PSYC 5303 – Lecture 1

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Introduction

As an introduction, let's consider three foundational questions about learning, all of which have incredibly complex and nuanced answers that we will not completely exhaust in this course!

1. What is learning?
2. Is learning observable?
3. What is learned when learning takes place?

What is learning?

Dictionary definition:

learning | ˈlərniNG |

noun

the acquisition of knowledge or skills through experience, study, or by being taught: *these children experienced difficulties in learning* | [as modifier] *: an important learning process.*

• knowledge acquired through experience, study, or being taught: *I liked to parade my learning in front of my sisters.*

ORIGIN Old English *leornung* (see LEARN,-ING[1]) .

Problems:

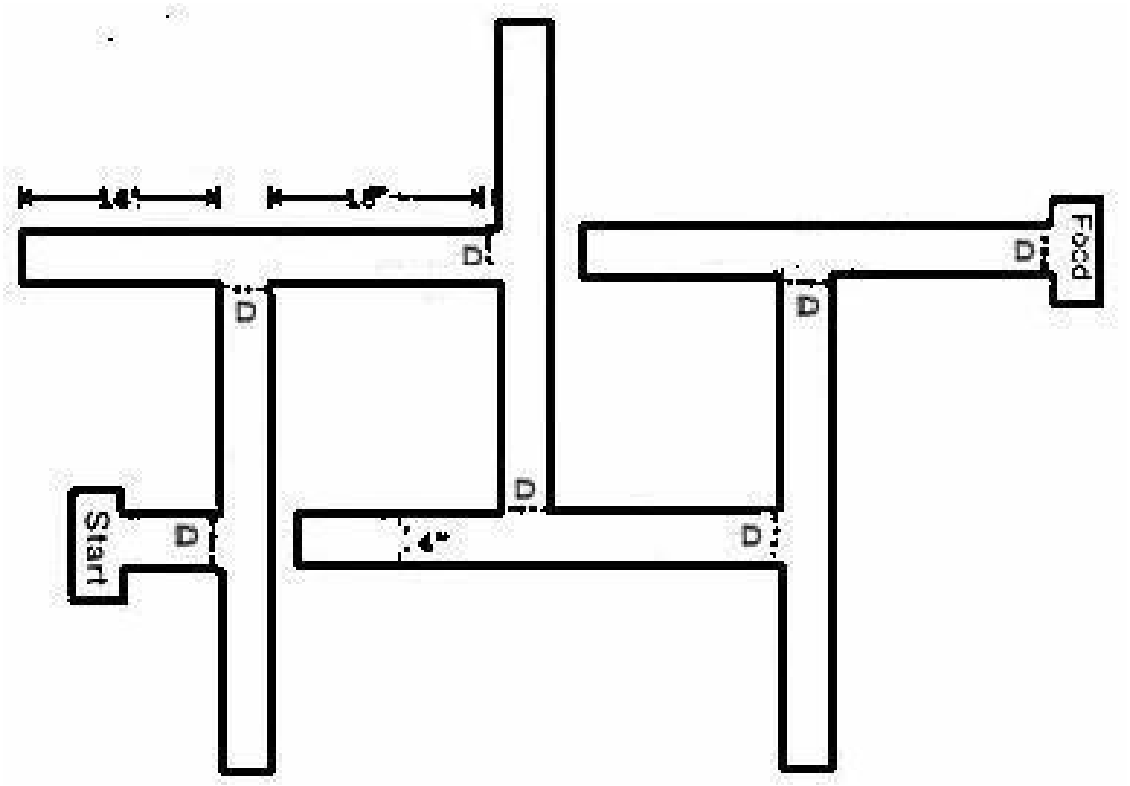
- learning does not always involve a "gain" or benefit
  - e.g., psych disorder, prejudice, maladaptive behaviors
- learning not always intentional
  - e.g., you know what you had for lunch today. Did you intend to learn this?

Definition of learning

Learning is a relatively permanent change in behavior (or behavioral repertoire) that occurs as a result of experience.

- basic idea: learning –> observe a change in behavior
- this behavior must satisfy two requirements:
  - *relatively permanent*
    - rules out changes that result from fatigue/motivation
  - *produced by experience*
    - rules out changes that result from maturation
- learning often takes place without immediately being shown in behavior
  - instead, learning may create the *potential* for behavior change when the conditions are right
  - "latent learning"

Latent learning

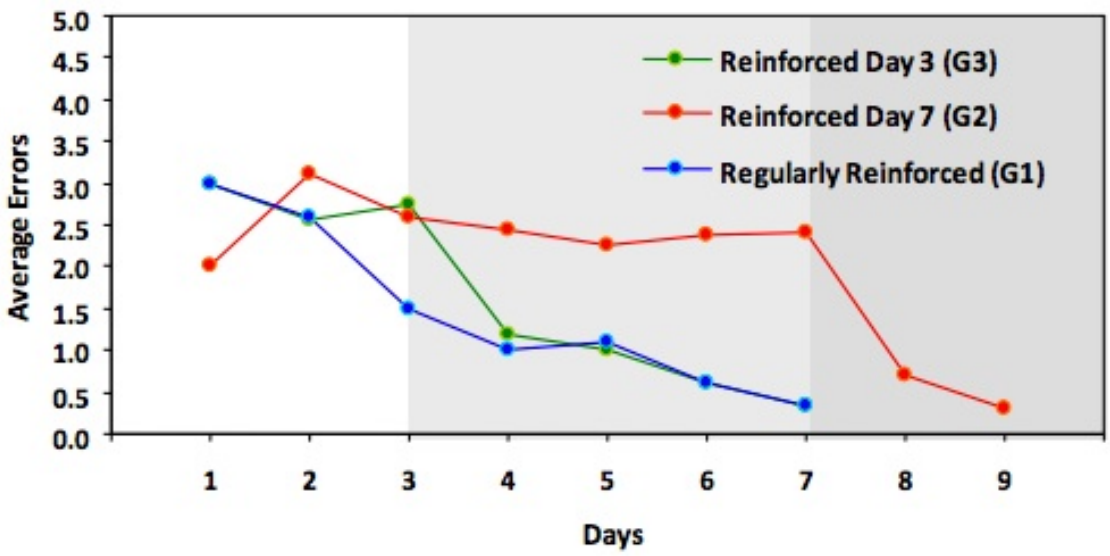


To show that rats can learn by exposure (i.e., latent learning), Blodgett (1929) took three groups of rats and allowed them to explore a 6-unit alley T maze:

- G1 - regularly reinforced
- G2 - reinforced on day 7
- G3 - reinforced on day 3

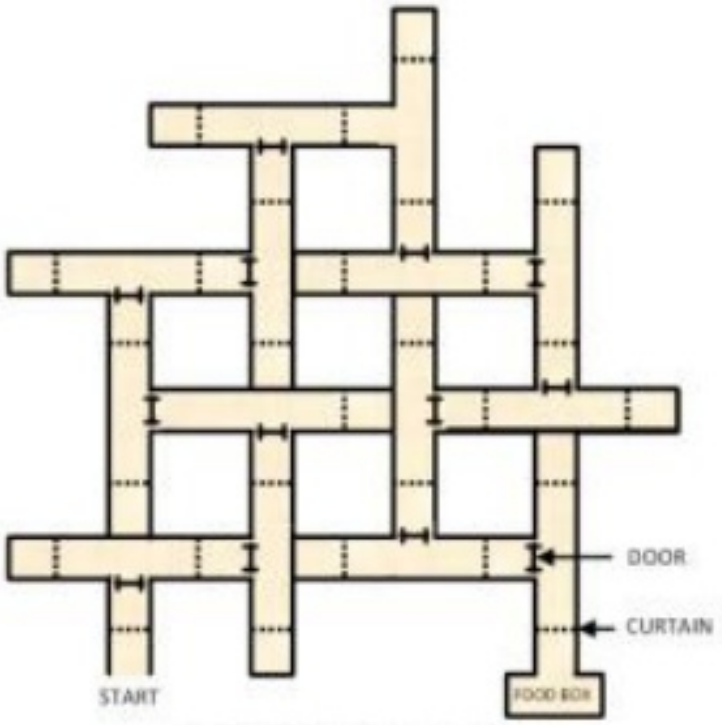
Latent learning

Blodgett's (1929) results:



Errors dropped to level of G1 immediately after first reinforcement, indicating that learning took place **even in the absence of reinforcement**.

Latent learning



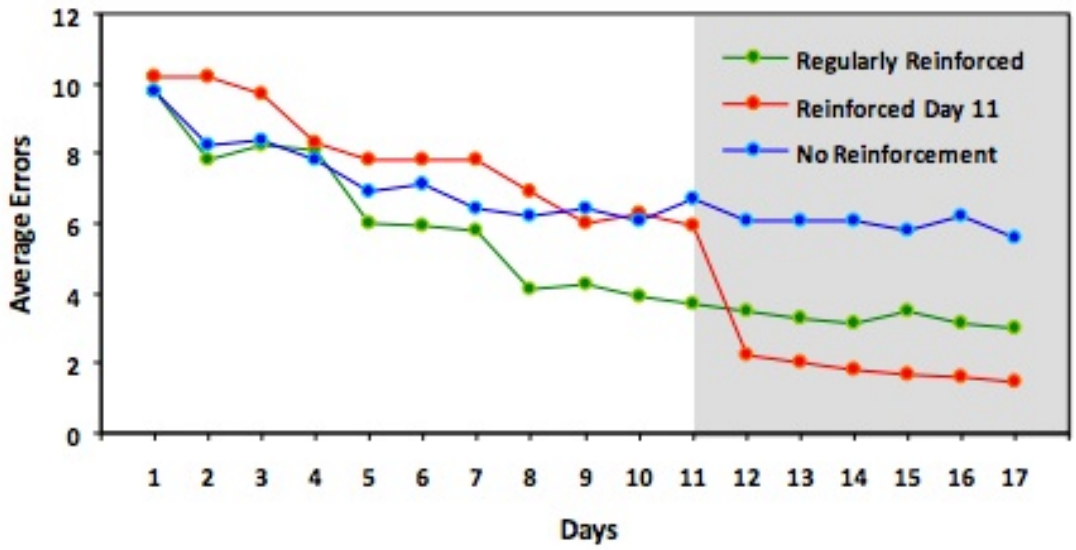
14 Unit Alley T-Maze

Tolman & Honzik (1930):

- replicated Blodgett (1929)
- Three groups of rats:
  - regular reinforcement
  - no reinforcement
  - delayed reinforcement (day 11)

Latent learning

Tolman & Honzik's (1930) results:

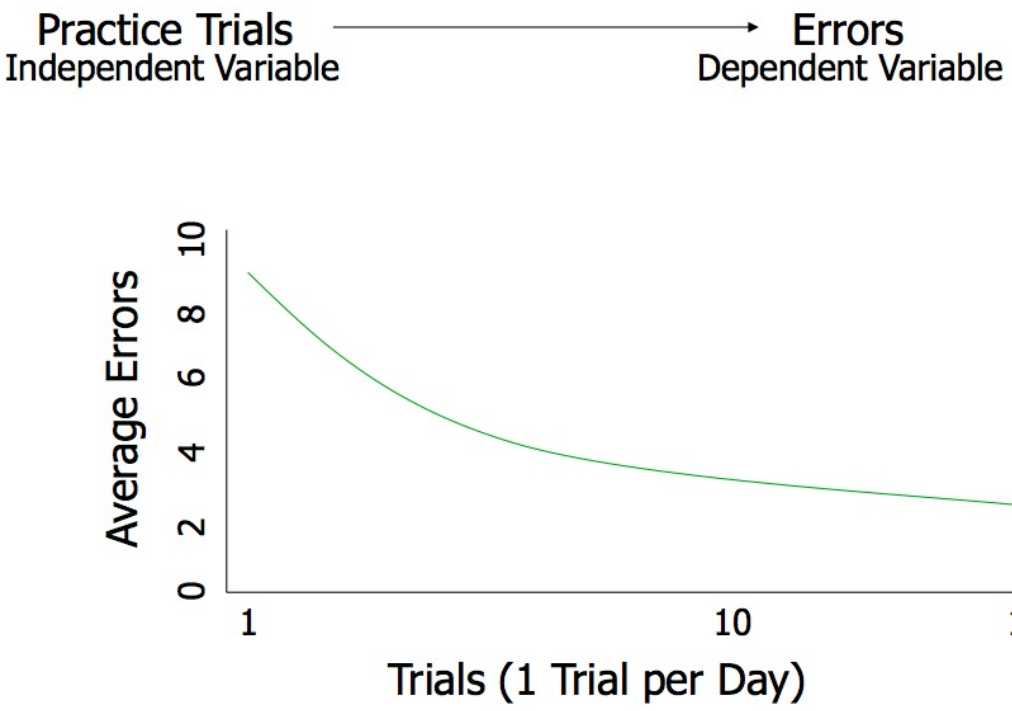


Delayed reinforcement group (red) shows sudden improvement immediately after reinforcement.

Is learning observable?

Question: is it the *learning* that we are observing, or is it the *behavior*?

What are we "observing" here?



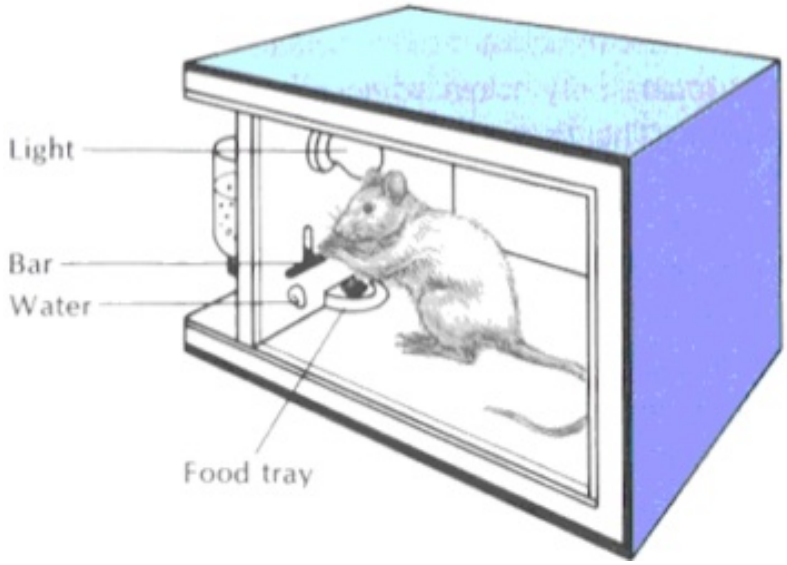
Perhaps learning is an **intervening variable** – that is, a hypothetical internal state that can be used to explain the relationship between two observed variables.

Operational definitions

Intervening variables must be studied using *operational definitions*

- defined in terms of how it is measured
- assumed to have some link to the internal state
- intervening variable does not "exist" in a separate context from these observed variables.

What is learned when learning happens?



In a Skinner box, a rat may receive a food reward every time he presses the bar. He presses faster and faster. What has he learned?

Behaviorists:

- "Specific actions"
- "*to* press the bar"

Cognitivists:

- "Mental representations"
- "*that* pressing produces food"

Behavioral vs. Cognitive View of learning

Behaviorists:

- learning involves the formation of associations between specific actions and specific events (stimuli) in the environment.- use intervening variables to explain behavior (e.g., habit, drive) but avoid direct reference to mental states

Cognitivists:

- learning takes place in the mind, not in behavior. It involves the formation of *mental representations* of the elements of a task and the discovery of how these elements are related
- behavior is used to make inferences about mental states, but is not of interest in itself
- Example: Tolman & Honzik (1930) – when rats practice mazes, they acquire a "cognitive map" of the layout – mental representations of the landmarks and their spatial relationships.

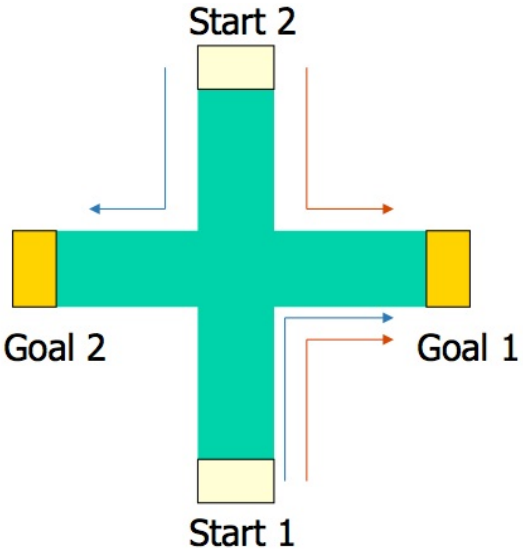
Which is correct? Well, that's complicated! To see why, let's consider some experiments on "response versus place learning".

Response vs. Place Learning

Tolman, Ritchie, & Kalish (1946):

This maze had no walls or roof so that rats could see "landmarks" in the room such as a window, door, or lamp.

On a random half of the trials, the rats started from Start Box 1, and on the other half they started from Start Box 2.



GROUP P always found food in Goal Box 1.

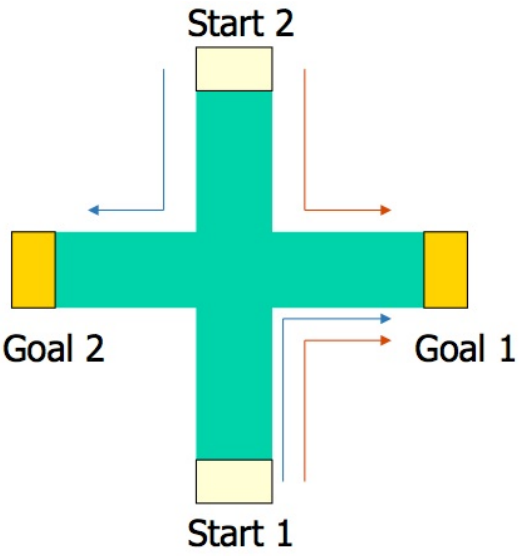
GROUP R found food in Goal Box 1 when they started from Start Box 1 but received food in Goal Box 2 when they started from Start Box 2.

Response vs. Place Learning

Tolman, Ritchie, & Kalish (1946):

Cognitive theory predicted that GROUP P would learn faster because they only had to learn one cognitive map.

Behavior theory predicted GROUP R would learn faster because they only had to learn one sequence of movements at the choice point—a right turn.



GROUP P always found food in Goal Box 1.

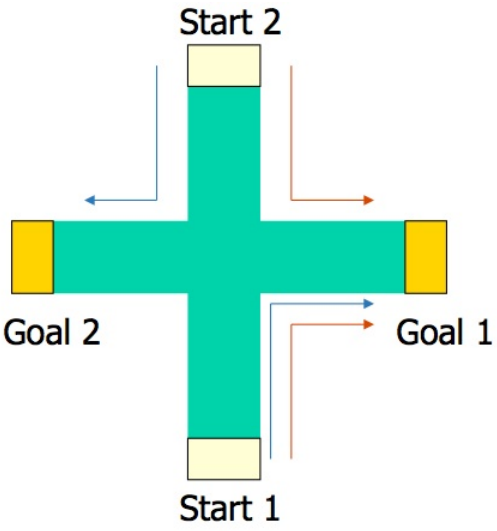
GROUP R found food in Goal Box 1 when they started from Start Box 1 but received food in Goal Box 2 when they started from Start Box 2.

Response vs. Place Learning

Tolman, Ritchie, & Kalish (1946):

What's YOUR prediction?
Are you a behaviorist or a cognitivist?

GROUP R GROUP P



GROUP P always found food in Goal Box 1.

GROUP R found food in Goal Box 1 when they started from Start Box 1 but received food in Goal Box 2 when they started from Start Box 2.

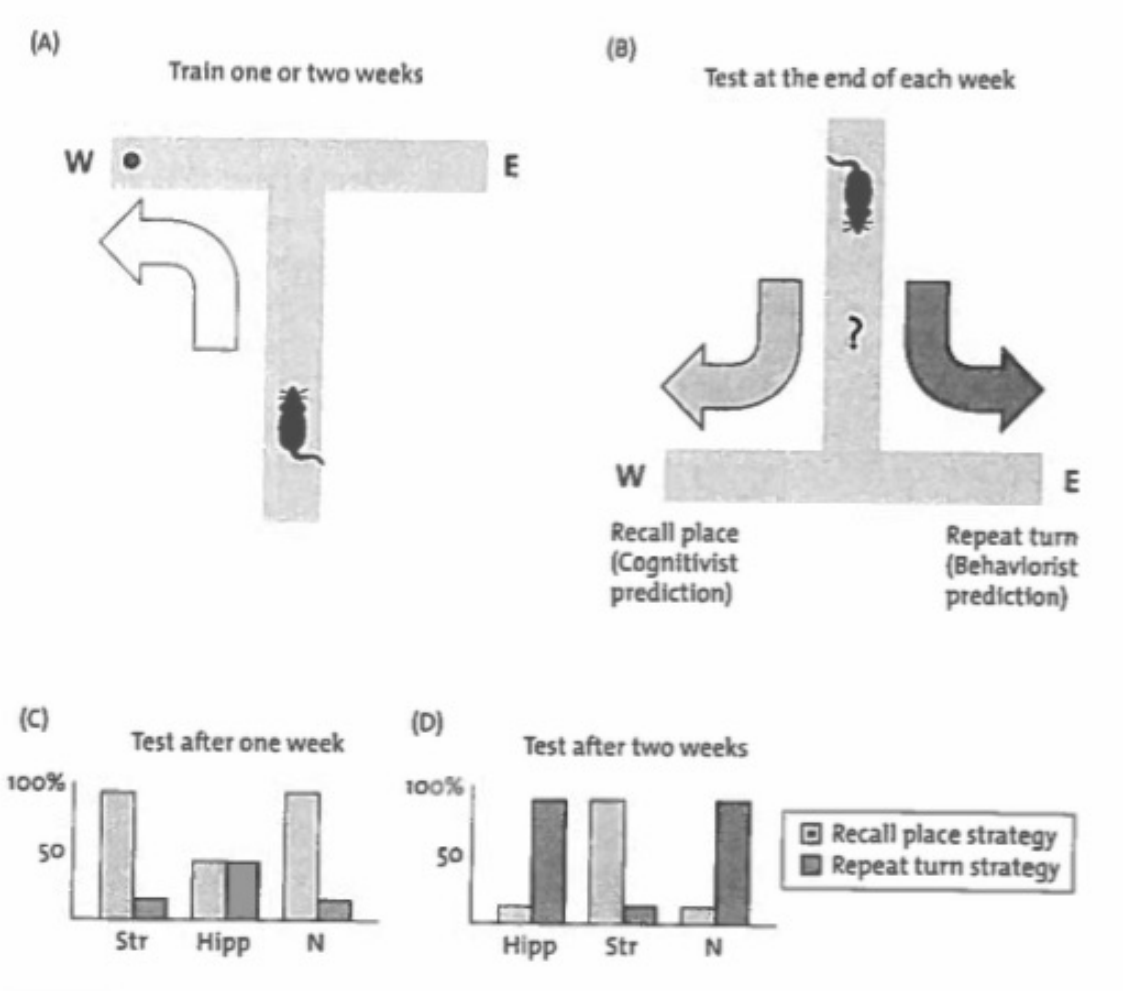
BUT!

- later studies found that if the maze had a roof so the rats couldn't see things in the room, *response learning* was faster
- both types of learning occurred, depending on what cues were available. Both the behavioral and cognitive viewpoints were right!

Response vs. Place Learning

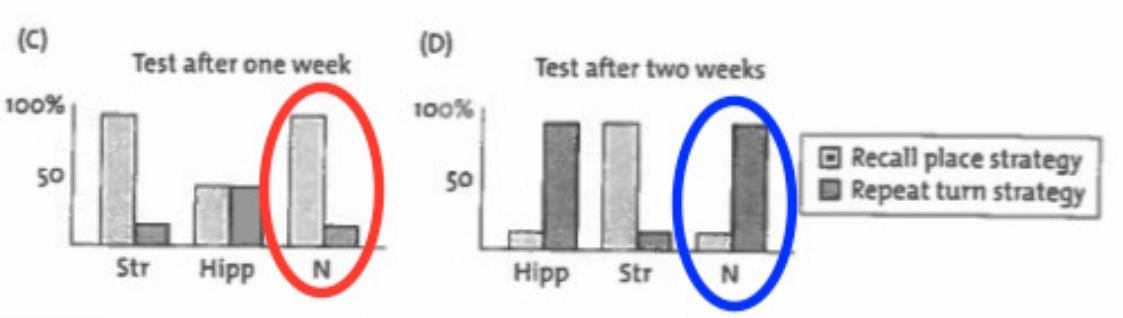
Consider Packard & McGaugh (1996):

- trained rats on a T-maze for one week
- recorded turn direction on a single probe trial after rotating maze 180 degrees
- trained rats again for one additional week
- recorded turn direction on a final probe trial with rotated maze



Response AND Place Learning

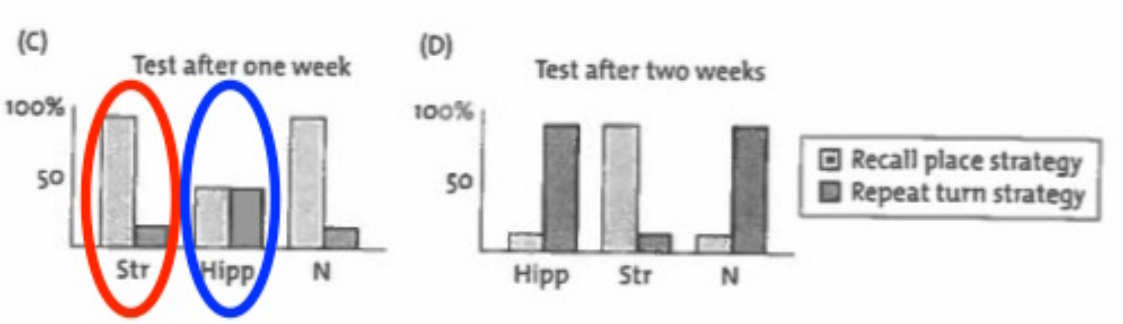
Packard & McGaugh (1996):



- initial test (1 week) –> place memory
- subsequent test (2 week) –> response memory

Response AND Place Learning

Further:

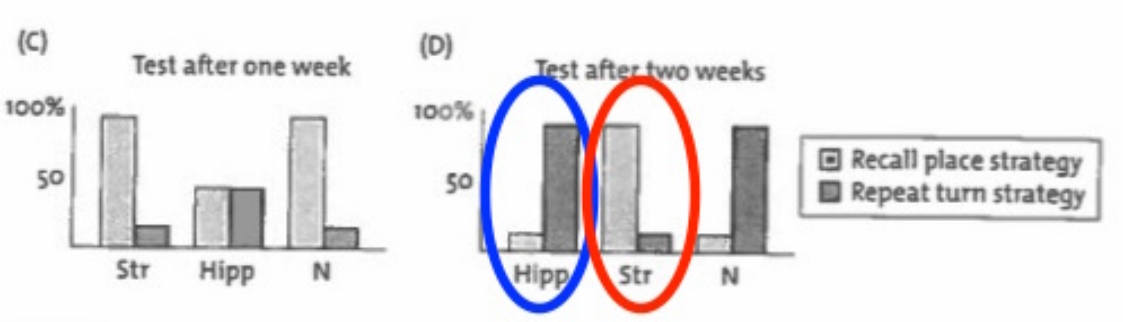


at initial test:

- blocking striatum –> same preference for place memory as control
  - striatum NOT involved in formation of place memory
- blocking hippocampus removed preference
  - hippocampus IS involved in formation of place memory

Response AND Place Learning

Further:



at subsequent test:

- blocking striatum –> *opposite* preference to control group
  - striatum must be involved in formation of response memory
- blocking hippocampus –> same preference as control group
  - hippocampus NOT involved in formation of response memory