

A Cognitive View of Learning

Lecture 10

Cognition and Conditioning

- Conditioning Occurs When the US Surprises the Organism
- Conditioning Accrues to CSs that Provide Information About the US
- In Classical Conditioning, the Organism Learns to Predict Environmental Events
- What about *Instrumental* Conditioning?

Two-Factor Theory of Avoidance Learning

Mowrer (1947)

- Tone CS \implies Shock US
 - Respond During Shock \implies Escape
 - Respond Prior to Shock \implies Avoidance
- Classical Conditioning
 - Fear Conditioned to Tone
- Instrumental Conditioning
 - Escape Reinforced by Offset of Shock
 - Reduction in Pain
 - Avoidance Reinforced by Offset of Tone
 - Reduction in Fear



Learned Helplessness

e.g., Seligman & Maier (1967); Seligman, Maier, & Solomon (1971)

- Prior Fear Conditioning Should Facilitate Avoidance Learning
 - Organism Already Fears CS
 - Only Has to Learn Avoidance Response
- Phase 1: Condition Fear to Tone
- Phase 2: Avoidance Learning
- But Prior Fear Conditioning *Retards* Acquisition of Avoidance Response



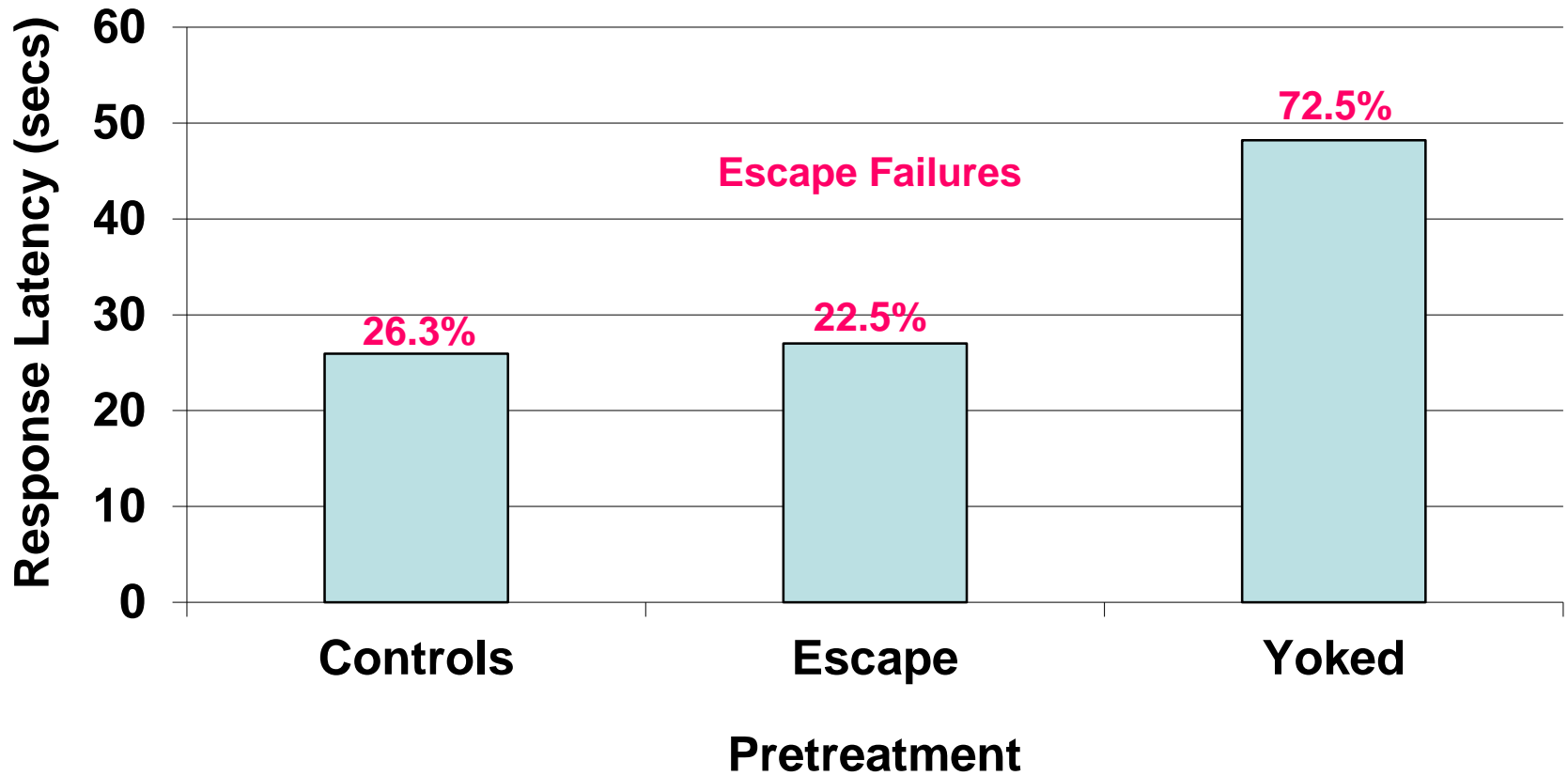
Escapable vs. Inescapable Shock

Seligman & Maier (1967)

- Avoidance Learning in Shuttlebox
- Pretreatment: 64 Signalled Shocks
 - Escape Shock by Pressing Paddle with Snout
 - Yoked Controls
 - Receive Same Amount of Shock as Escape Group
 - No Experience of Control Over Shock
 - Standard Controls
 - Receive No Shocks

Learned Helplessness

Seligman & Maier (1967)



Controllability and Instrumental Conditioning



- Learned Helplessness
 - Shock is Inescapable, Unavoidable
 - Negative Expectations of *Control*
 - Generalize to New Learning Environment
- Instrumental Conditioning
 - Organism Learning to Control Environment
- Develops Expectations Concerning Control

Prediction, Control, and Conditioning

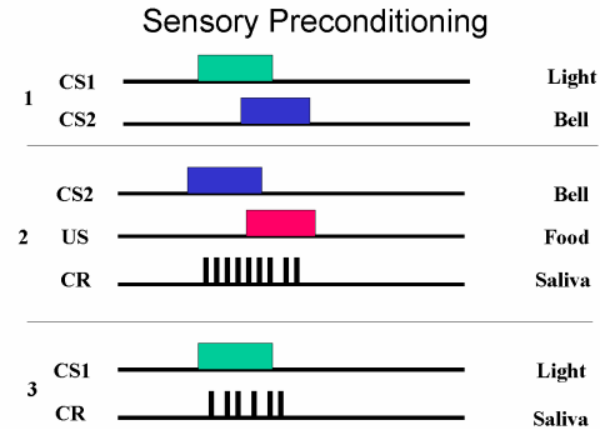
- Classical Conditioning
 - Learning to Predict Environmental Events
 - Conditional Probability: $p(\text{Event} \mid \text{Signal})$
- Instrumental Conditioning
 - Learning to Control Environmental Events
 - Conditional Probability: $p(\text{Event} \mid \text{Behavior})$

Role of Reinforcement in Learning

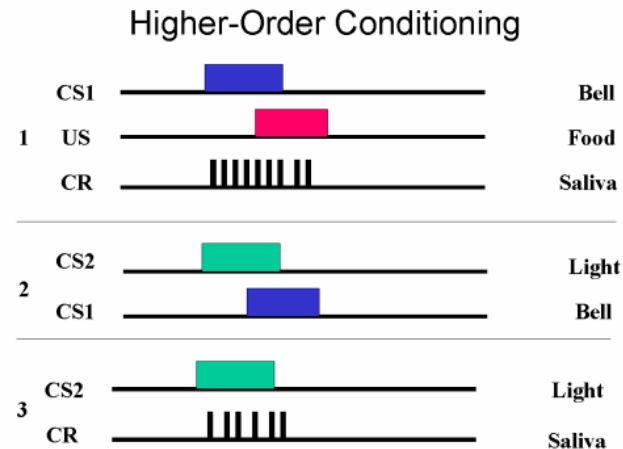
- Corollary to S-R Learning Theory
 - Conditioned Response
 - Reinforced in Presence of Conditioned Stimulus
- Classical Conditioning
 - CS Reinforced by Experience of US
- Instrumental Conditioning
 - CR to CS Reinforced by Reward
 - Yields Thorndike's Law of Effect
 - Skinner: Reinforcement is Any Stimulus that Increases the Probability of the Conditioned Response to the CS

Classical Conditioning in the Absence of Reinforcement

- Sensory Preconditioning
 - CS1 → CS2
 - CS1 Predicts US by Transitivity

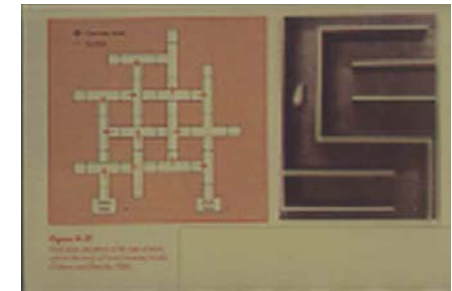
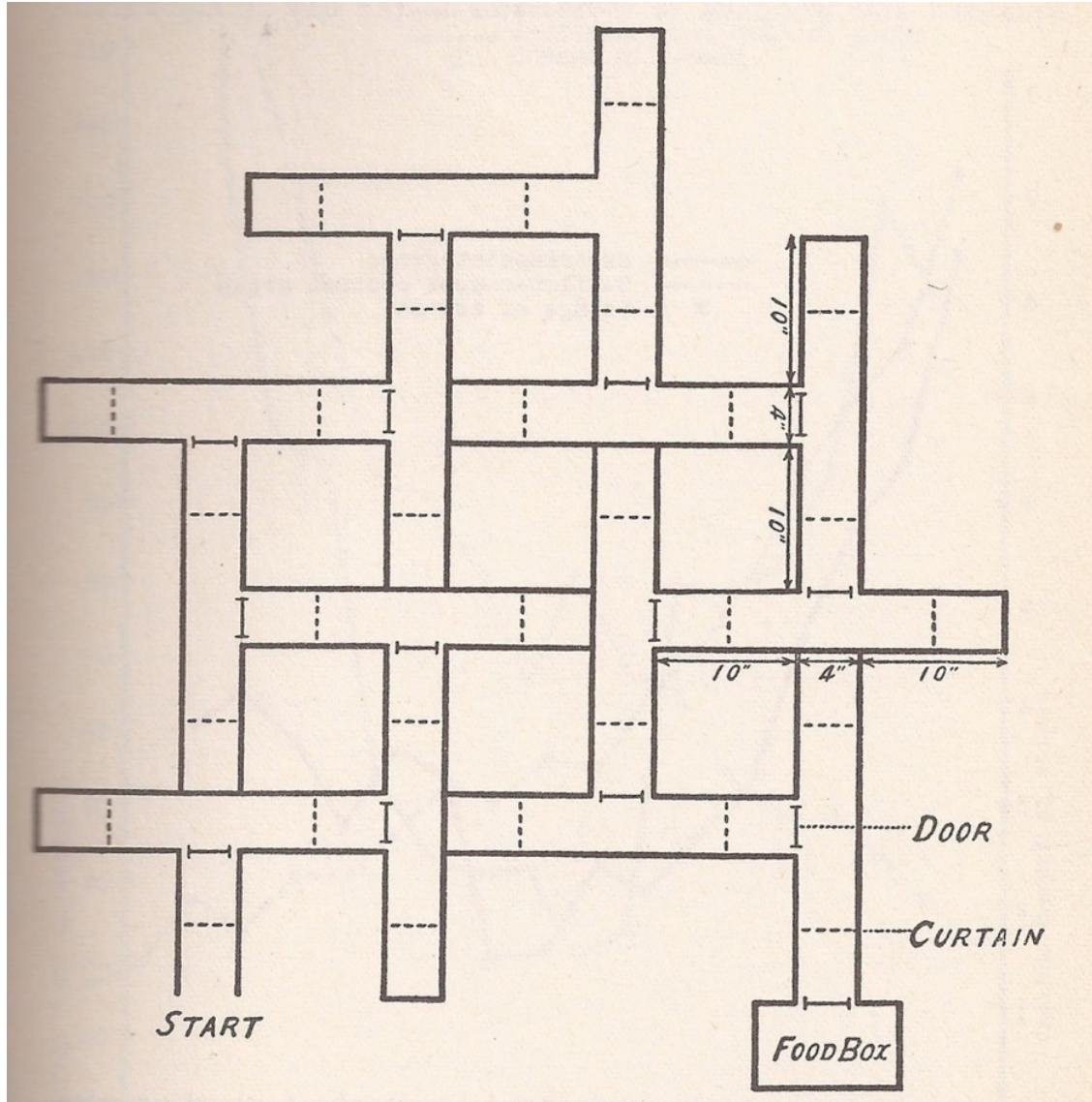


- Higher-Order Conditioning
 - CS2 → CS1
 - CS2 Predicts US by Transitivity



Maze Learning in Rats

Tolman & Honzik (1930); Tolman (1932)



Latent Learning

Tolman & Honzik (1930)

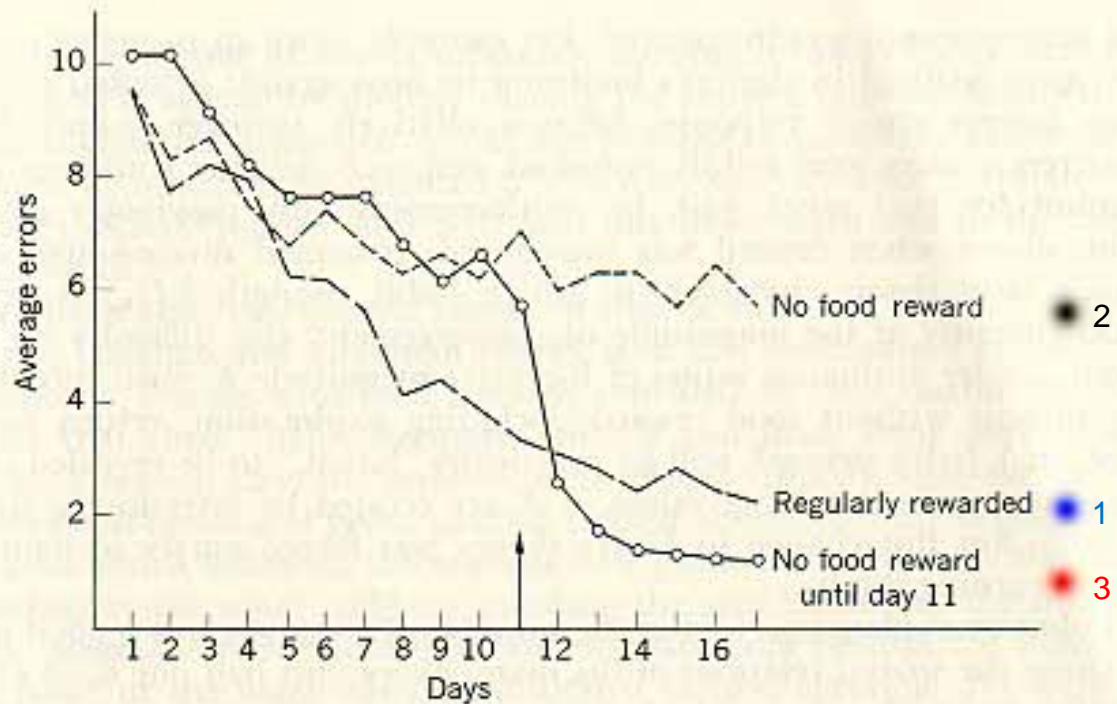


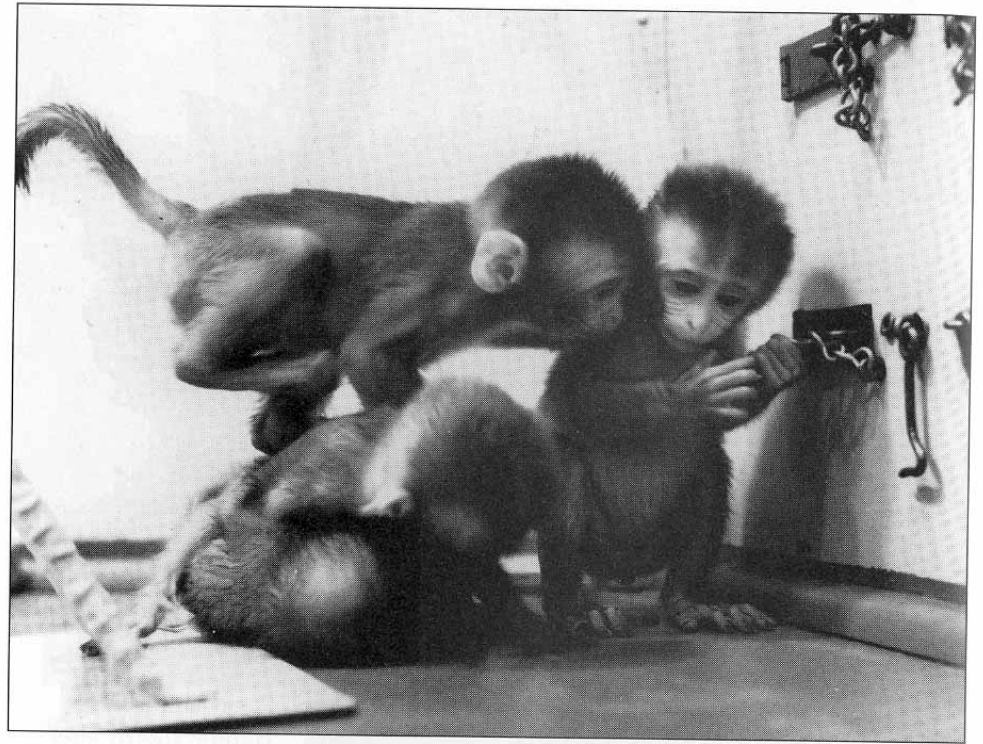
Figure 5.3. Evidence for latent learning in the maze. With no food reward there is some reduction in errors, but not as great a reduction as with regular food reward. Despite the higher error scores prior to the introduction of food, the group rewarded only from the eleventh trial immediately begins to do as well as the group that had been regularly rewarded. The interpretation is that some learning went on within the first ten trials which did not show in performance until the food incentive activated it. (From Tolman & Honzik, 1930b. Originally published by the University of California Press; reprinted by permission of The Regents of the University of California.)

Hilgard &
Bower

Curiosity in Rhesus Monkeys

Harlow (1953); Harlow et al. (1956)

- “Puzzle Lock”
- Food Reward
- Hunger
- Intrinsic vs. Extrinsic Motivation



Three young rhesus macaques puzzle their way toward opening a lock during a curiosity experiment at the Harlow laboratory. *Photo courtesy of the Harlow Primate Laboratory, University of Wisconsin-Madison*



What is Learned in Learning?

- *Not* Associations between Stimuli, Responses
- Expectations
 - Outcomes of Events
 - Outcomes of Behaviors
- Classical Conditioning
 - Predictability of Environmental Events
- Instrumental Conditioning
 - Controllability of Environmental Events

Cognitive Reinterpretation of Learning

- Relatively Permanent...
- Change in Behavior **Knowledge**...
 - Predictability
 - Controllability
- Resulting from Experience.
 - Not Drugs
 - Not Injury
 - Not Maturation

Observational Learning

- Direct versus Vicarious Experience
 - Conditioned Stimuli
 - Unconditioned Stimuli
 - Reinforcements

Observational Fear Conditioning

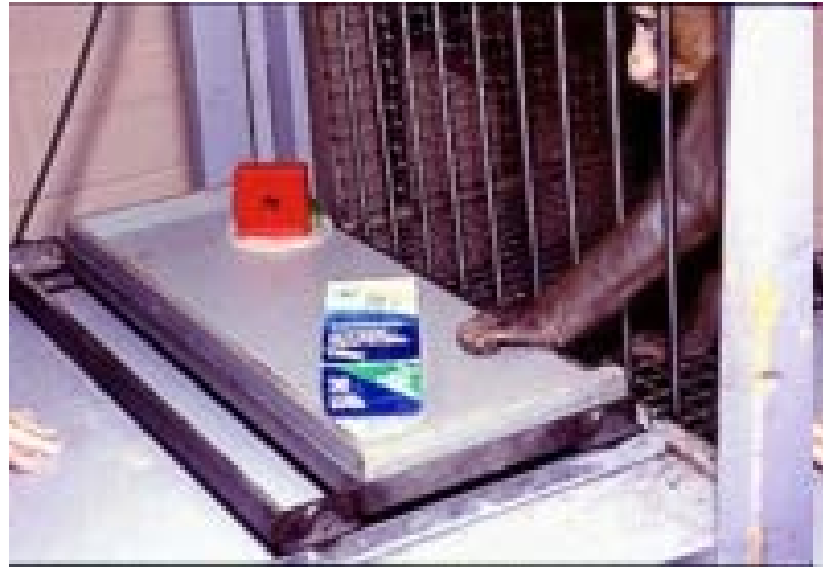
Mineka et al. (1984)



- Snake Fear in Rhesus Monkeys
 - It's Adaptive: But Is It Innate?
- Wild-Reared vs. Lab-Reared
 - Snake Fear Not Innate
- What Role for Direct Experience?
 - Snake Fear Not Acquired Directly
- Adaptive Value of Vicarious Learning
 - Vicarious Learning of Human Fears, Phobias

Test of Snake Fear

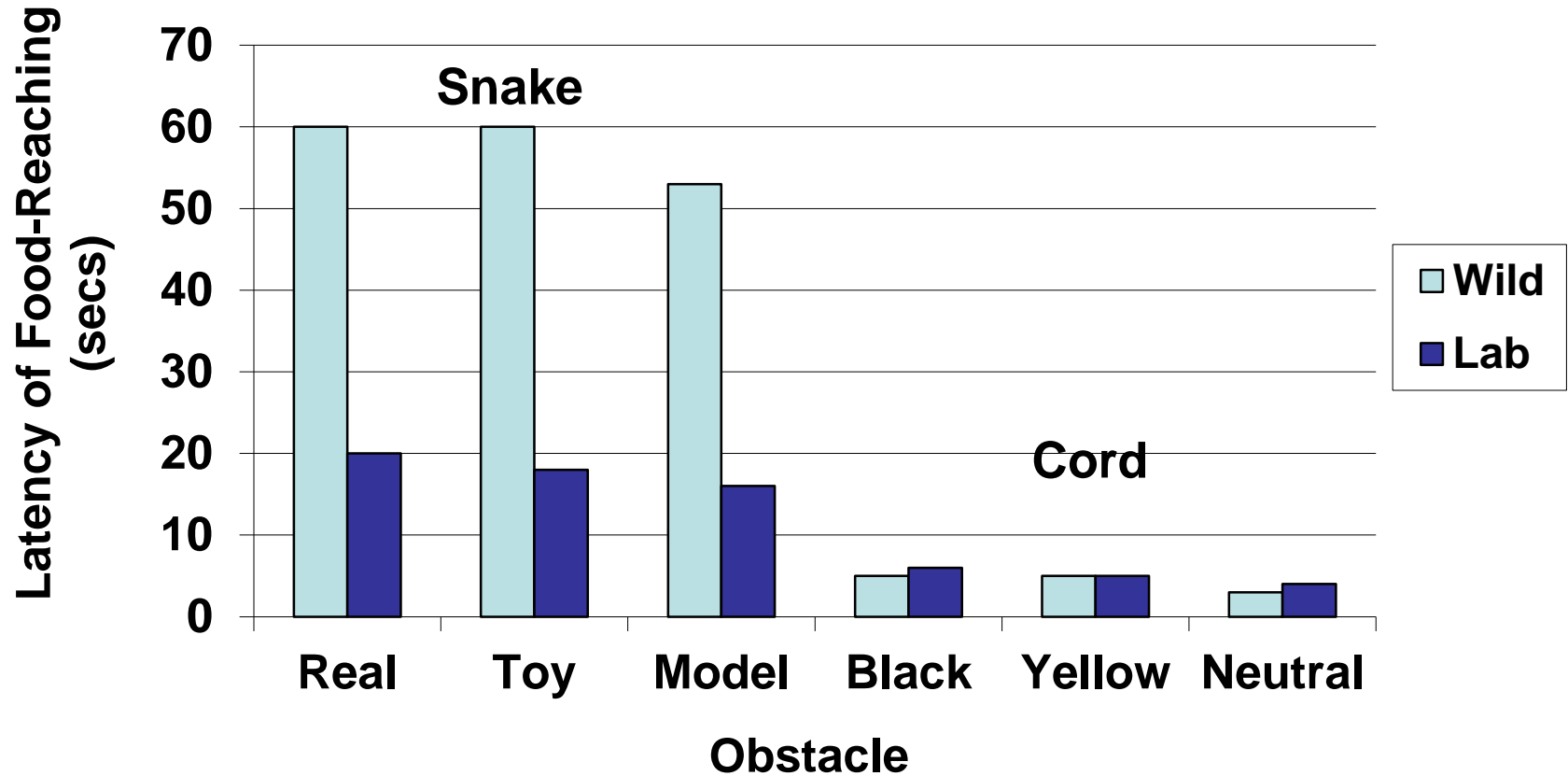
- Wisconsin General Test Apparatus
- Obstacle Between Animal and Food Reward
 - Must Reach Past Object to Obtain Food



- Measure of Fear
 - Latency to Reach Past Object

Pretest of Snake Fear in Rhesus Monkeys

Mineka et al. (1984)



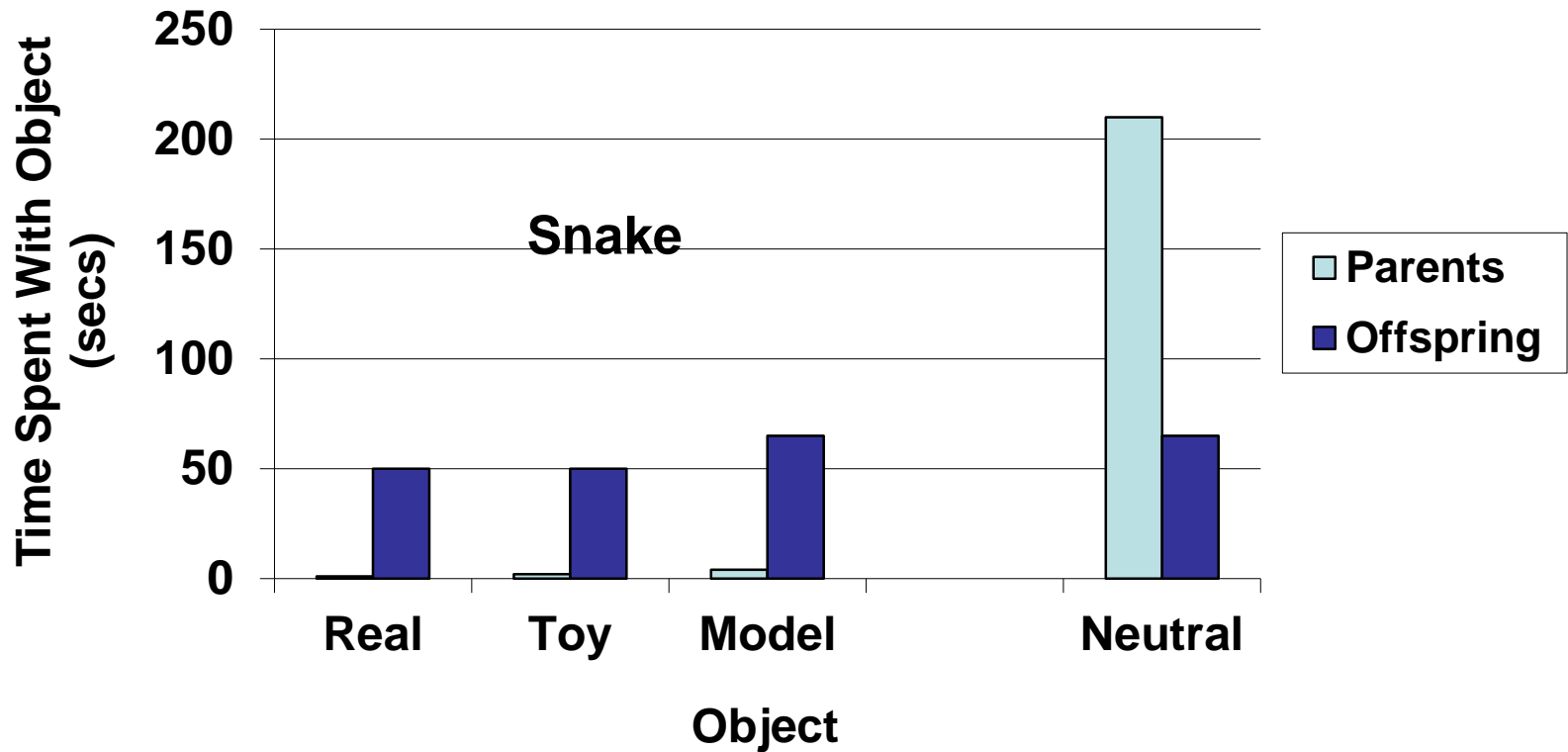
Vicarious Conditioning of Snake Fear

Mineka et al. (1984)

- Wild-Reared Adults
 - Already Afraid of Snakes
- Lab-Reared Adolescent Offspring
 - No Snake Fear
- Posttest After Observing Parent

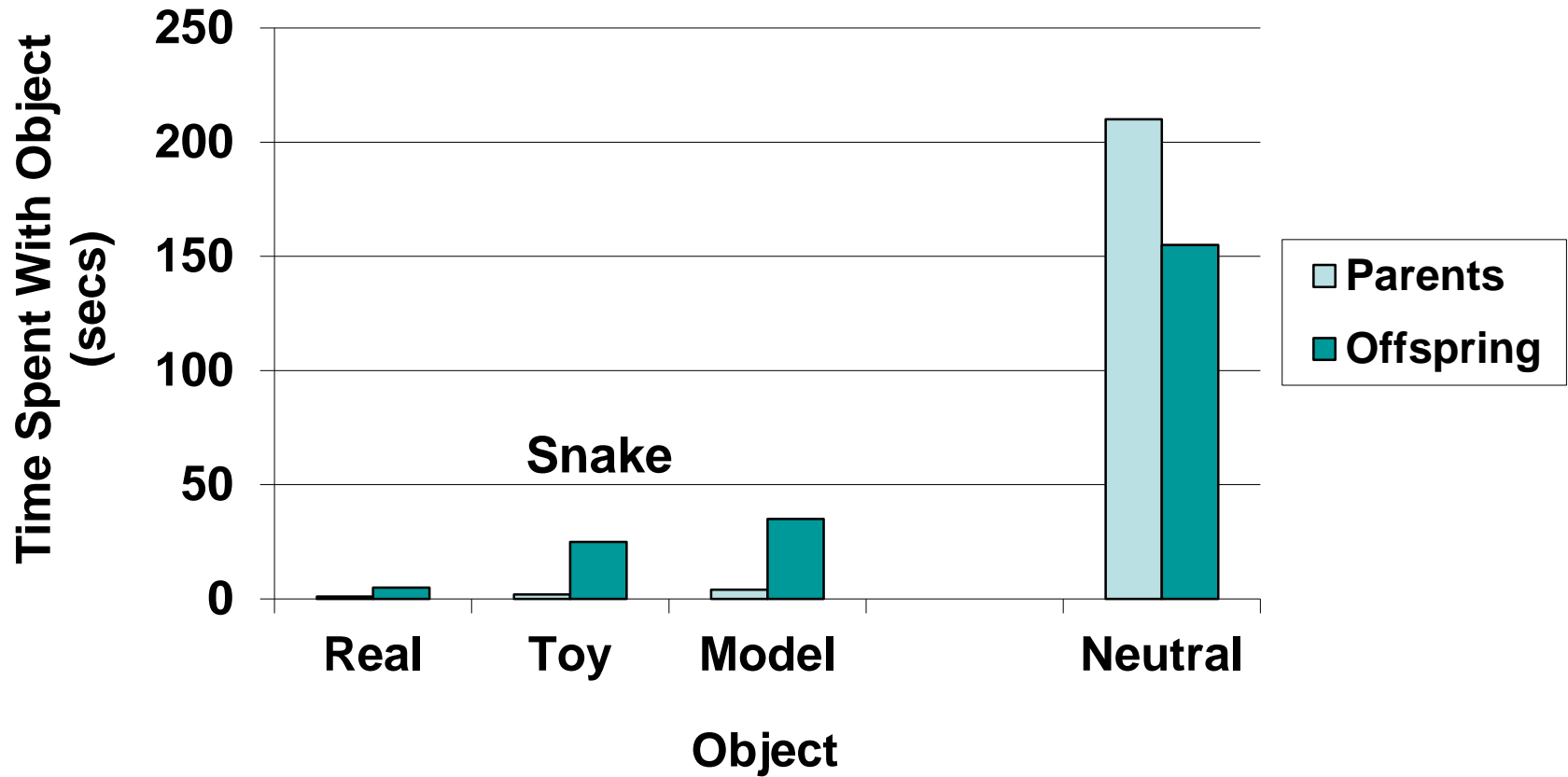
Snake Fear in Rhesus Monkeys Prior to Vicarious Exposure

Mineka et al. (1984)



Snake Fear in Rhesus Monkeys After Vicarious Exposure

Mineka et al. (1984)



Variants on Observational Learning

- Unrelated Adult as Model
- Immunization through Extensive Prior Exposure to Snakes
- Snake vs. Flower
 - Mirrors, Video to Control Exposure
 - Model Sees Snake
 - Observer Sees Snake or Flower

Examples of Observational Learning by Animals in the Wild

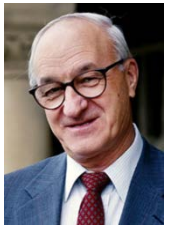
- Chickadees and Milk Bottles
- Red Squirrels and Hickory Nuts
- Israeli Roof Rats and Pine Cones
- Chimpanzees and Panda Nuts



Scientific American

The “Bobo Doll” Experiment

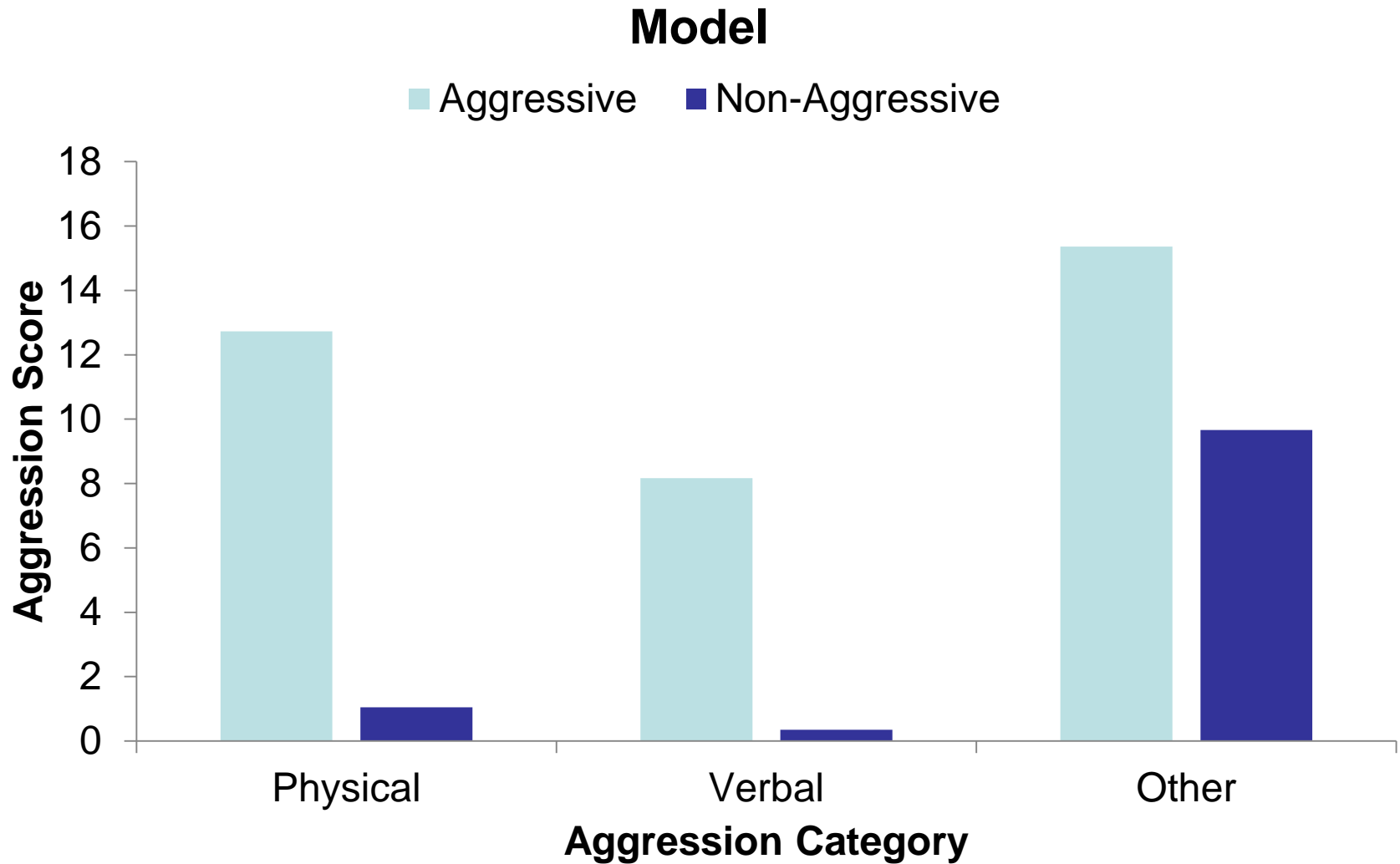
Bandura et al. (1961)



- Nursery-School Children
- Adult Model
 - Aggressive
 - Non-Aggressive
 - Control
- Aggression During Free Play
 - Imitative: Physical and Verbal
 - Punching, Hitting with Mallet
 - Nonimitative Aggression, Gun-Play



Aggression Scores



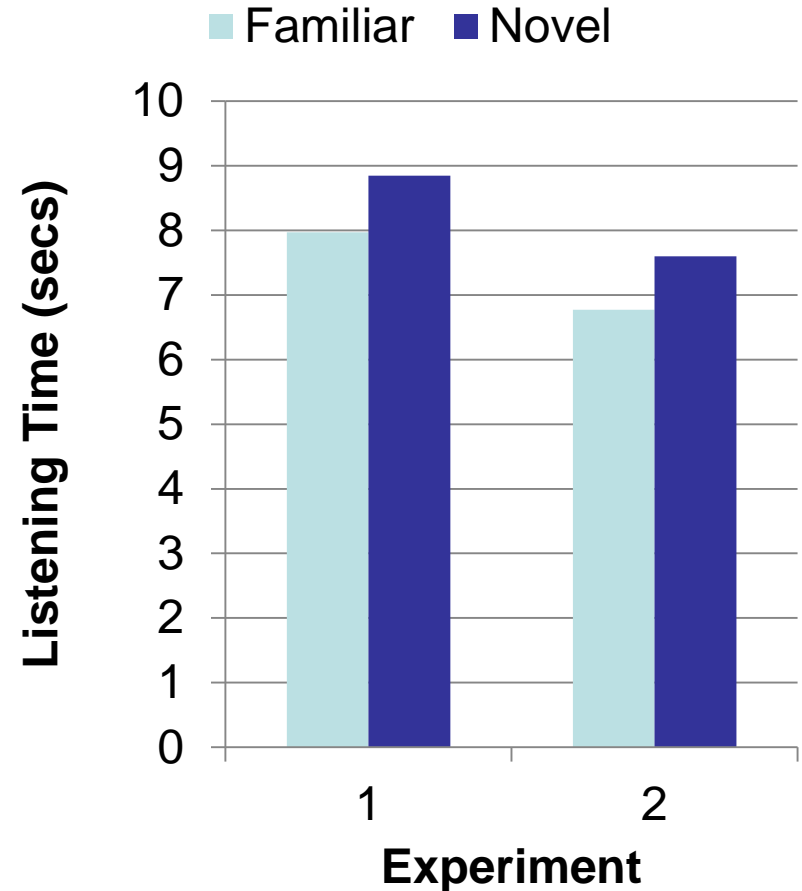
Observational Learning and Language Acquisition

- Native or Secondary Language
- Exposure to Language
 - Aural or Gestural
 - Critical Period before Puberty
- Detect Sounds of Language
 - Separate into Words
- Recognize Words
- Grammatical Rules
- Prosody, Nonverbal Communication

Statistical Learning by Infants

Saffran, Aslin, & Newport (1996)

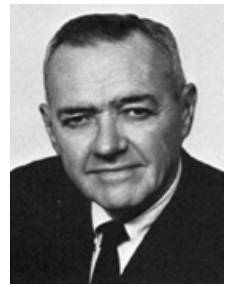
- Stimulus Materials
 - *Tupiro Golabu*
Bidaku Padoti
- Test Items, Exp. 1
 - *Tupiro Golabu*
Dapiku Tilado
- Test Items, Exp. 2
 - *Tupiro Golabu*
Tibida Kupado





Social Learning Theory

Miller & Dollard (1941)



- Imitation as Acquired (Secondary) Drive
 - Necessary Component of Socialization
 - Conformity
 - Discipline
- Two Forms of Imitation
 - Matched-Dependent Behavior
 - No Awareness of Cues
 - Copying
 - Awareness of Cues

Cognitive Social Learning Theory

Bandura & Walters (1963); Bandura (1977)

- Expectations, not Behavior
- Learning by Response Consequences
 - Direct Experience
 - Trial and Error
 - Reward and Punishment
- Vicarious (Observational) Learning
 - Example
 - Modeling, Imitation (Informal)
 - Precept
 - Sponsored Teaching (Formal)



Social Learning and Culture

- *Culture*: Customary Beliefs, Social Forms, and Material Traits of a Racial, Ethnic, or Social group
 - Transmitted through Informal Learning and Formal Training from One Generation to the Next
- Observational Learning is the Cognitive Basis of Culture and Cultural Transmission
- *Thinking* is the Cognitive Basis of Cultural Evolution



Micronesia Project