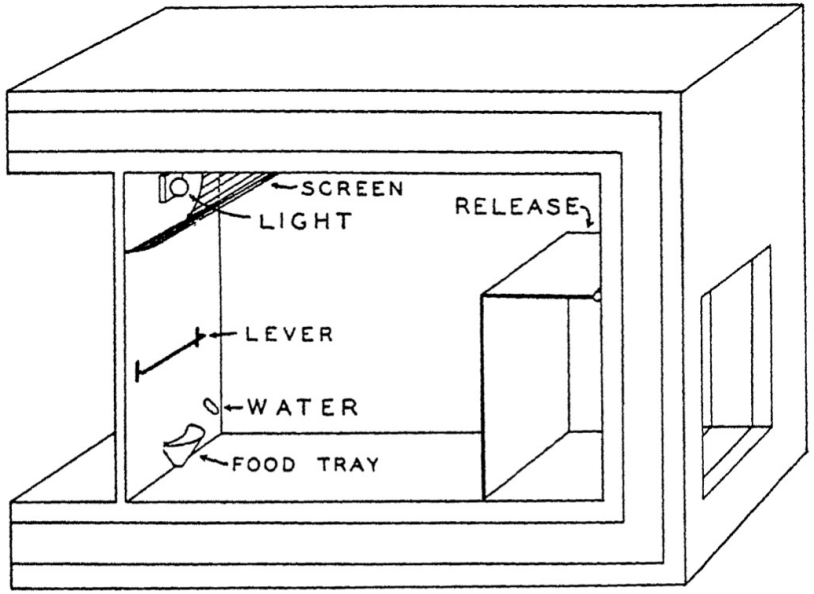


FIGURE 1

A TYPICAL EXPERIMENTAL BOX

One side has been cut away to show the part occupied by the animal. The space behind the panel at the left contains the rest of the lever, the food magazine, and other pieces of apparatus.

Skinner's behaviorism: Skinner box

- Skinner first measured how often an animal spontaneously pressed the level when placed inside the box (baseline)
- "cumulative" response graphs record the response rate, i.e., lever pressing per unit time
  - first 4 responses, 120 minutes, i.e., slope = 4/120 = .03 responses per minute
  - 100 responses in 30 minutes, i.e., slope = 100/30 = 3.33 responses per minute

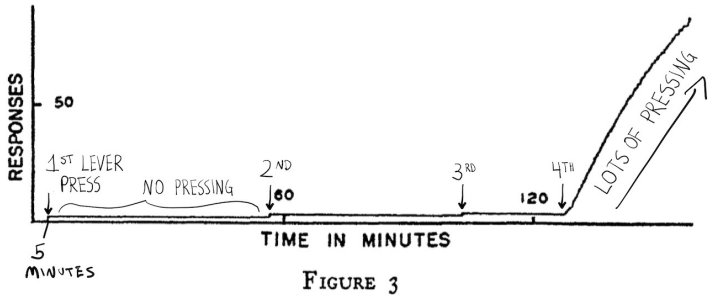
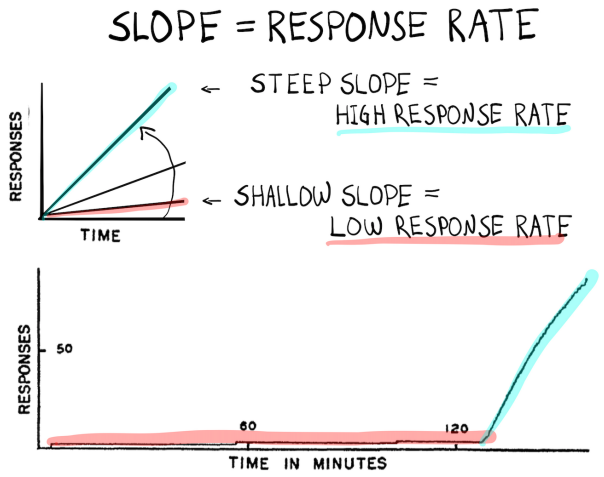


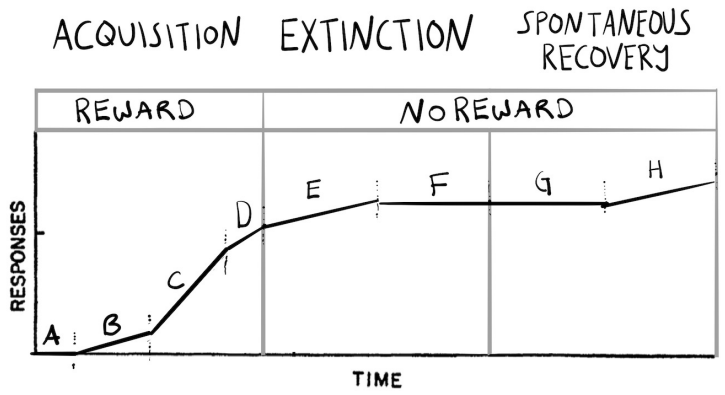
FIGURE 3
ORIGINAL CONDITIONING

All responses to the lever were reinforced. The first three reinforcements were apparently ineffective. The fourth is followed by a rapid increase in rate.



Skinner's behaviorism: descriptive system

- Skinner wanted to develop an abstract system that could describe and predict lever-pressing behavior; he came up with specific terms, laws, and relationships
- terms/laws:
  - reflex: any operant behavior
  - reflex strength: changes in behavior over time
  - law of threshold: the intensity of the stimulus must reach or exceed a certain critical value (called the threshold) in order to elicit a response.
  - law of latency: an interval of time (called the latency) elapses between the beginning of the stimulus and the beginning of the response
  - law of magnitude of the response: the magnitude of the response is a function of the intensity of the stimulus
  - law of after-discharge: the response may persist for some time after the cessation of the stimulus
  - reflex reserve: total available activity
- you are not expected to learn these terms!

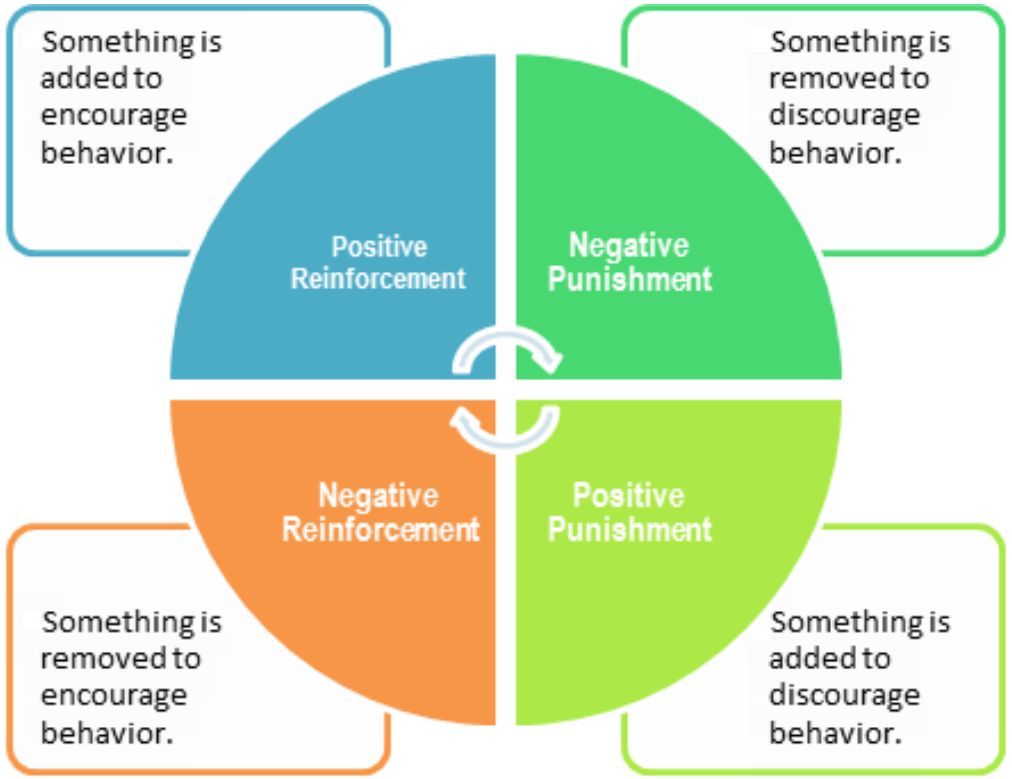


conceptual question #abstract

I am struggling to wrap my head around why laws of behavior were established by Skinner when the behaviorist concepts are so abstract and subject to change. If a "threshold" cannot be quantified and a "reflex" can only be predicted, why was it important to make generalizations? I understand his models were helpful in training animals but if these laws can't be quantified how can behaviorist concepts contribute to psychology even in the future?

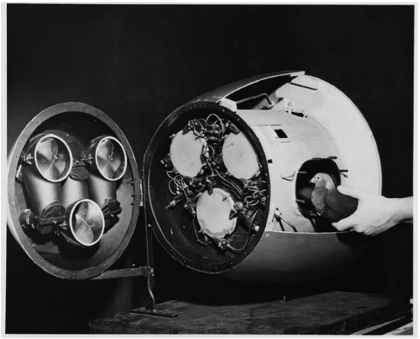
reinforcements and punishments

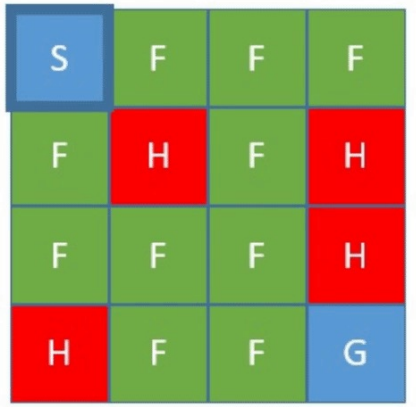
- type of action/stimulus
  - positive: something is added
  - negative: something is removed
- goal
  - reinforcement: encouraging behavior
  - punishment: discouraging behavior
- activity: in pairs
  - come up with an example of each



Skinner's behaviorism: applications and implications

- applications
  - Project Pigeon (WWII)
  - parenting / animal training
  - applied behavioral analysis
  - reinforcement learning in AI!
  - therapy: behaviors can be modified
- broader implications
  - moving away from mentalists (religious/metaphysical influences)
  - doing away with defining/studying cognition
  - continued emphasis on theorizing and multiplicity of approaches





1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16

conceptual questions #implications

- In the chapter, there is some discussion on how Watson applied behaviorism to disciplining his own children and the harmful effects it had on their upbringing. I can see why this would be the case, as Watson's behaviorism only focuses on the direct stimulus-response relationship, when children should be taught the nuances of why certain behaviors are good or bad so that they can make autonomous choices. Some therapies for neurodivergent people, such as applied behavior analysis (ABA), use similar conditioning techniques to elicit a preferred behavior in the individual. Would this also be considered unethical, or is it different to the methods that Watson proposed in its application?

Hull's behaviorism

- Clark Hull tried to establish a mathematical form of behaviorism
- we've seen similar ideas before: some scientists propose ideas/theories of behavior, other scientists attempt to *model* it using equations, in an effort to be precise and assist the goal of predicting behavior
- idea was to be similar to other sciences (e.g., laws in physics)
- but behavior is complex...Hull's mathematical theory was not successful in predicting behavior

$$_{S}E_{R} =_{S} H_{R} \times D \times V \times K$$

big takeaways

- there were several schools of psychology before behaviorism occupied centerstage, such as positivism, utopianism, associationism and conditioning
- behaviorism had many flavors/versions
  - Watson propagated the idea that psychology should focus on stimulus (S) – response (R) relationships and abandon questions about internal processes
  - Tolman brought back the idea of purposes and cognitions, first as descriptors of behavior, and then as critical intervening operations/components of behavior
  - Skinner introduced operant conditioning and attempted to develop a descriptive system that could be used to predict and manipulate behavior
  - Hull (unsuccessfully) proposed a mathematical theory that would be able to predict behavior
- behaviorism took us slightly away from the mental operations that occur between perceiving a stimulus and producing a response, i.e., where cognition lies

next class

- **before** class:
  - *finish:* L5 quiz + writing assignments
  - *fill out*: class survey
    - https://forms.gle/8KSgcRyE7o2h4VLU8
  - *start finding*: project research articles (milestone #3)
  - *start:* L6 (information processing) chapter
- **during** class:
  - the rise of cognitivism via information processing

project milestone #3

- finding 3 research articles + jointly written QALMRIs
- use your review article to guide your search
- might need to read ~10 abstracts to find the best 3 papers
- QALMRIs should be detailed enough for an outsider to know what the paper was about (independent/dependent variables, key results)
- show it to a friend/classmate and ask them what they learned
- submit a self/peer assessment