

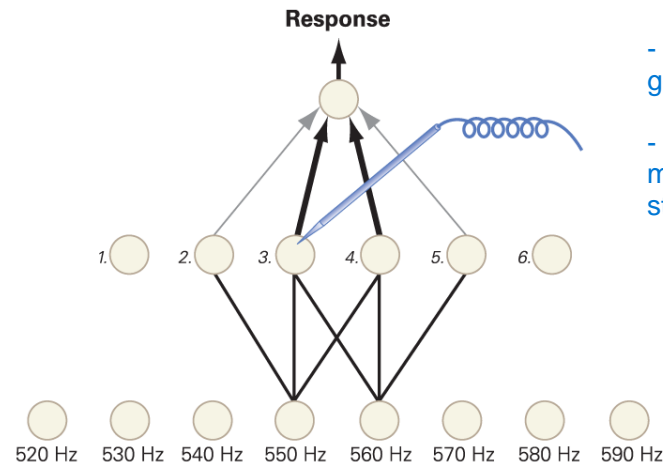
Generalization vs Discrimination

Various behavioral paradigms of generalization

- a. discrimination training
- b. sensory preconditioning
- c. acquired equivalence
- d. negative patterning

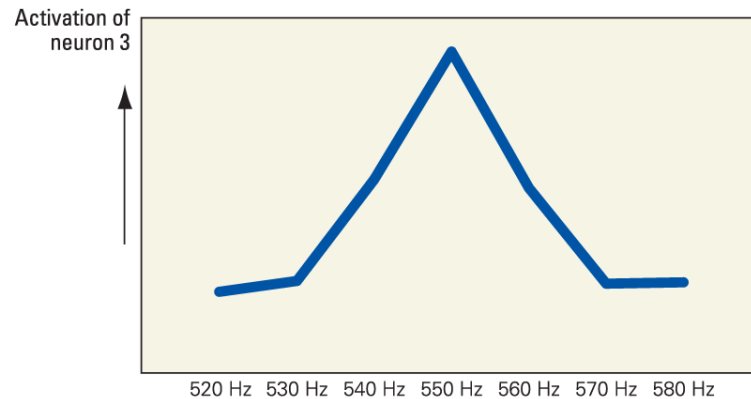
Help us to form the basic knowledge systems that we develop

Brain mechanisms that lead to generalization

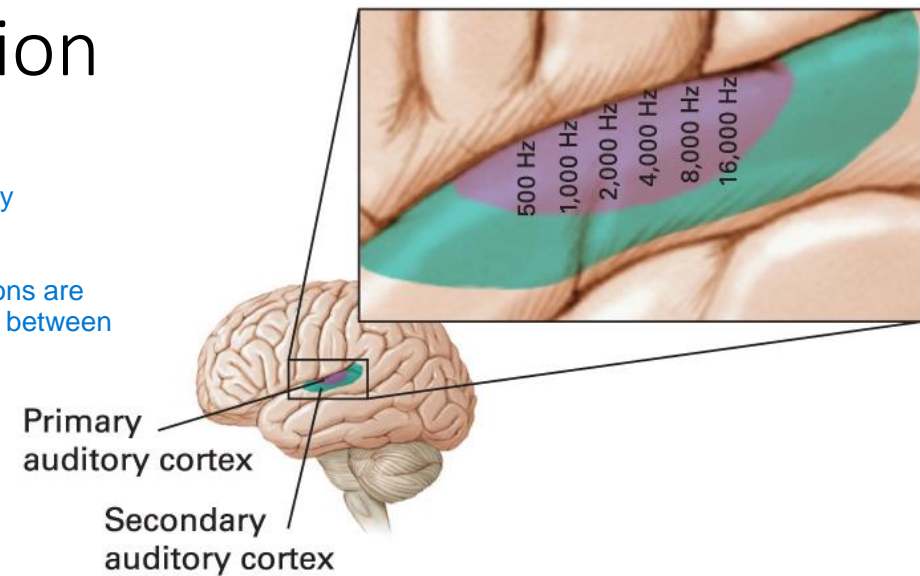


- The broader the receptive field, the more likely generalization will occur

- When receptive fields are narrower and neurons are more selective, the brain can better distinguish between stimuli, leading to discrimination.



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- Overlapping representation
- Offers redundancy (One stimulus → ~3 neurons fire)
- Known as receptive field of neuron → same neuron fires to stimuli very similar to actual stimulus
- Downside → stimulus detected by neighbouring neurons → loss of specificity → generalization

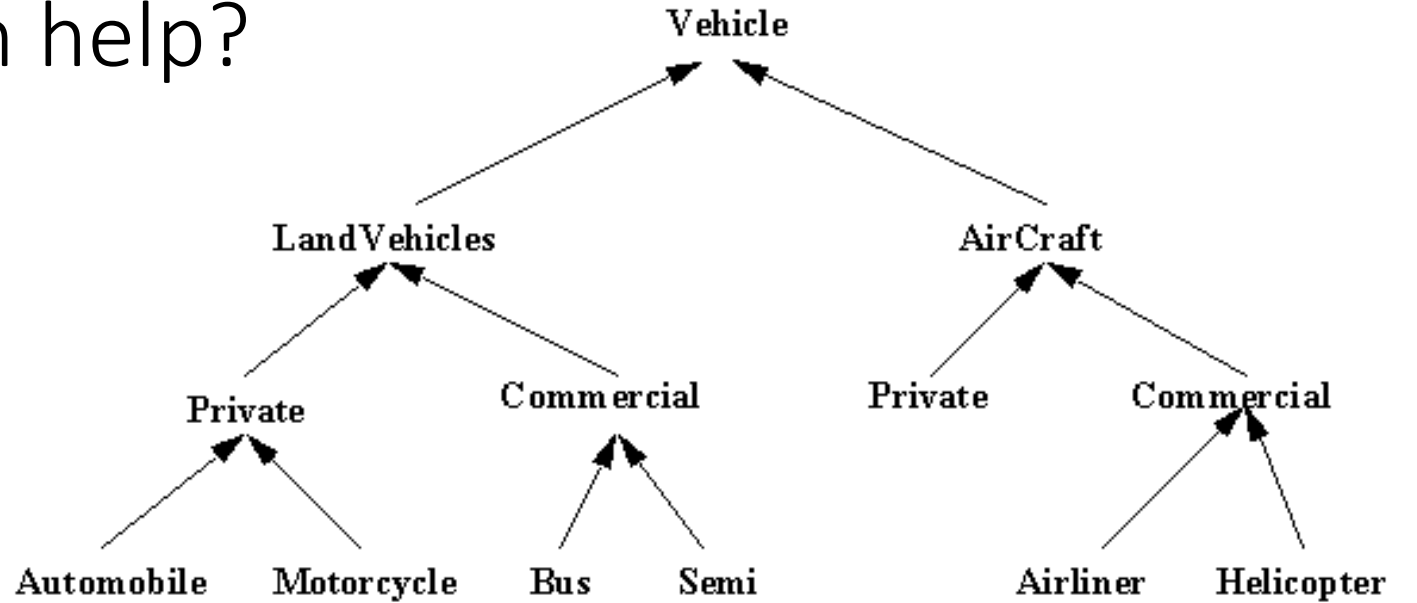
Receptive fields provide a balance between discrimination and generalization

How does generalization help?



Try to extract meaning from what you see

How does generalization help?



You try to extract commonalities from what you know and yet maintain distinction

Knowledge networks organize themselves to form concepts

Vehicle is a concept

Concept Formation, Category Learning, and Prototypes

- **Concept:** an internal psychological representation of a real or abstract entity
- Forming concepts requires both generalization and discrimination. We generalize all dogs to have basic “dog feature” but discriminate between its members to identify different breeds

E.g. dog → 4 legs, round nose, floppy ears, tapering jaw, etc.



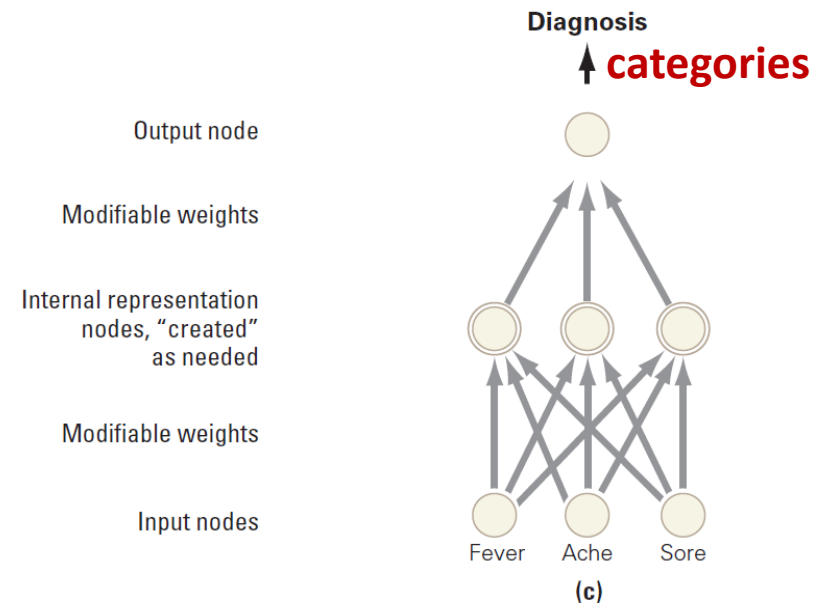
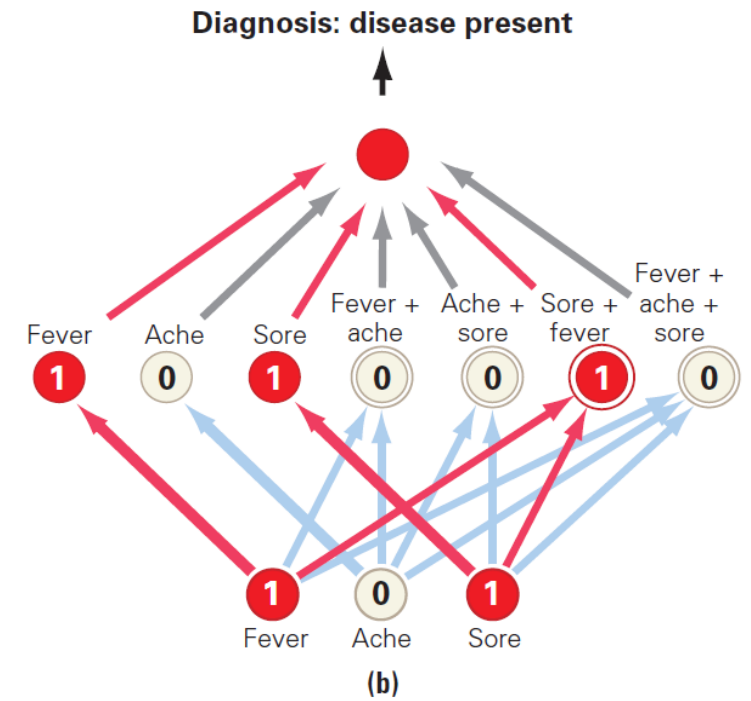
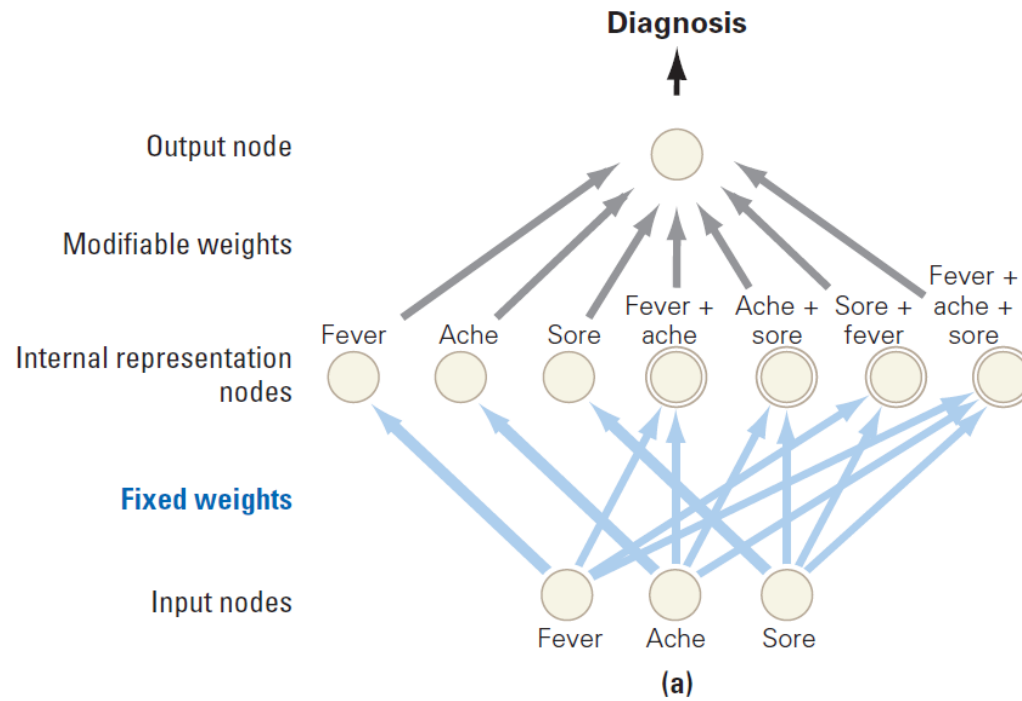
Concepts help to categorize information

- **Category:** a division or class of entities in the world
- E.g. dogs, birds, cats, cars, fruits, vehicles
- categories help us make inferences about objects and events and guide us in predicting the future.

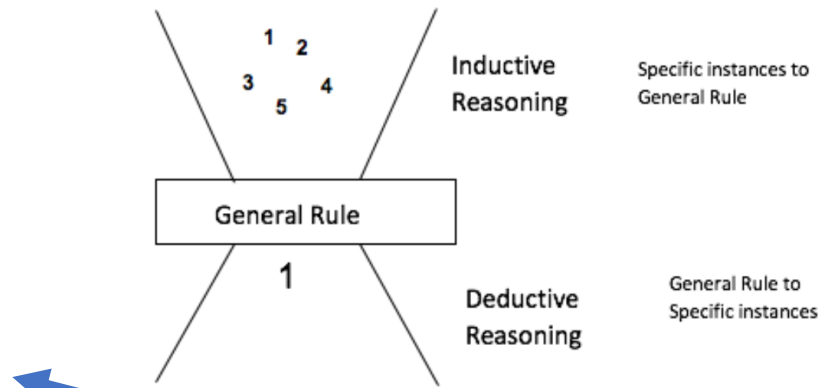
Prototype – Abstracted from examples



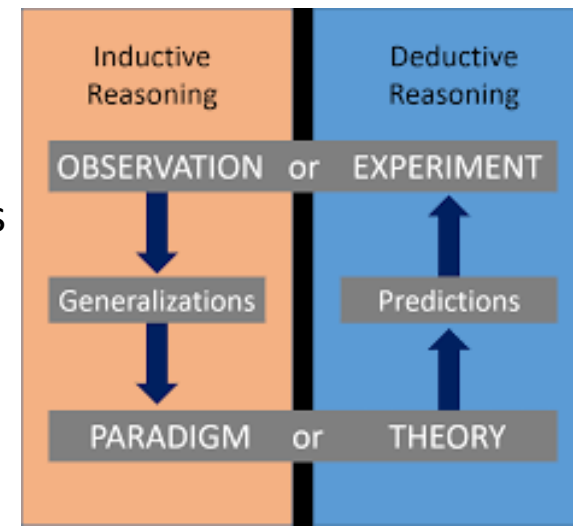
Classifying stimuli into categories



Concept



concepts derived from categories are tools for helping us induce meaningful relationships in the world, help us to make decisions or choices



inductive inference

A logical inference that is probably (but not necessarily) true and is usually based on attempts to draw a general rule from one or more specific instances or premises.

Prototypes and exceptions

All birds that fly have wings
All birds who have wings can fly
(but not penguins, ostrich, emu, kiwi, etc.)

Category

Quiz

What is categorizing people called?

stereotype

Stereotypes & Generalizations about Other People

- **Stereotype:** A set of beliefs about the attributes of the members of a group
- In everyday social contexts, *discrimination* is more often used to mean the unfair differential treatment of individuals on the basis of the group to which they are perceived to belong

Negative stereotype vs Positive stereotype

Religious stereotyping



RACISM IN INDIA

1) North-East

2) South

3) North

How do people learn stereotyping?

- Personal experiences
 - through our parents,
 - friends,
 - Second-hand reports in books, movies, TV, and social media
-
- people filter what they attend to through the personal lens of their own needs and self-interest.
 - We tend to believe good things about the groups we belong to and view groups that are different from ours with varying degrees of skepticism.
 - Once we have formed a negative stereotype about members of another group, we are more likely to pay attention to examples that confirm this stereotype; this process is known as **confirmation bias**

Why do we stereotype?

the cost of finding out correct information is too high relative to the ease of making a choice informed by only an inductive inference based on category membership.

How do we evaluate accuracy of stereotyping?

- (1) all bull dogs are dangerous,
- (2) most bull dogs are dangerous, or
- (3) bull dogs are more dangerous than most other breeds of dog?

finding a balance between

- Specificity/discrimination (does the stereotype apply only to members of a particular group?) and
- generality (does it apply to all members of that group?)

Appropriate vs Inappropriate -- generalization errors – overcoming stereotype

All zebras have 4 legs

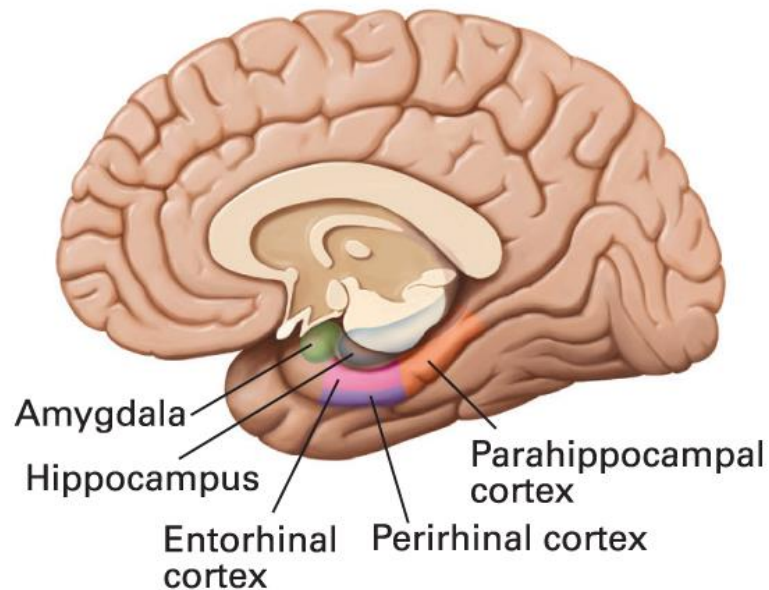
All 4-legged animals are zebras

People with malaria have high fever

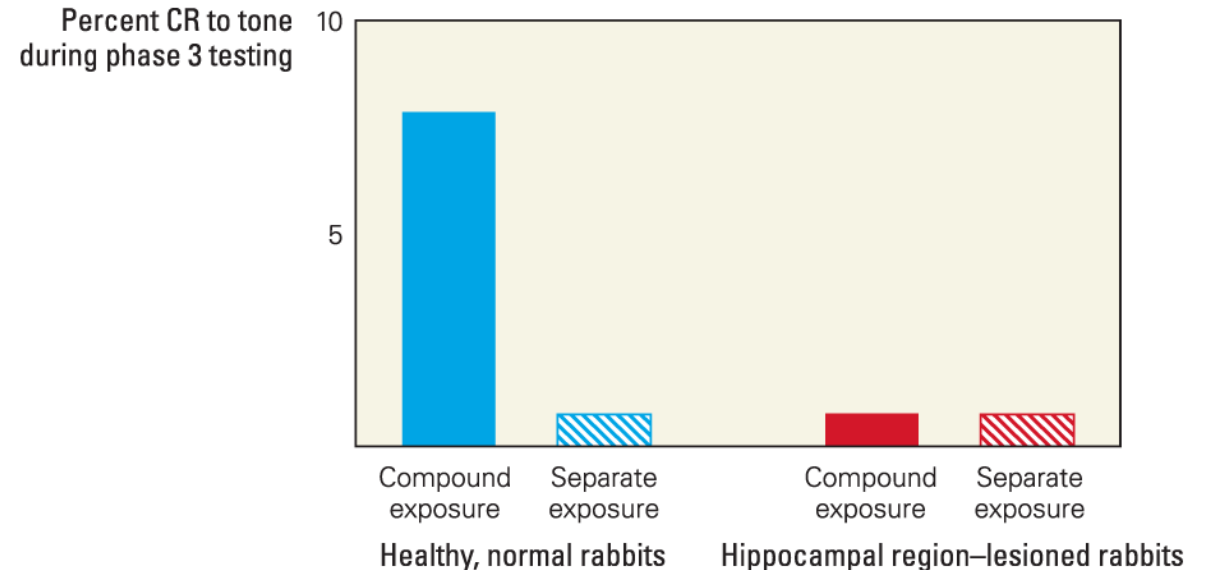
People with high fever have malaria

Effect of Damage to the Hippocampal Region on Sensory preconditioning

- Rabbits with surgically created lesions in the fornix (a part of the hippocampal region) display no sensory preconditioning



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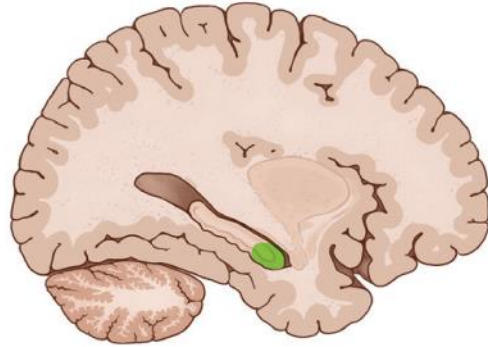


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Group	Phase 1	Phase 2	Phase 3: test
Compound exposure	Tone + light (together)	Light → airpuff → blink!	Tone → blink!
Separate exposure (control group)	Tone, light (separately)	Light → airpuff → blink!	Tone → no blink

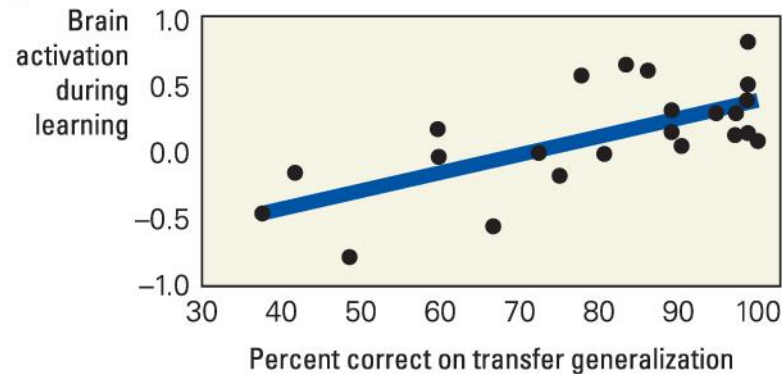
Individual Differences in Acquired-Equivalence Learning in Healthy Subjects

A



- (A) Brain images showed that hippocampus activation correlated with learning in an acquired-equivalence task

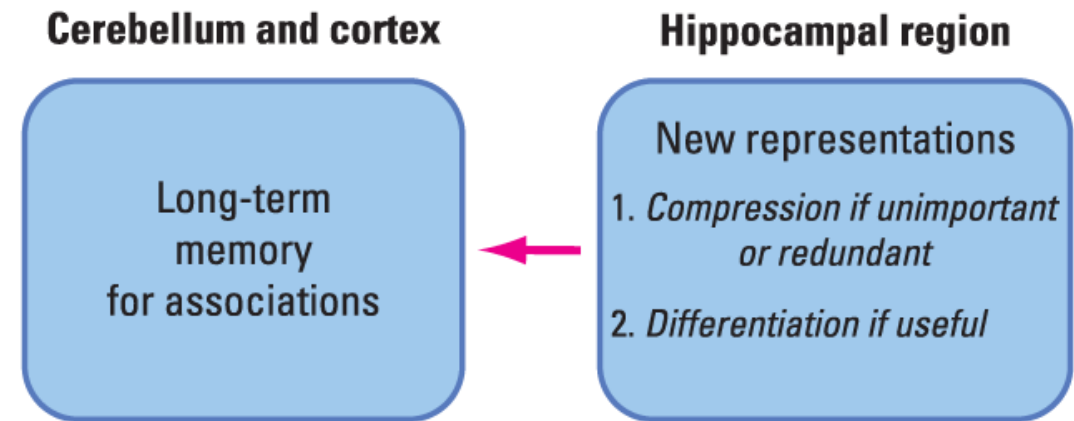
B



- (B) Brain activation signal during learning correlated with accuracy in tests of generalization across all subjects

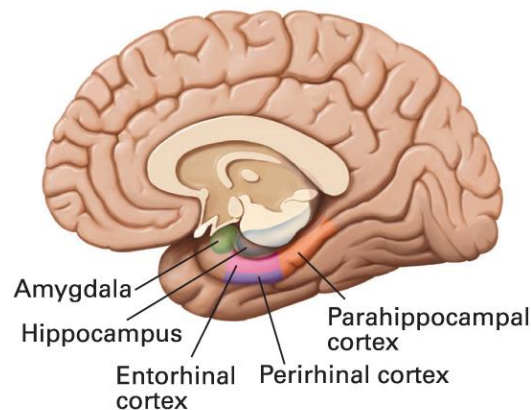
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Gluck and Myers's Model of Hippocampal-Region Function in Learning



Gluck et al., *Learning a*
Publishers

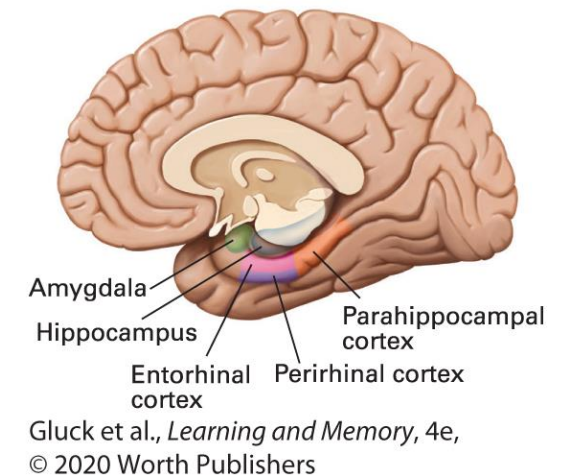
- hippocampal region operates as an “information gateway” during associative learning, processing new representations of events that are experienced
- hippocampal region selects what information is allowed to enter memory and how it is to be encoded by other brain regions
- hippocampal-region function imp for modification of stimulus representations in human learning and generalization



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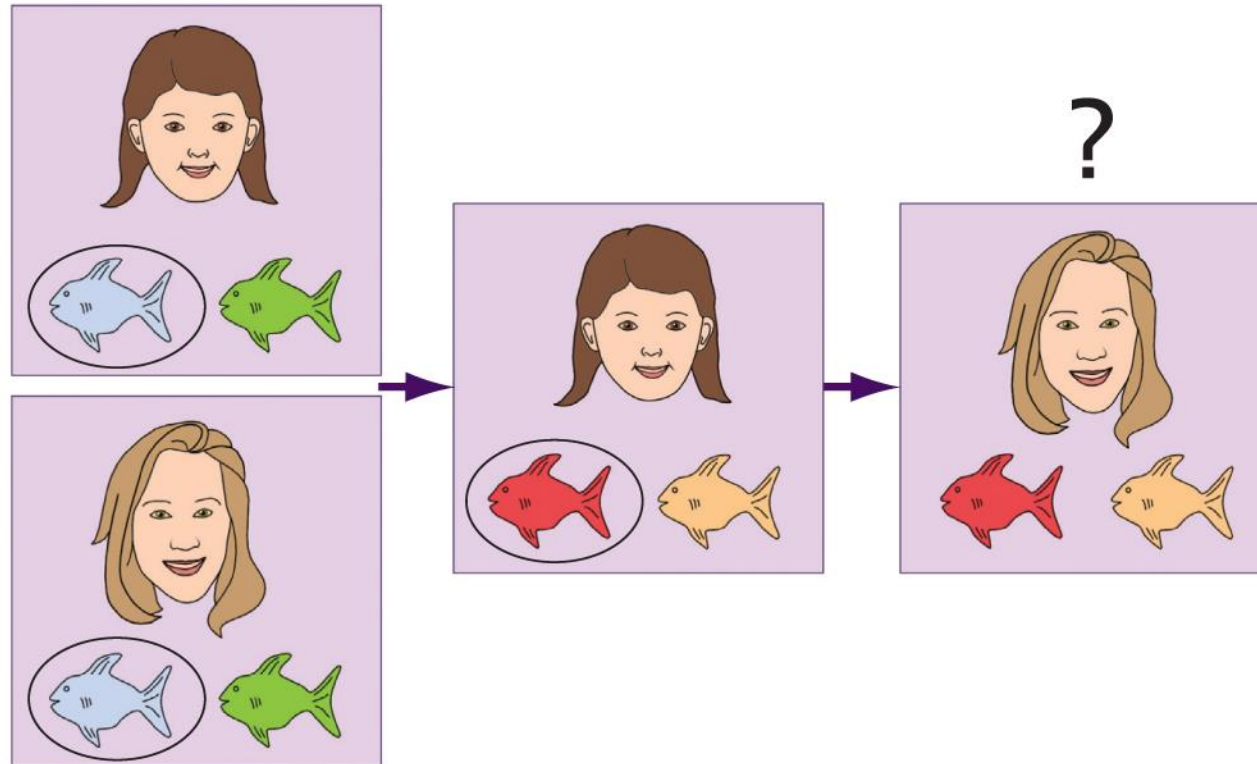
Schizophrenia

- Schizophrenia is a severe mental disorder with symptoms of hallucinations, delusions, flattened affect, and social impairment
- People diagnosed with schizophrenia show abnormalities in their hippocampal shape and reduced hippocampal activity



An Acquired-Equivalence Task for Humans

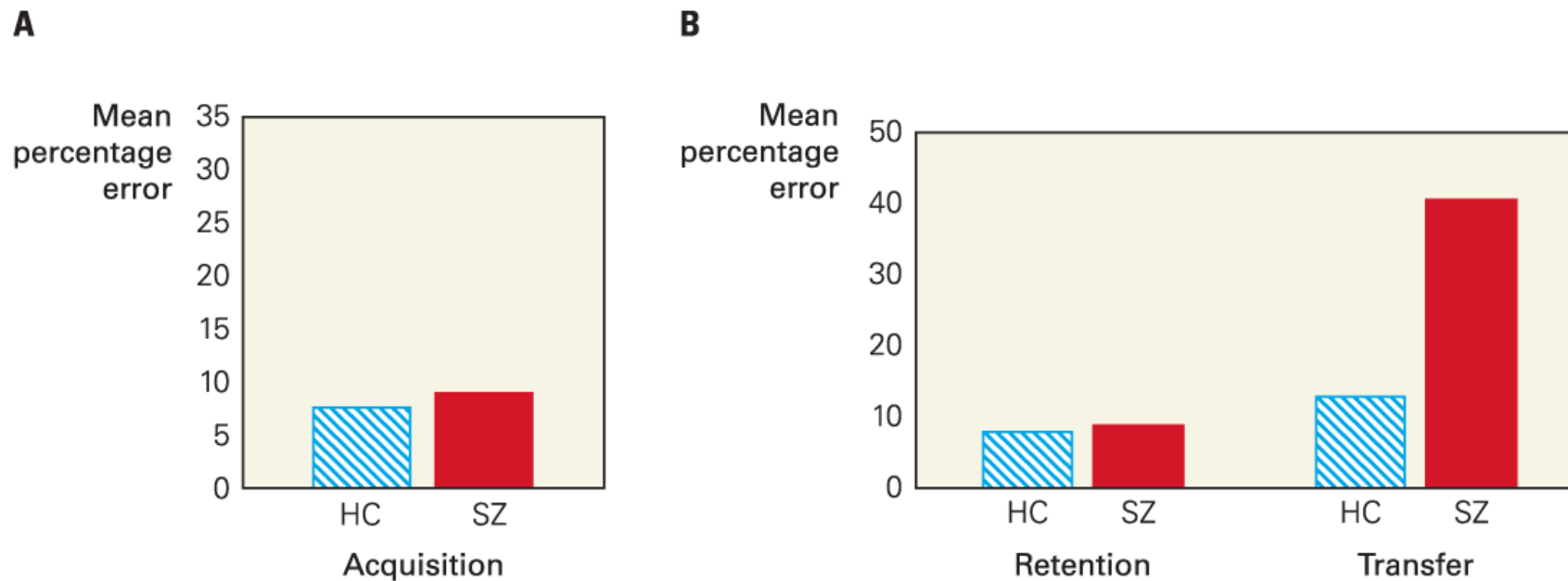
Phase 1: equivalence training Phase 2: train new outcome Phase 3: transfer



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Acquired Equivalence in Schizophrenia

- The deficit observed in the generalization phase in patients with schizophrenia suggests that hippocampal-region-dependent functions are impaired in schizophrenia



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impaired at transitive inference

Altered Generalization in Autism Spectrum Disorder

- Autism spectrum disorder (ASD) is a lifelong neurodevelopmental condition for which there is no known cure
 - Differs greatly from person to person in severity
 - Commonly associated with poor social skills and impaired communication abilities
- inability to process compound cues and cannot integrate multiple sources of information; instead become highly selective, adhering to just one
- exhibit stimulus overselectivity in generalization tasks has been linked to a variety of clinical behaviors associated with ASD, including impaired social skills, language deficits, lack of inhibitory control, and ritualistic behaviors
 - a 150-watt red light (visual),
 - a 63-decibel white noise (auditory),
 - an inflatable blood-pressure cuff (tactile),
 - and a variable period during which these cues were presented (temporal).

“tunnel vision”
Hyperfocused