Lecture 14

Implicit Learning

- An Introduction
- Implicit Motor Learning
    - How we pick up motor skills
- Implicit spatial learning
    - How the brain automatically "navigates"
- Implicit pattern associations
    - How we automatically search for "meaning"

Review from Psych 100

classical conditioning

From *The Office*

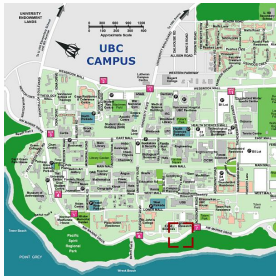
Implicit Learning

The process of acquiring knowledge about the world without intending to do so, and independent of whether or not you're consciously aware of what is being learned

Examples in lecture today:

Motor skills

Spatial locations



Patterns of association

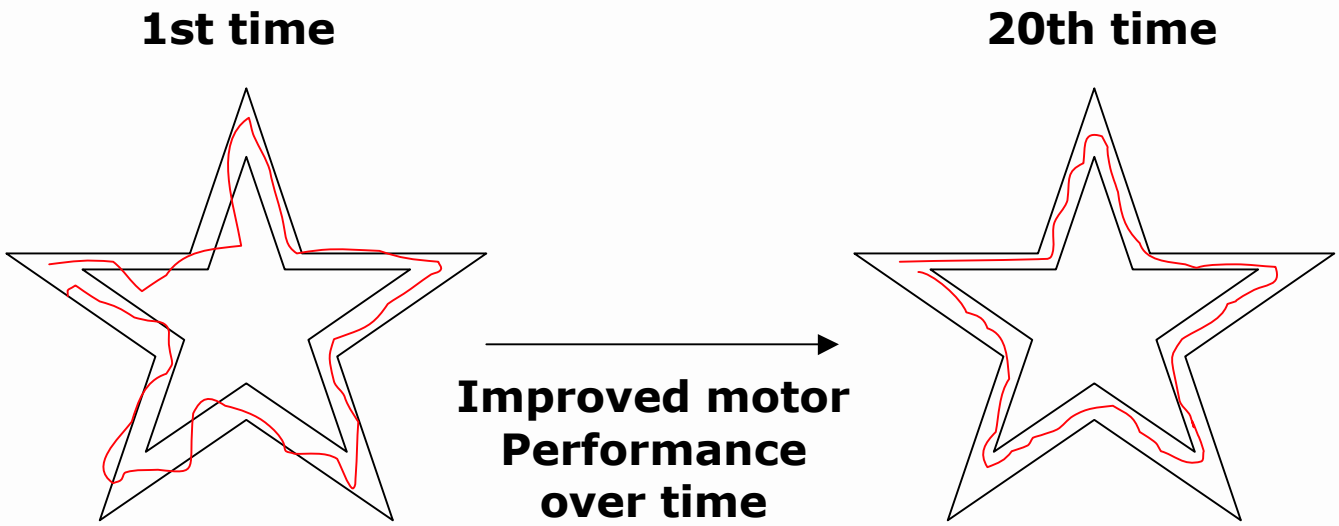
Implicit Motor Learning

A form of procedural memory

From *The Office*

Implicit Motor Learning

Recall Amnesiac HM from Lecture 6

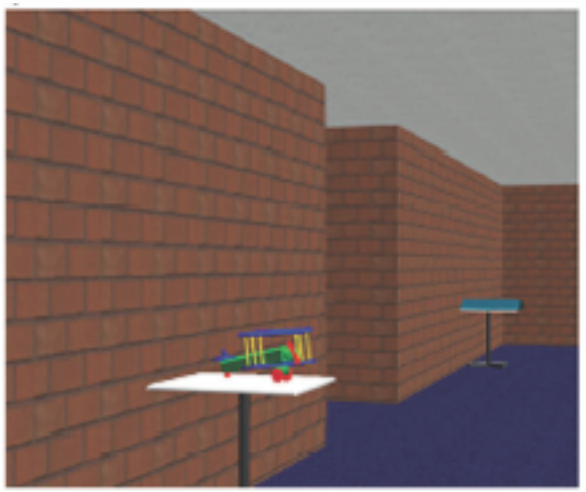


Consciously, always felt like a "new" task to HM

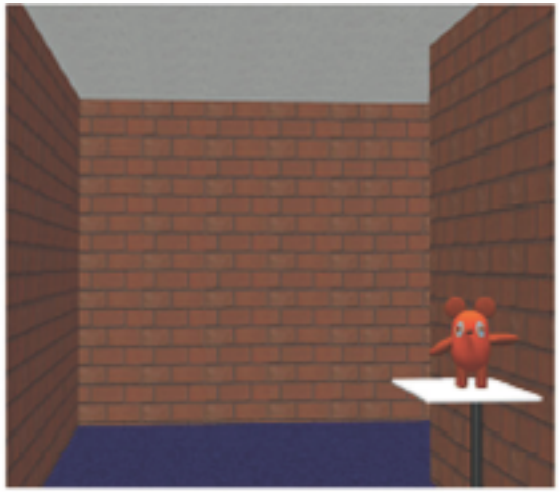
Implicit Spatial Learning

Learning Phase of Experiment:

Navigate a virtual set of hallways with two kinds of things on tables--"toys" and "non-toys"



Toy at decision point



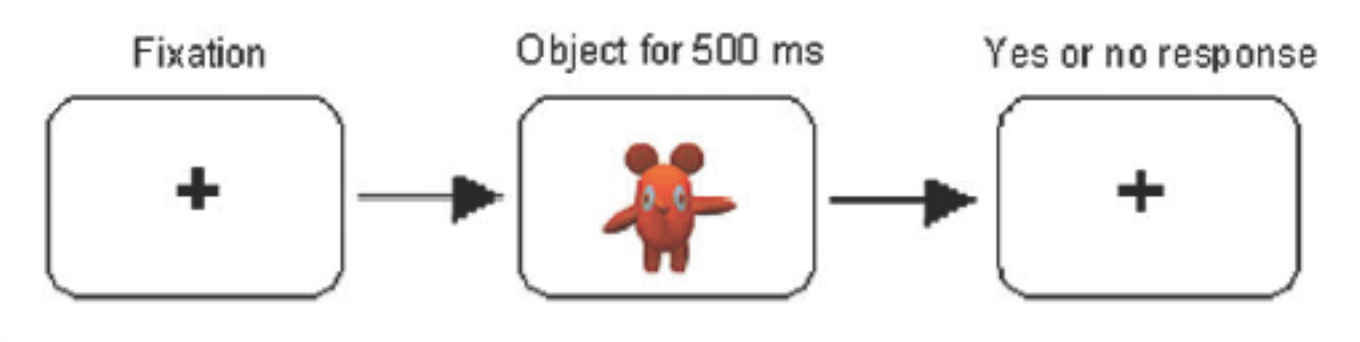
Toy at non-decision point

van Turennout (2004)

Implicit Spatial Learning

Test Phase of Experiment:

During fMRI scanning, shown objects and asked for each one "do you remember this from the learning phase?"



Two key questions:

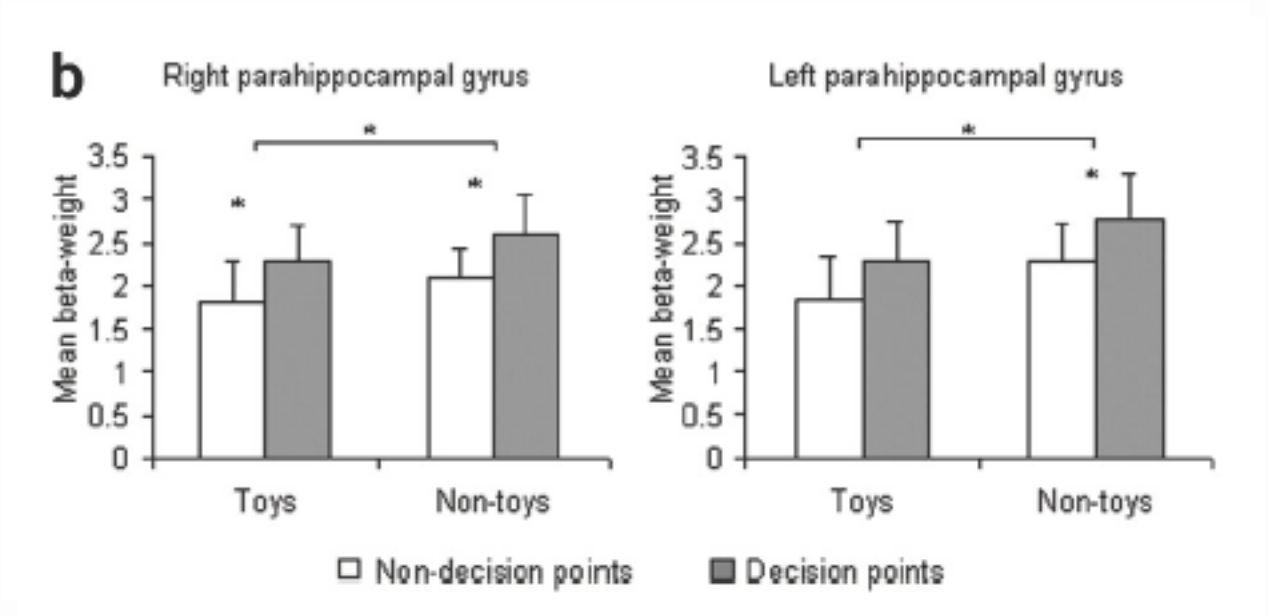
Were "spatial" brain regions more activated for objects from decision points, and did this depend on whether or not they remembered the object?

van Turennout (2004)

Implicit Spatial Learning

The parahippocampal gyrus (a brain region linked to learning spatial layouts) was indeed more active for objects encountered at decision points during the learning phase of the study.

Measure of Brain activation level →

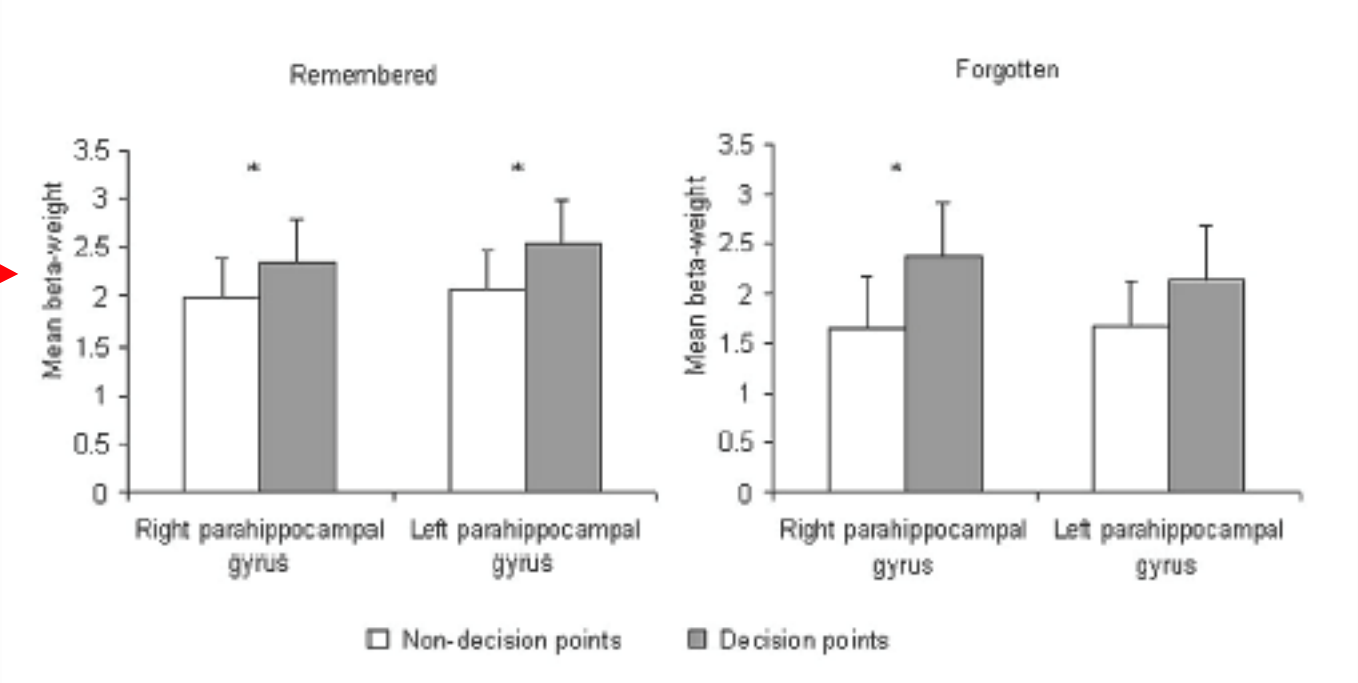


van Turennout (2004)

Implicit Spatial Learning

The effect in the parahippocampal gyrus was present regardless of whether or not the objects were remembered or not.

Measure of Brain activation level



van Turennout (2004)

Implicit Spatial Learning

DISCUSSION

Our data indicate that during route learning, the brain automatically distinguishes between objects at navigationally relevant and irrelevant locations. Representation of objects in the parahippocampal gyrus was directly related to `their navigational relevance in a large-scale environment. This selective neural marking for relevant objects occurred in the absence of any spatial information during retrieval, and even without conscious recollection of the route or conscious awareness of having seen the object previously.

van Turennout (2004)

Implicit Association Learning

The "meaning maintenance" model

Our minds are designed to notice patterns and associations

- **An adaptation that helps us predict/understand the world around us**

When our current understanding of patterns and associations is challenged, we implicitly search for new patterns

- **i.e., we are more likely to notice new patterns and associations when old patterns have been violated**

Heine (2009)

Implicit Association Learning

A Between-subjects design

"Meaning threat" condition	No "meaning threat" condition
Read a short story by Kafka, a story that violates normal patterns of narrative and prose	Read a translation of the Kafka short story that conformed to normal pattern of narrative and prose

Prediction is that the "meaning threat" should trigger increased implicit association learning

Heine (2009)

Implicit Association Learning

An Artificial Grammar Task

After reading one of the two stories, participants were shown a set of 45 letter strings. Unknown to the participants, the letters strings had certain predictable transition properties between letters that mimic the kinds of common letter combinations in regular language. No instructions were given to memorize the strings.

V T T T T V M

X M X R T V T M

T M X M R T V

Z W T V M M T

Heine (2009)

Implicit Association Learning

An artificial Grammar Task

After seeing the original set of letter strings, participants were then given a "surprise" memory test. On a sheet of 60 letter strings, they were asked to identify which strings they had seen before and which were new (there were 30 of each). At issue was whether memory performance was affected by which story the partipants had read.

V T T T T V M

V T R M X M T

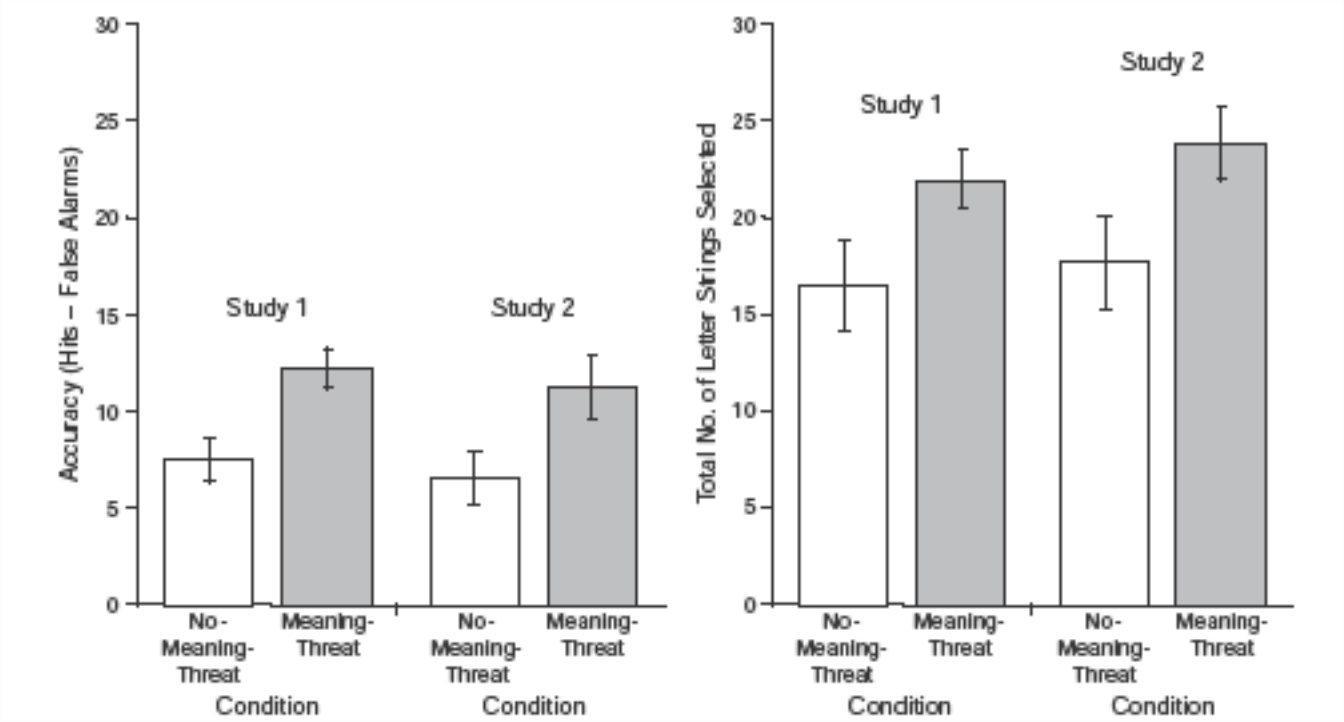
X M X R T V T M

T M M V T W Z

Heine (2009)

Implicit Association Learning

Both measures of memory performance showed that participants who had read the



Heine (2009)