9.00 Learning

Professor John Gabrieli

Recent Research on Effective Study

- **Test First, Study Later**

- **Testing Yourself on Material More Useful Than Continued Study**

(ok to have wrong answers)

LEARNING

- how behavior changes within the lifespan of an individual
- everything we know that is not genetically given
- how to predict the *future* on the *basis* of past experience
- to imbue the world with *meaning*
- learning about learning through scientific psychology

LEARNING

1. Classical Conditioning
2. Operant Conditioning
3. Limits to Conditioning

Ivan Pavlov (1849-1936)

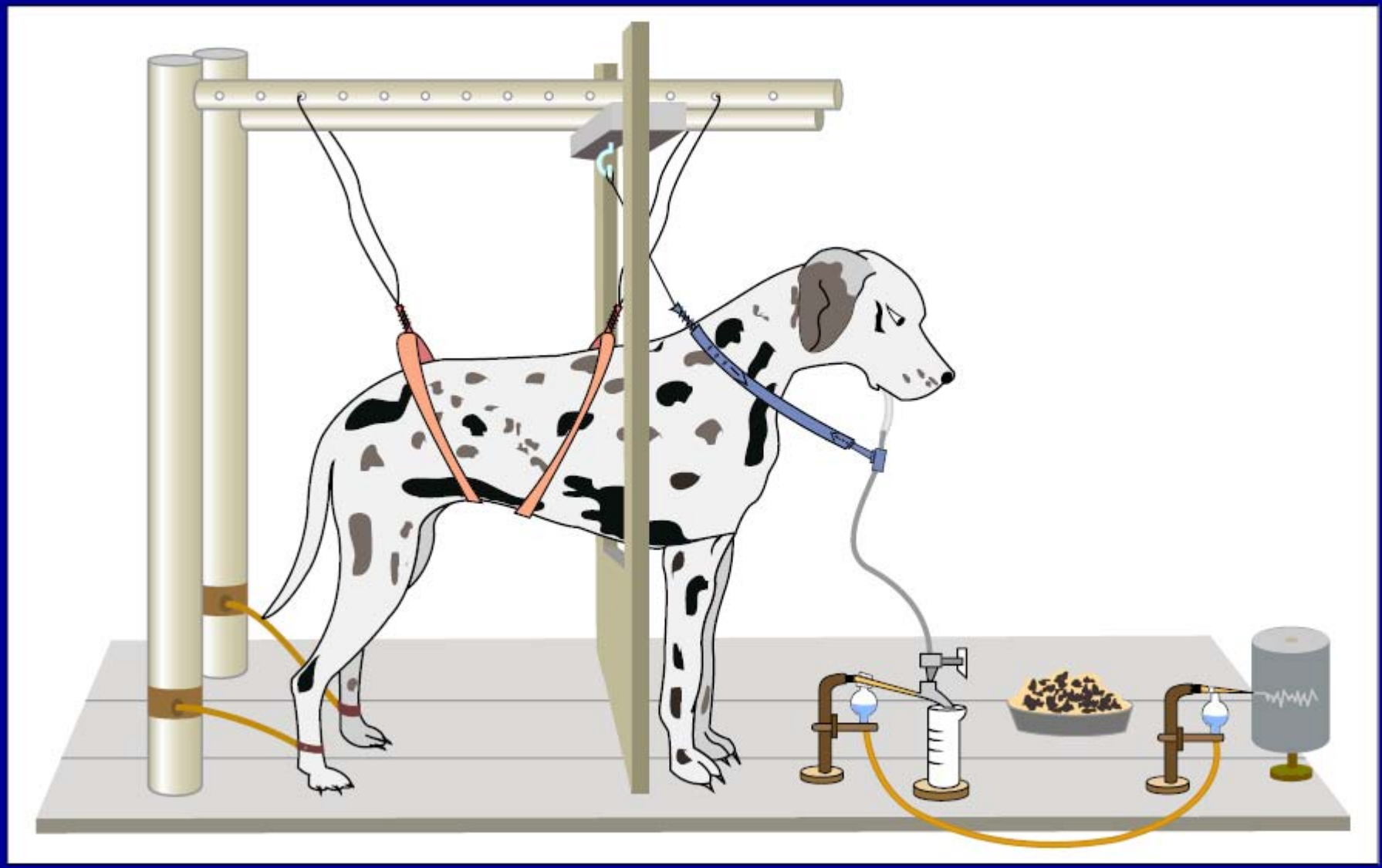
- Nobel Prize for reflexes of digestion - food in mouth provokes specific salivation to prepare for digestion - salivation *reflexes*

"But Professor, there's a revolution going on with shooting in the streets."

"What difference does it make when you've work to do in the laboratory? Next time there's a revolution, get up earlier!“

- cut esophagus so food could not go to stomach
- placed food in dog's mouth, stomach secreted plenty of gastric juice
- sight of food or sight of feeder - psychic secretions or conditioned reflex

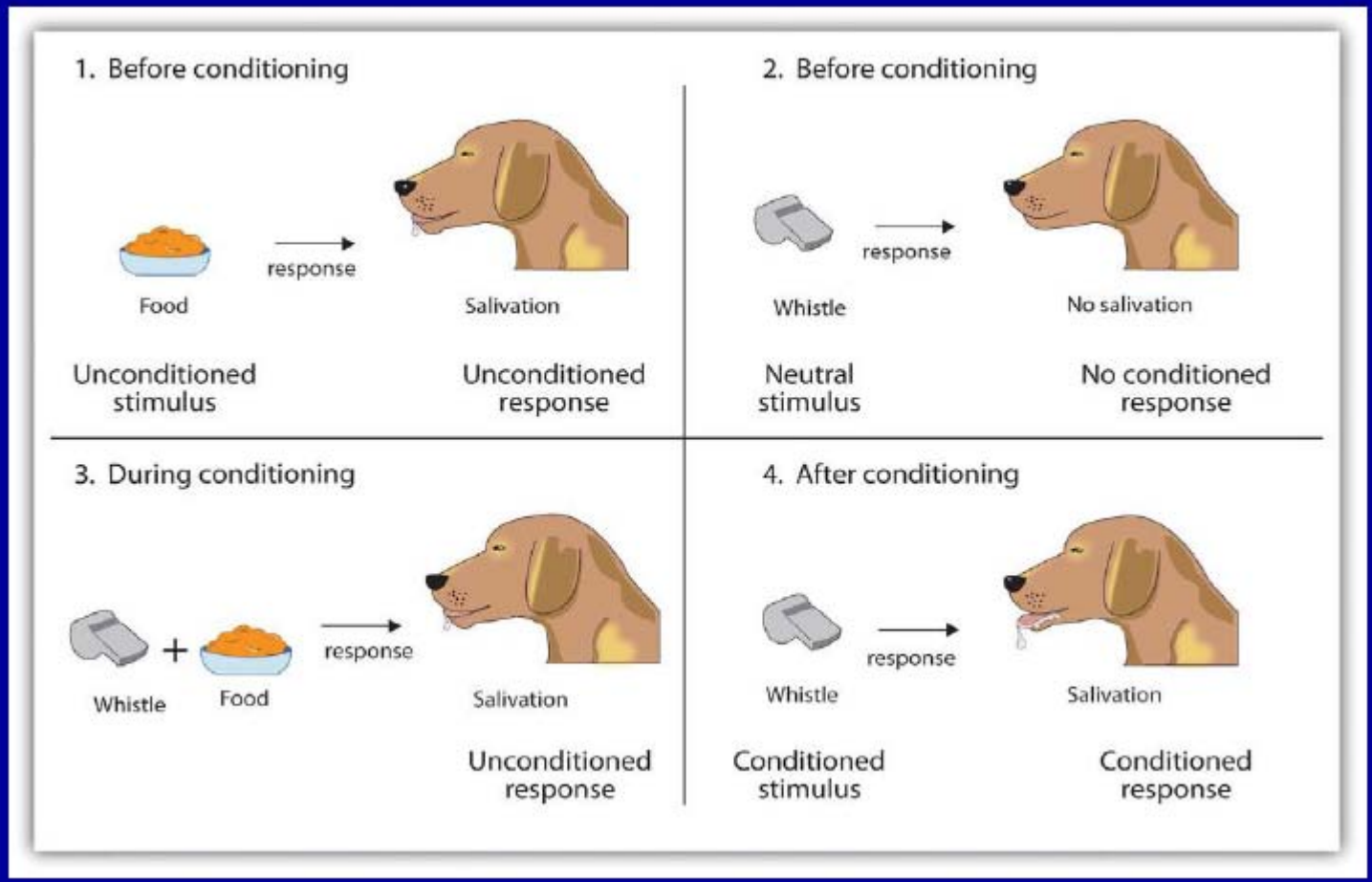
PAVLOVIAN CONDITIONING



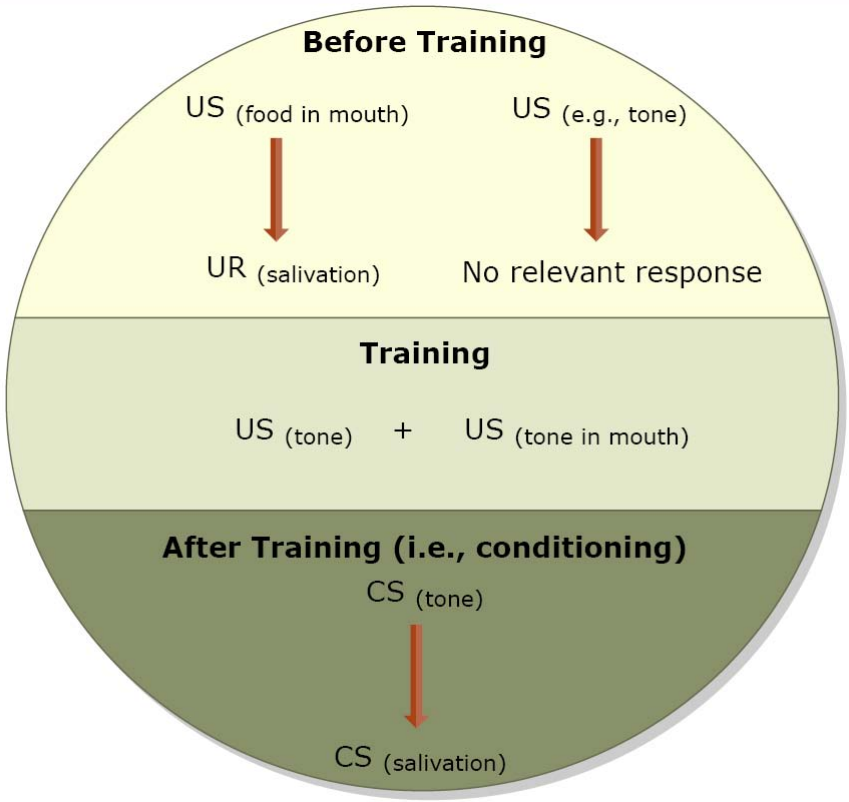
A modification of Pavlov's method

- **Unconditioned Stimulus (UCS) – food**
- **Unconditioned Response (UCR) - salivating (food)**
- **Conditioned Stimulus (CS) – bell**
- **Conditioned Response (CR) – salivating**
- ***new association !!***
  bell (CS) & salivating (CR)
- **law of association by contiguity (Aristotle)**

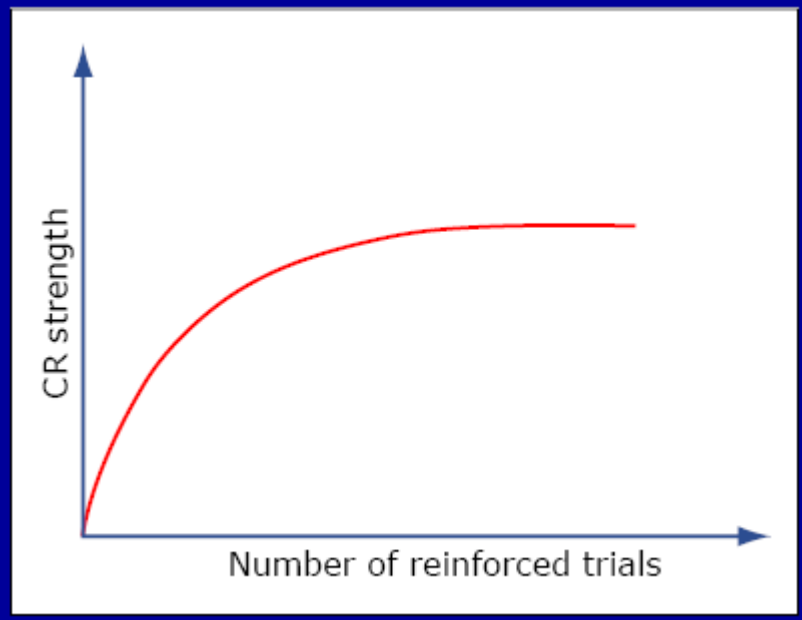
Classically Conditioning a Salivation Response



Source: Stangor, C. *Introduction to Psychology*. Flatworld Knowledge, 2010. Courtesy of Flatworld Knowledge.



The relationship between CS, US, CR, and UR in classical conditioning.



Ivan Pavlov & His Dogs

- http://www.youtube.com/watch?v=hhqumfpxuzI

- **how to predict the *future* on the *basis* of past experience**

  bell---food---salivation
- **to imbue the world with *meaning***

  bell---means that food is near

  (any UCS worked)

Water Demo

- **Unconditioned Stimulus (UCS) - water in face**
- **Unconditioned Response (UCR) - flinching to water**

UCS-UCR association is built-in reflex

- **Conditioned Stimulus (CS) - hearing “CAN”**
- **Conditioned Response (CR) - flinching to “CAN”**
- ***new association !!***

  CAN (CS) & flinching (CR)

Balloon Demo

- **Unconditioned Stimulus (UCS) - balloon noise**
- **Unconditioned Response (UCR) - flinching**

UCS-UCR association is built-in reflex

- **Conditioned Stimulus (CS) - needle touching balloon**
- **Conditioned Response (CR) - flinching to needle**
- ***new association !!***

  needle (CS) & flinching (CR)

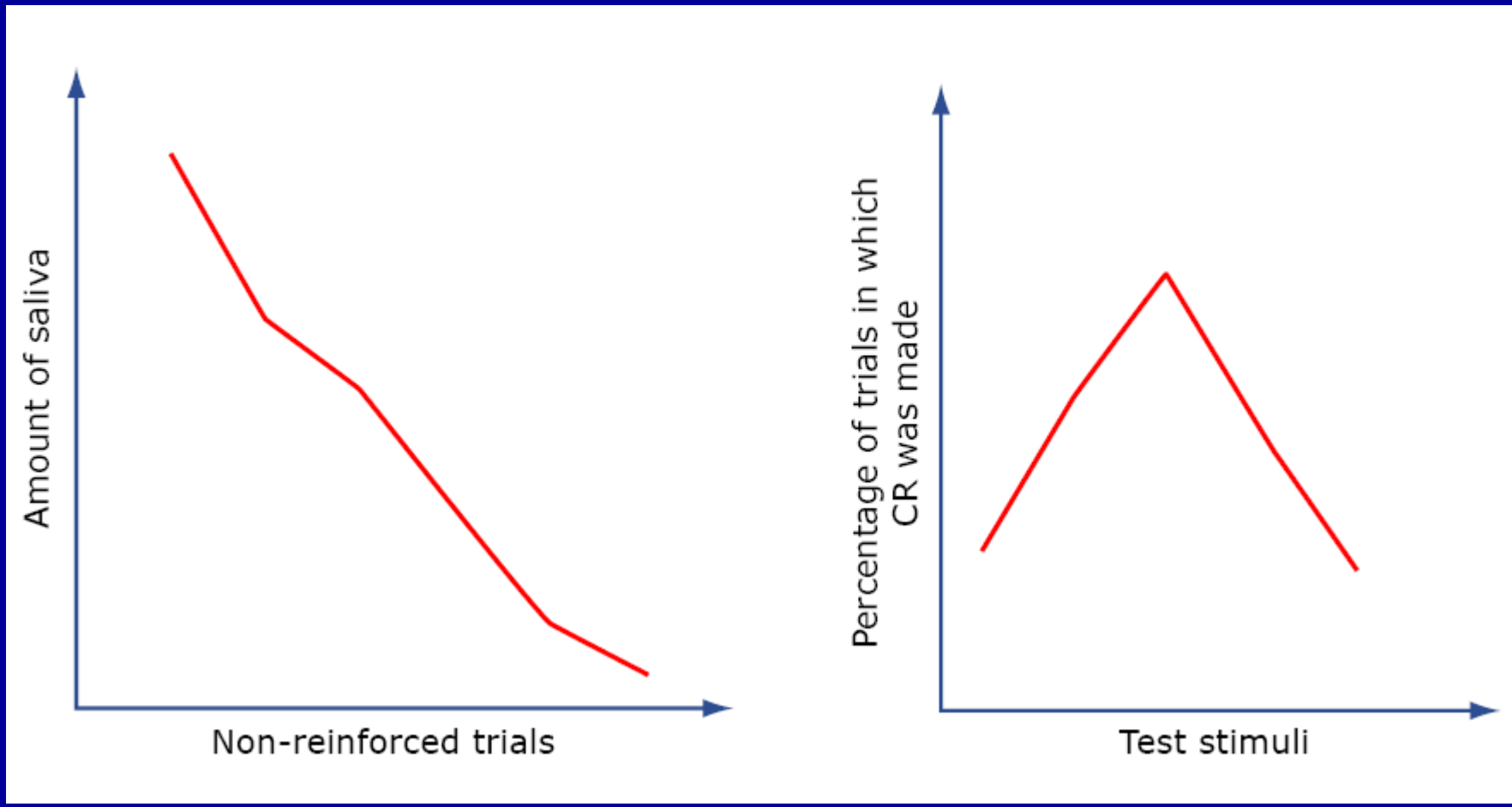
PROPERTIES OF CLASSICAL CONDITIONING

- extinction
- generalization gradient
- discrimination training

  black (CS+) & gray (CS-) squares
- second-order conditioning

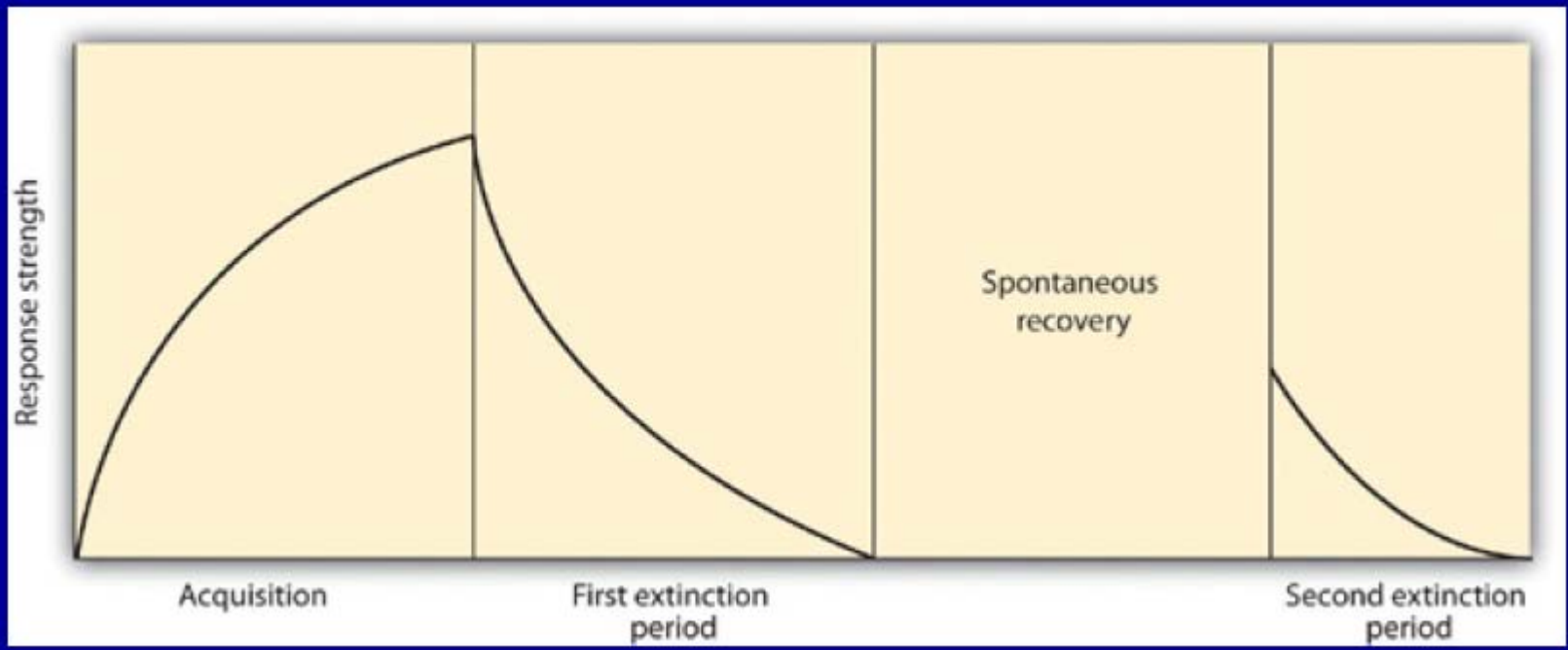
  bell (CS)

  bell (US) & black square (CS)
- is temporal contiguity the basis of classical conditioning?



EXTINCTION **GENERALIZATION**

Acquisition, Extinction, and Spontaneous Recovery in Classical Conditioning



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PROPERTIES OF CLASSICAL CONDITIONING

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  bell (CS)

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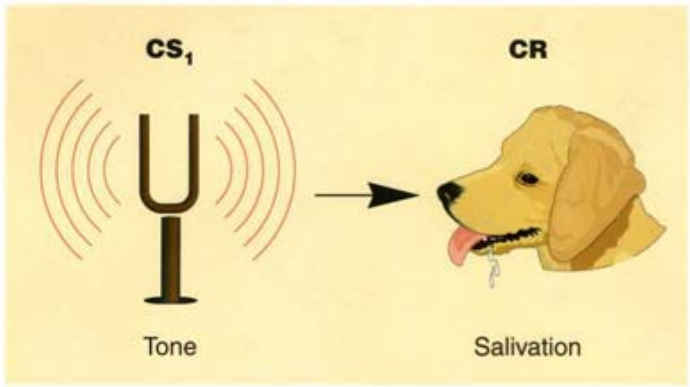
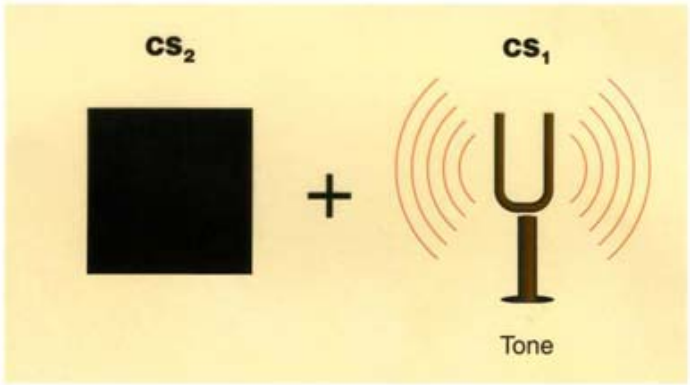
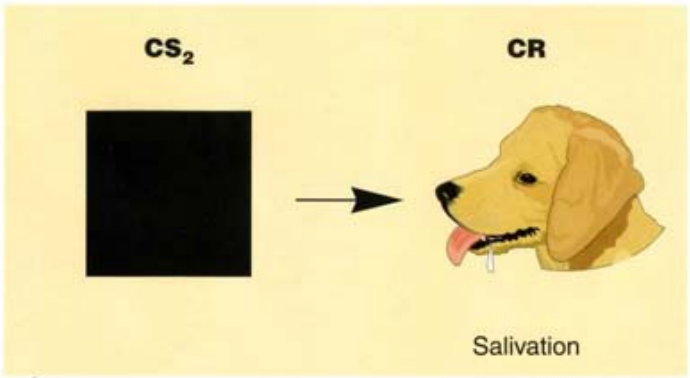
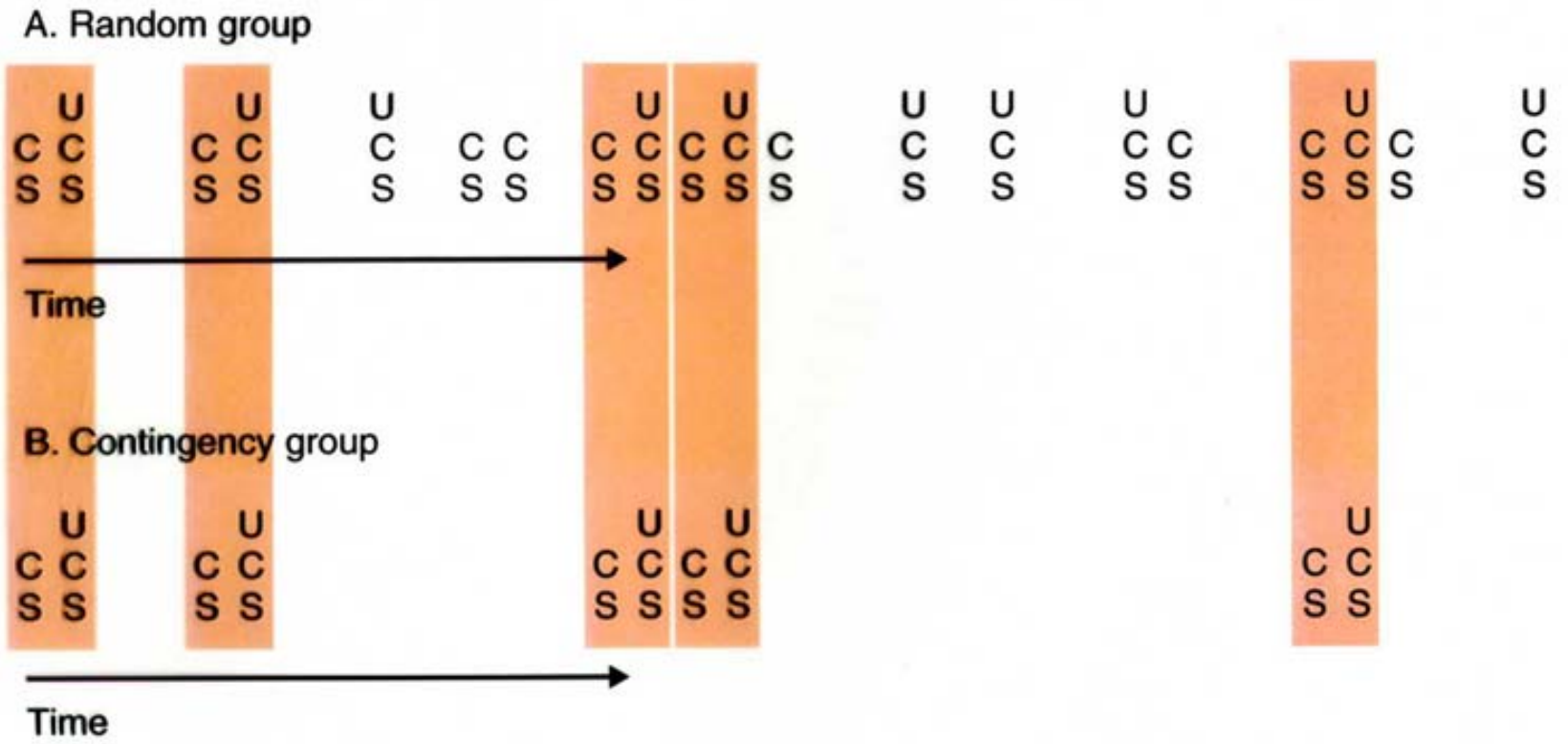
Second Order Conditioning







CONTINGENCY



Rescorla's Procedure for Demonstrating the Importance of Contingency

- **cognitive conditioning: *Blocking***
  contiguity vs. contingency

CS1	CS1 + CS2	CS2
tone (food)	tone + light (food)	light (food)

less conditioning to CS2

	CS1+ CS2	CS2
	tone + light (food)	light (food)

more conditioning to CS2

Demo

- **how to predict the *future* on the *basis* of past experience**

  bell---food---salivation
- **to imbue the world with *meaning***

  bell---means that food is near

  (any UCS worked)

Why do we work hard? (where is the UCS?)

LEARNING

1. Classical Conditioning
2. Operant Conditioning
3. Limits to Conditioning

INSTRUMENTAL/OPERANT CONDITIONING

operate as instruments to produce desired effect

E. L. Thorndike (1898)

puzzle box - cat had to unlatch door by pulling latch - trial and error - fewer errors over time -

where is US?

consequence of response

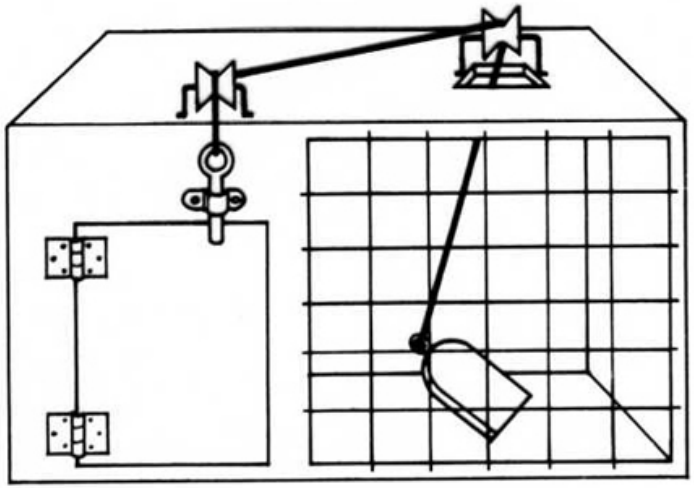
- **Law of Effect**

  consequence of a response determines whether it is strengthened or weakened

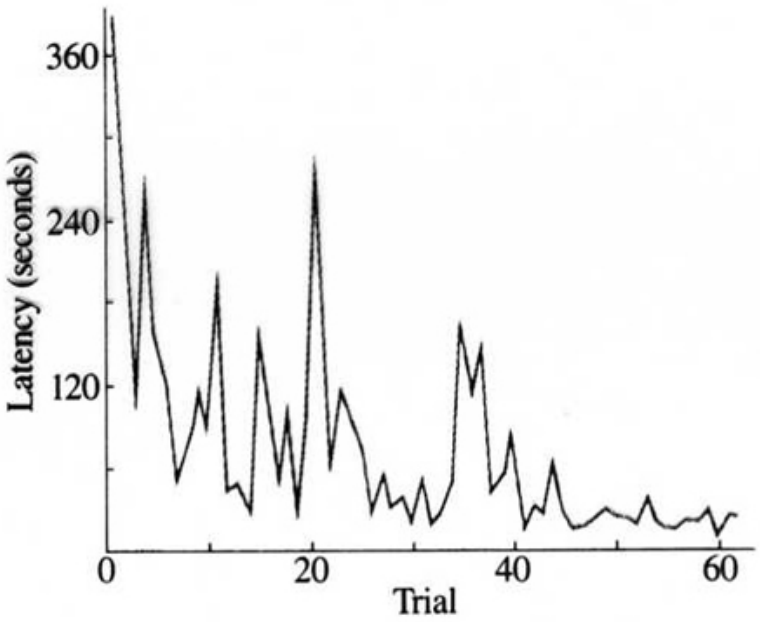
Reward - Strengthened

No Reward - Weakened

Punishment - Very Weakened

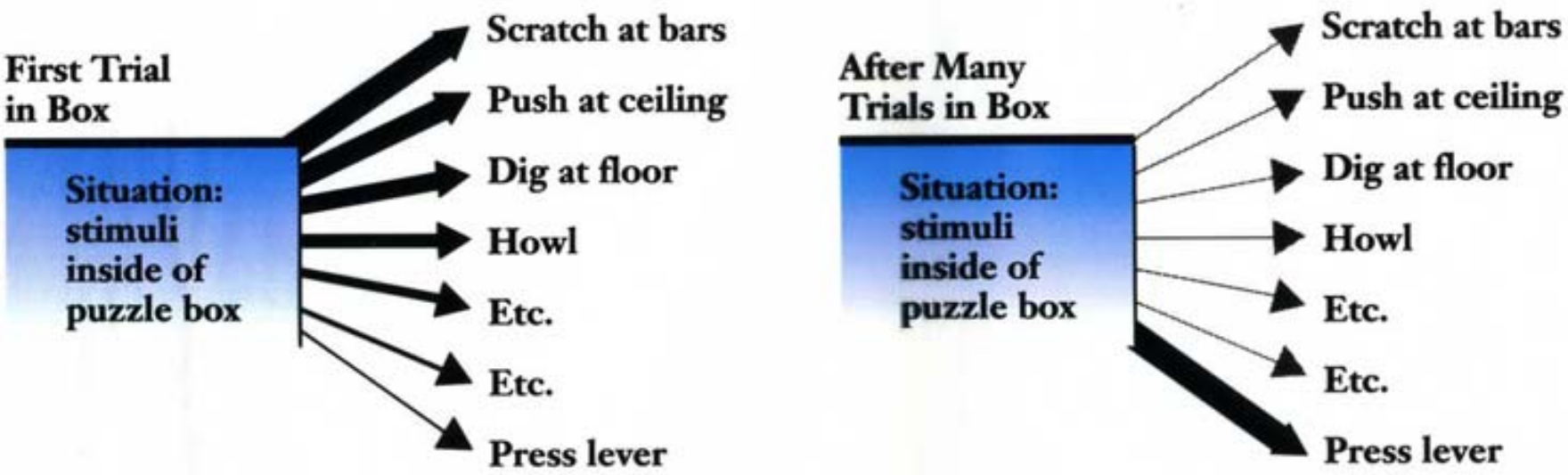


4.9 Puzzle box



4.10 Learning curve of one of Thorndike's cats

Transparency 21
Figure 5.7, page 132
Thorndike's law of effect



consequence of a response determines whether it is strengthened or weakened

John B. Watson (1878-1958)

- University of Chicago/Johns Hopkins
- "mind" unobservable
- *behaviorism*
- study behavior = observable actions, not the mind
- identify environmental conditions
- no fundamental difference between animals and humans
- describe lawful relations between environment-behavior reflexes

STIMULI---------RESPONSES
(environment) (behavior)

Fear Conditioning

Classical Conditioning of a Phobia: Little Albert

http://www.youtube.com/watch?v=0FKZAYt77ZM

B. F. Skinner (1904-1990)

- *consequences* of responses
- operant response is an action that operates on environment to produce some consequence
- *Beyond Freedom and Dignity*
- operant behavior

classical conditioning CS *elicits* CR

instrumental conditioing CRs are *emitted* - CRs = operants

create the CRs

OPERANT CONDITIONING

- novel response?

  successive approximations & shaping

high lever

- click & pellet
- location, click & pellet
- face lever, location, click & pellet
- stretching body upward, face lever, location, click & pellet
- touch lever with paws, stretching body upward, face lever, location, click & pellet
- press high lever, touch lever with paws, stretching body upward, face lever, location, click & pellet

INSTRUMENTAL/OPERANT CONDITIONING

operate as instruments to produce desired effect

- **Law of Effect**

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Reward - Strengthened
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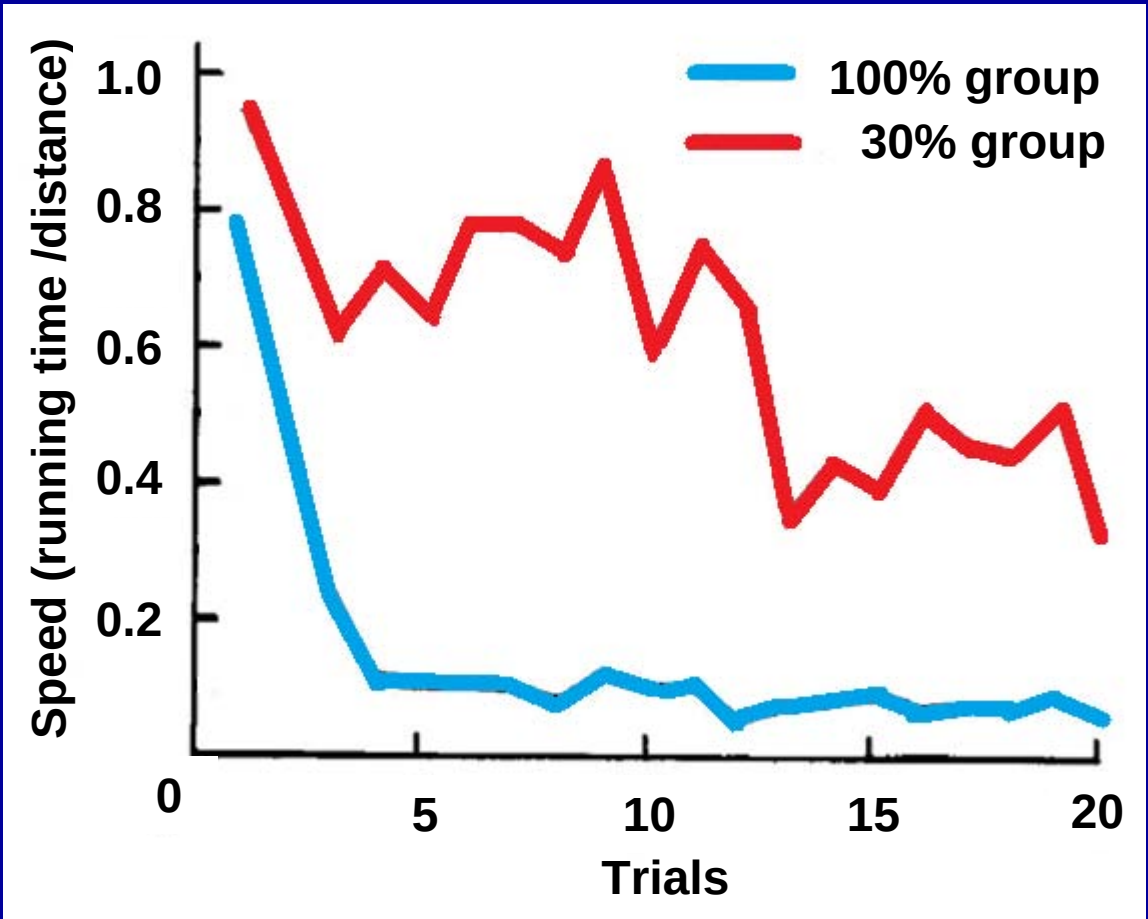
http://www.learner.org/resources/series138.html?pop=yes&pid=1529
11:37

REINFORCEMENT

- Primary Reinforcers
  food, thirst, pain
- Secondary Reinforcers
  money, attention, praise, admission, promotion
- Positive (increase behavior)
- Negative (decrease behavior, escape)
- Punishment
- Partial Reinforcement

Partial-reinforcement effect



More resistant to extinction

LEARNED HELPLESSNESS

Seligman & dogs

Phase 1

Yoked in hammock with shocks:

Group A could stop by pushing panel near nose

Group B could not stop

equal number & duration of shocks

Phase 2

avoidance learning in shuttle box

CS - tone

jump within 10 secs to avoid shocks

Group A - learns

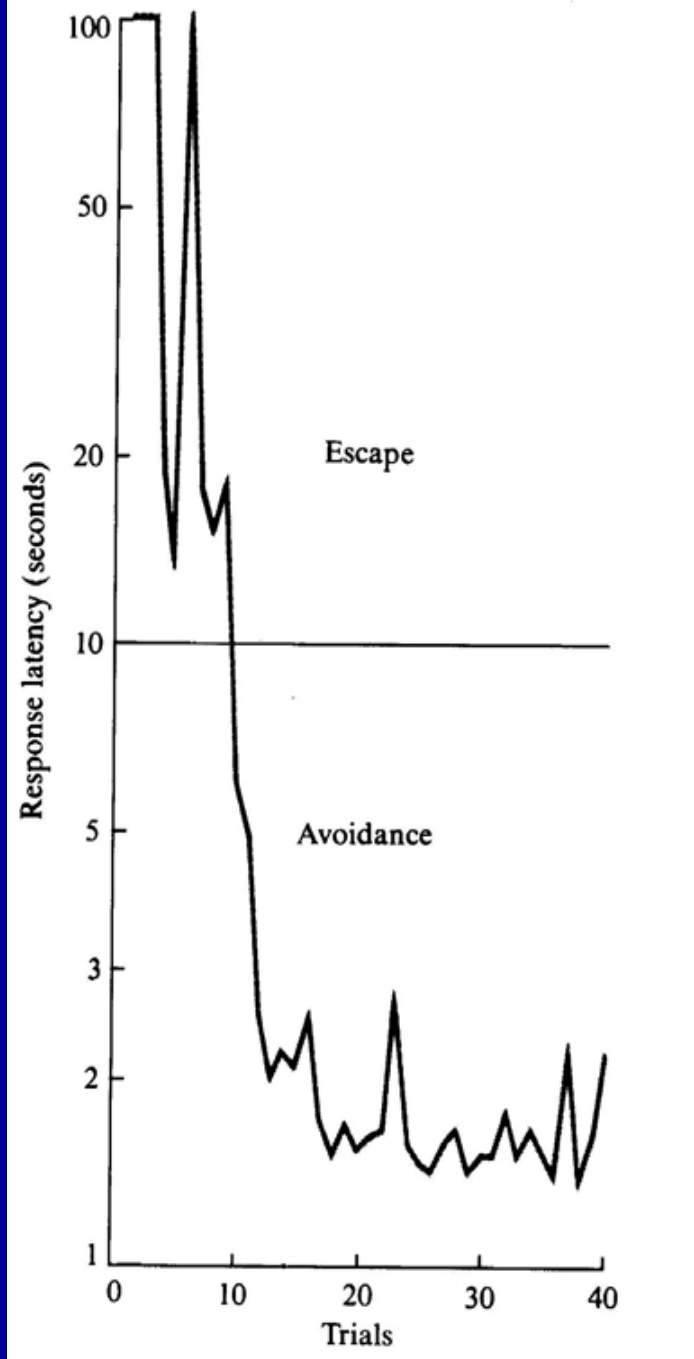
Group B - does not learn

motivational deficits **- slow to initiate known actions**

emotional deficits **- listless, frightened, distress**

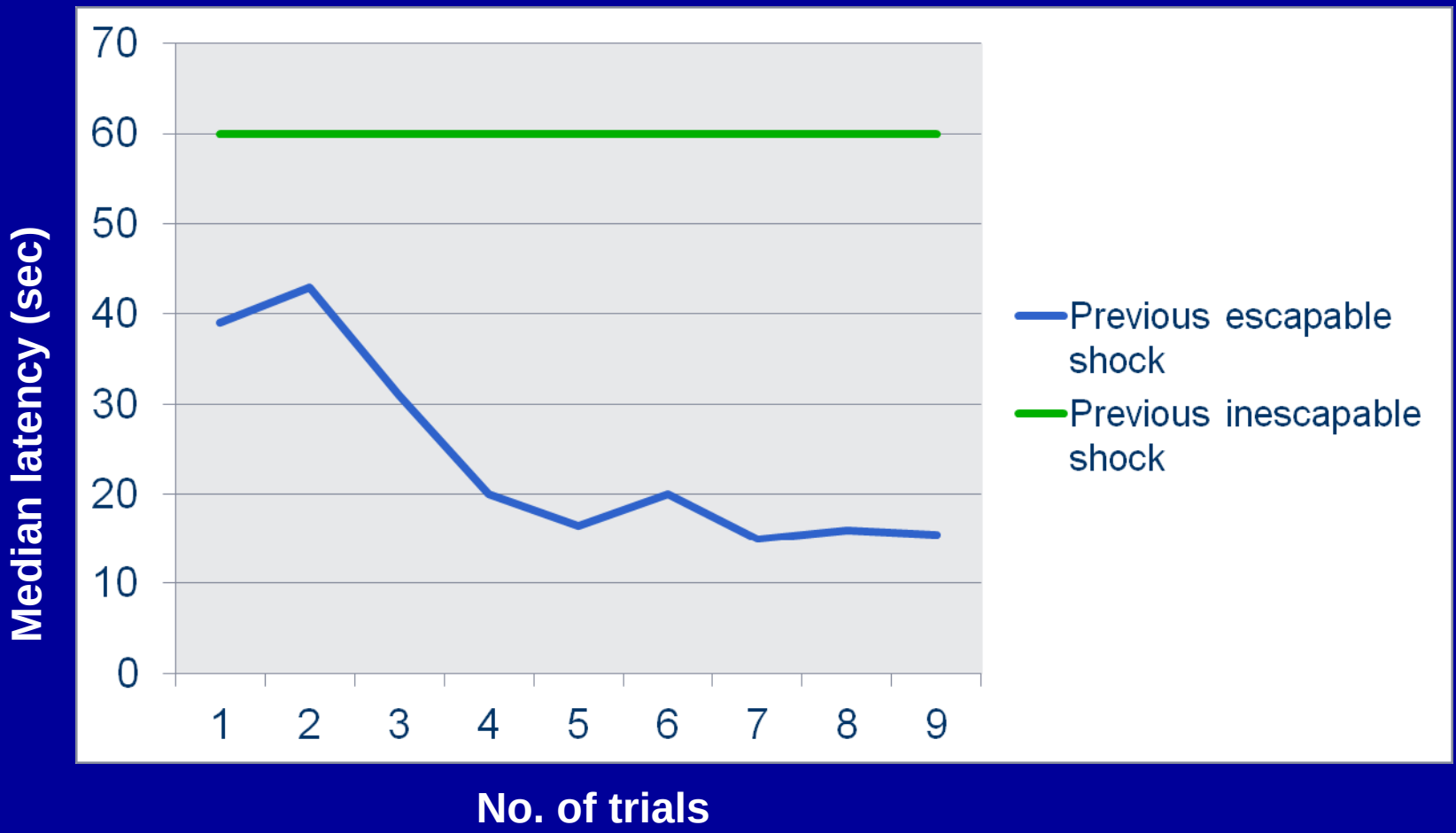
cognitive deficits **- poor learning in new situations**

Avoidance of Shock by Dogs



4.23 The course of avoidance learning in a dog

Learned Helplessness



Depression & People?

how we explain life to ourselves

- internal-external
- global-specific
- stable-unstable

LEARNING

1. Classical Conditioning
2. Operant Conditioning
3. Limits to Conditioning

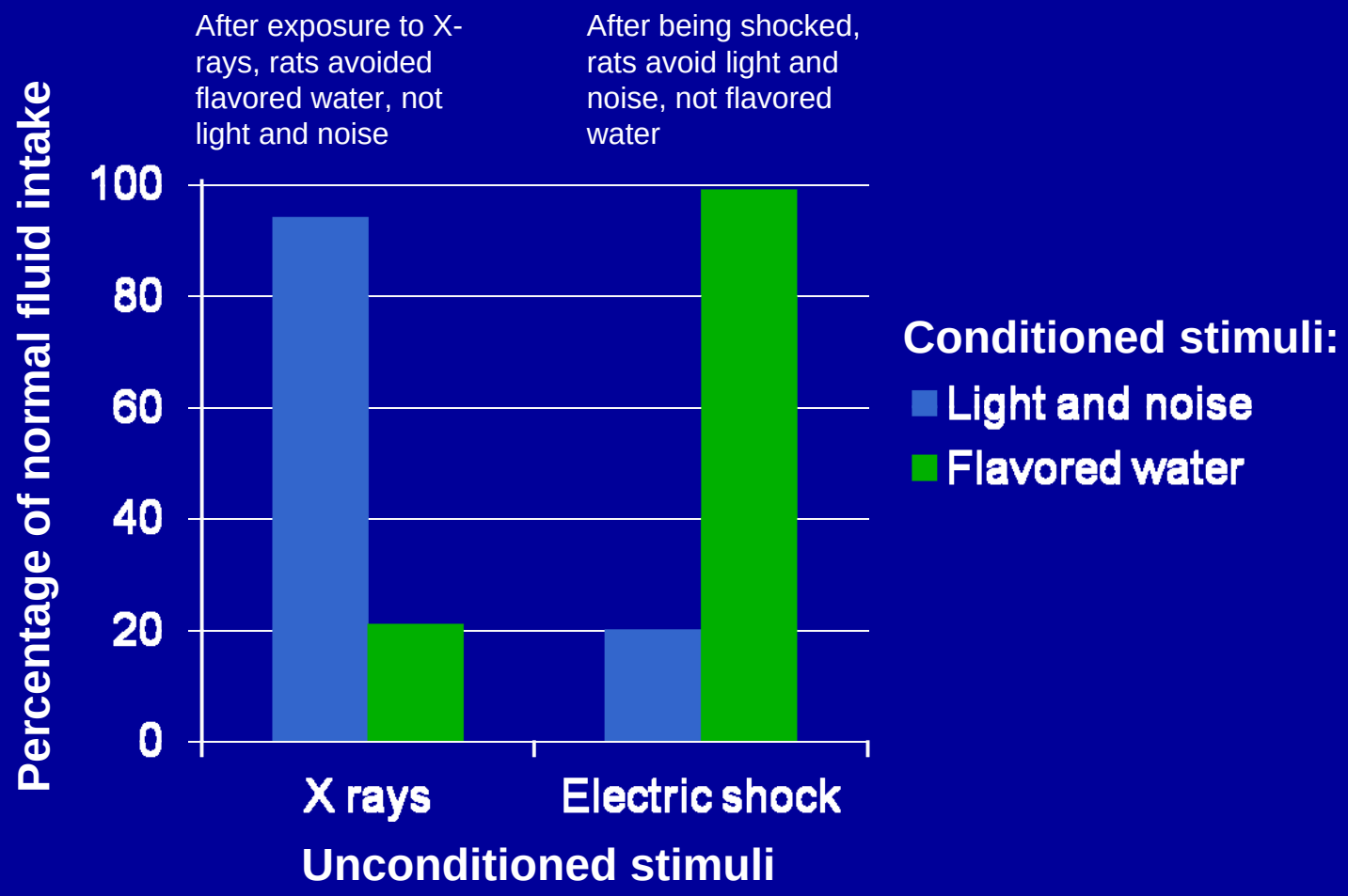
LIMITS TO CONDITIONING

- preparedness
- latent learning
- contingency
- reward value
- delayed gratification
- when reward harms
- language

Results of Garcia and Koelling's Experiment - Taste Aversion

Type of Aversive Stimulus		
Type of Water	**Received Shock**	**Received X-ray/lithium chloride**
		
Bright-noisy water 	Avoided bright-noisy water, but not sweet water	No evidence of classical conditioning
Sweet water 	No evidence of classical conditioning	Avoided sweet water, but not bright-noisy water

Characteristics of the Conditioned Stimulus and the Unconditioned Stimulus Affect the Acquisition of the Conditioned Response



Preparedness

Picture - CS

snakes/spiders or flowers/mushrooms

Shock - US

UR - GSR (sweat)

Better conditioning for snakes/spiders

Preparedness

Little Albert Study

rat - worked

wooden block, piece of cloth

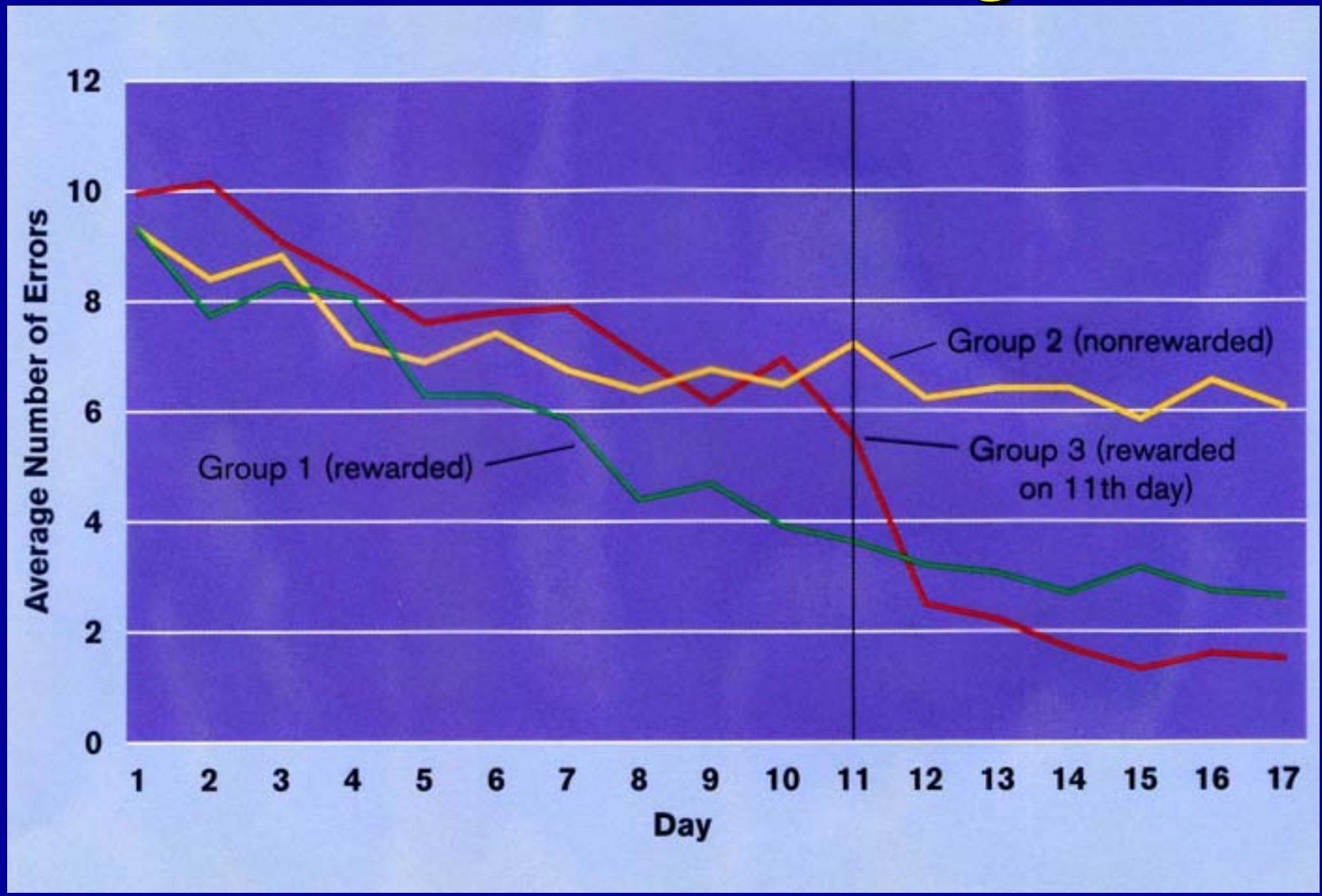
did not work

LATENT LEARNING

3 groups of rats in goal maze

- food reward every day
- no rewards
- no rewards for 10 days; then reward

Latent Learning



Tolman & Honzik (1930)

CONTINGENCY

- 2-month-old infant/crib/color mobile
- moving head, switch in pillow/smile & coo
- second group/no control/no smile, no coo despite equal number of mobile turns

Reward Value

- negative contrast

What happens when you switch to a worse reward?

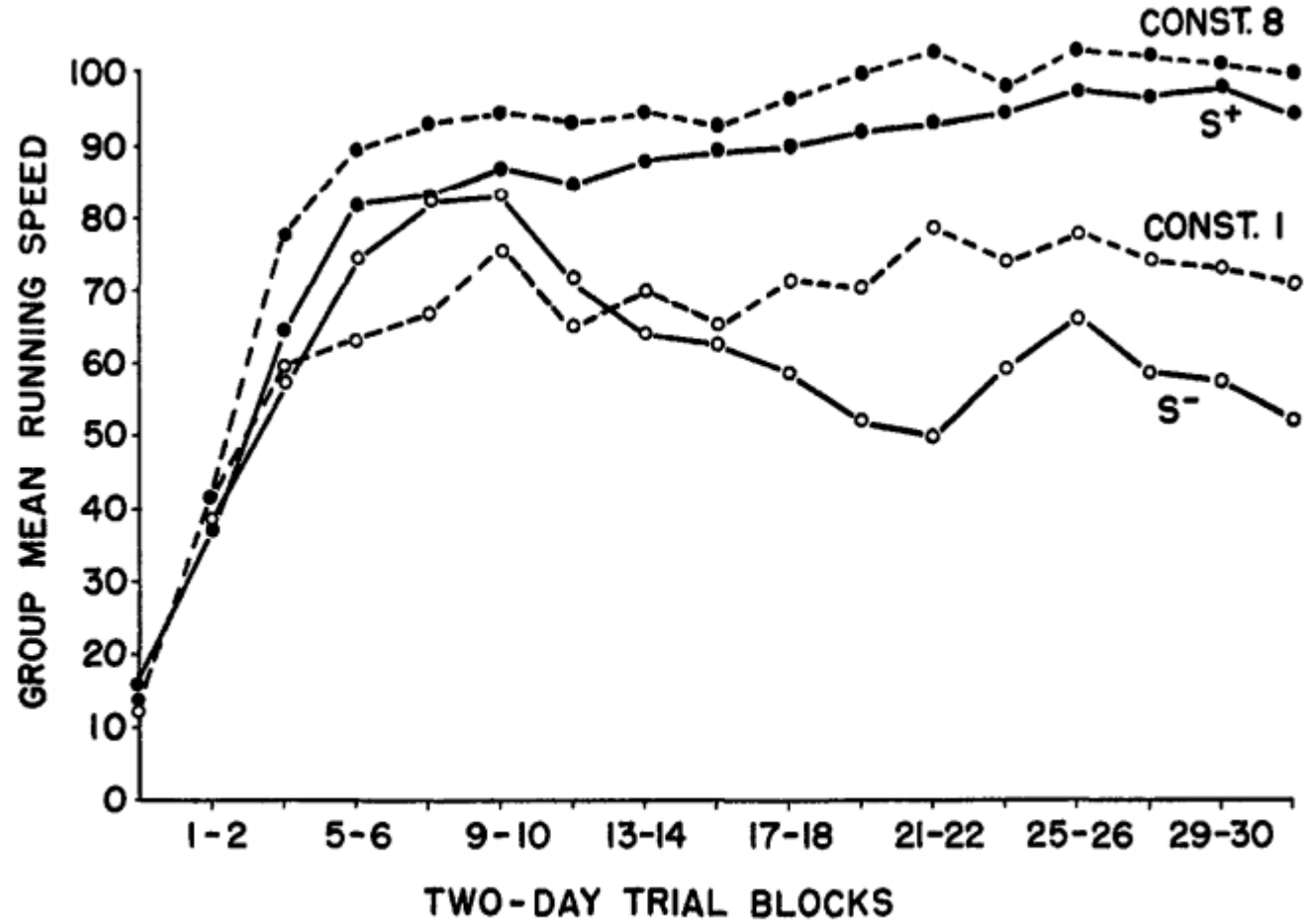


FIG. 1. Group average running speed plotted in blocks of two days. (The dashed curves represent performance of the Constant reward control groups; the solid curves represent performance of the Contrast group in S^+ and in S^-.)

DELAYED GRATIFICATION

- 4-5 year-old children – 653 children of faculty and graduate students
- two snacks

  one or two marshmellows
- wait 15 minutes to get two – 30% waited 15 minutes
- correlated 10 years later with behavioral problems, academic and social success (210 SAT points for 30 sec vs. 15 min delay)

WHEN REWARDS HARM

rat & running wheel

run for fun

run for food - no longer will run for fun

preschoolers draw for fun

gold stars (conditioned reinforcer)

no gold stars, no drawing

Is Language Learning A Conditioned Skill?

- 1 month - switch inside rubber nipple - hooked to tape recorder - when baby sucks, tape plays - *ba ba ba* vs. *pa pa pa* - may not be in their own language (Kikuyu/Spanish) and which their parents may be unable to distinguish (Czech, Hindi, Inslekampx)
- at 4 days, a French baby prefers French to Russian, Italian, backwards French
- correction/reinforcement?

  2-year-old: "Mamma isn't boy, he a girl."

  Mother" "That's right."
- generative - sentences are produced that are unique
- everybody learns it without training
- overgeneralizing - "My teacher holded the rabbit."

9.00SC Introduction to Psychology
Fall 2011