

PSYC 5303 – Lecture 2

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Review - classical conditioning

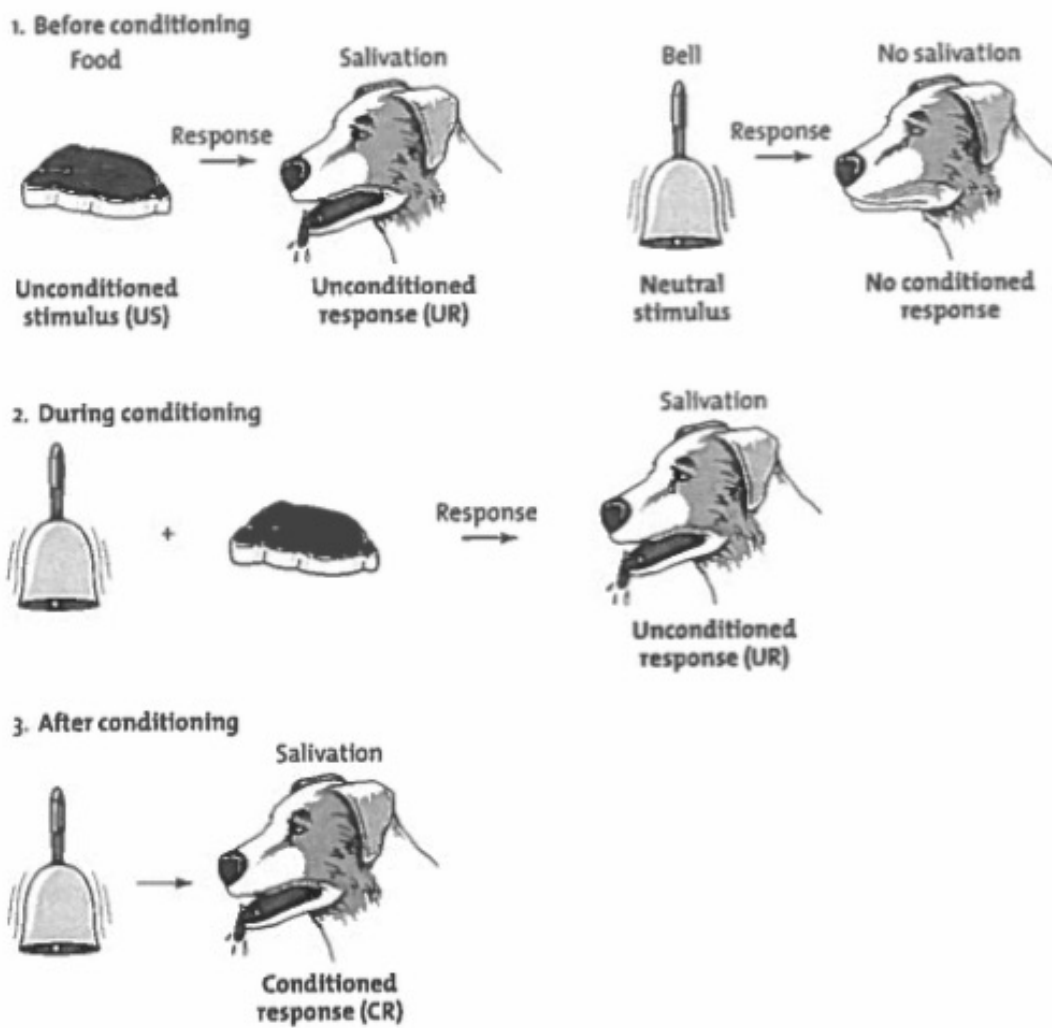


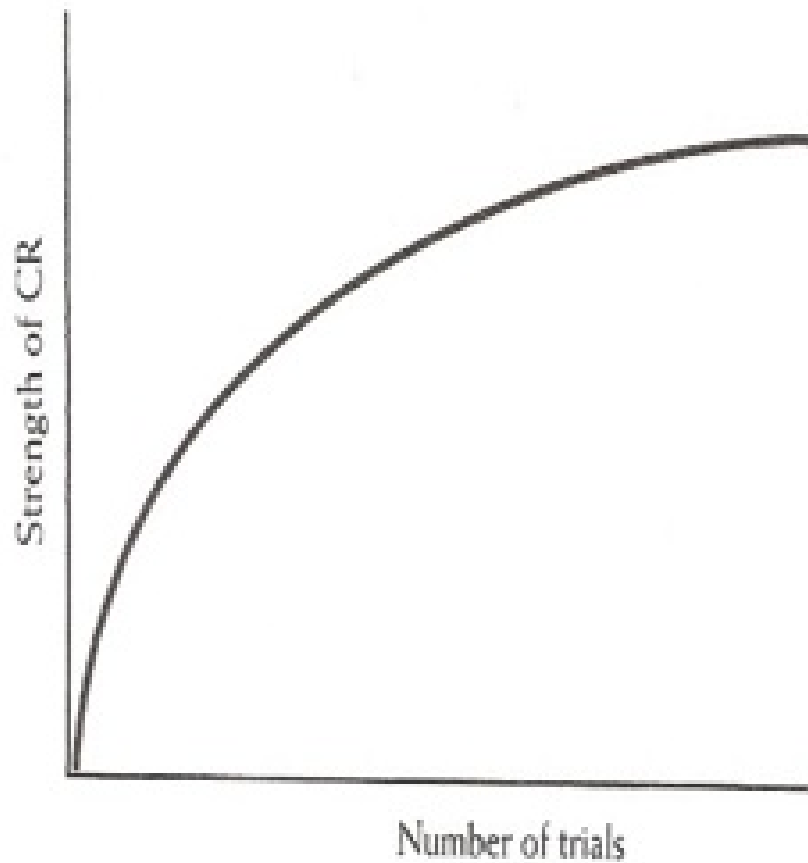
FIGURE 5.1 Stages in conditioning in Pavlov's experiments.

Definitions:

- Unconditioned Stimulus (US): a stimulus that has the ability to produce a specified response *before conditioning begins*
 - Food
- Unconditioned Response (UR): the response produced by the US
 - Salivation produced by food
- Conditioned Stimulus (CS): an initially neutral stimulus that comes to produce a new response because it is associated with the US
 - Bell
- Conditioned Response (CR): the response produced by the CS
 - Salivation produced by the bell

Experiments

To do a classical conditioning experiment, we need to be able to measure the **conditioned response (CR)**.



Plot:

- x-axis: number of trials (repetitions)
- y-axis: strength of conditioned response

Sniffy the Virtual Rat



Experiment:

- We will teach Sniffy to elicit a freezing response (CR) to the sound of a tone (CS) by repeatedly pairing the tone with a medium electric shock (CS + US)
- The freezing response (originally a UR in response to shock) will eventually become a CR.

Parameters:

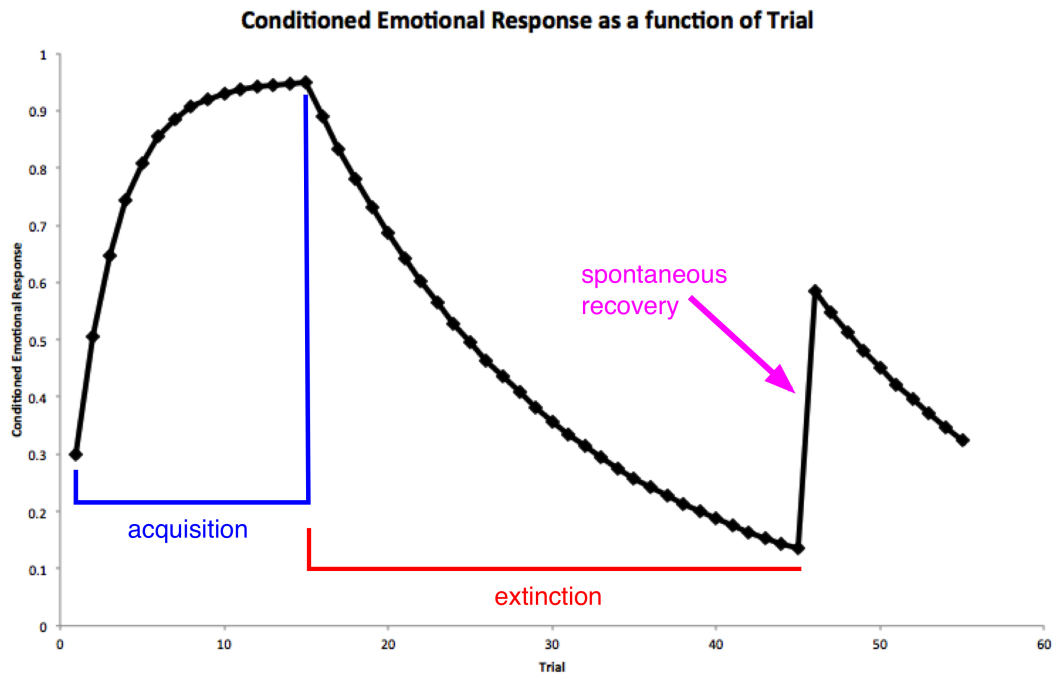
- NS/CS: a tone of medium volume, presented for 30 seconds
- US: a medium electric shock, presented for 1 second

Measurements:

- *Movement ratio* - fraction of time during presentation of NS/CS that freezing behaviors are exhibited.

Sniffy the Virtual Rat

Results:



Going deeper – multiple stimuli

When more than one CS is presented, the parts of this "compound stimulus" can condition differently!

Example 1 – **overshadowing** - one CS in a compound stimulus leads to a *stronger* CR than the other CS.

Training phase:

- CS_1 (firecracker) + CS_2 (pencil tapping) → no response
- CS_1 (firecracker) + CS_2 (pencil tapping) + US (candy) → UR (salivation)
- Repetition
- CS_1 (firecracker) + CS_2 (pencil tapping) → CR (salivation)

Test phase:

- CS_1 (firecracker) → CR (salivation)
- CS_2 (pencil tapping) → no response

Interpretation: the stronger stimulus overshadows the weaker stimulus

Going deeper – multiple stimuli

Example 2 – **blocking** - presence of an established CS interferes with conditioning a *new* CS

Training phase 1:

- CS (red light) \rightarrow no response
- CS (red light) + US (candy) $\rightarrow UR$ (salivation)
- CS (red light) $\rightarrow CR$ (salivation)

Training phase 2:

- CS (red light) + CS_{new} (green light) $\rightarrow CR$ (salivation)

Test phase:

- CS_{new} (green light) $\rightarrow CR$ (no salivation)

Interpretation: previous learning blocks learning of the new CS

What is learned?

Fundamental question: which of the following best represents what Pavlov's dog learns?

- that the tone means food?
 - *S-S theory* – learning = association between two stimuli
- to salivate when it hears the tone?
 - *S-R theory* – learned = association between a stimulus and a response

To investigate this question, let's look at the evidence from two other conditioning phenomena:

- second-order conditioning
- sensory preconditioning

Second-order conditioning

Training phase 1:

- CS_1 (tone) \rightarrow no response
- CS_1 (tone) + US (food) $\rightarrow UR$ (salivation)
- repeat. . .
- CS_1 (tone) $\rightarrow CR$ (salivation)

Training phase 2:

- CS_2 (light) + CS_1 (tone)
- repeat. . .

Test phase:

- CS_2 (light) $\rightarrow CR$ (salivation)

Summary: light means tone, and tone means food, so light means food.

Sensory preconditioning

Training phase 1:

- CS_2 (light) + CS_1 (tone)
- repeat. . .

Training phase 2:

- CS_1 (tone) \rightarrow no response
- CS_1 (tone) + US (food) $\rightarrow UR$ (salivation)
- repeat. . .
- CS_1 (tone) $\rightarrow CR$ (salivation)

Test phase:

- CS_2 (light) $\rightarrow CR$ (salivation)

Note: the light was NEVER paired with food, yet produces a CR anyway. . .

What's the difference?

What is the difference between second-order conditioning and sensory preconditioning?

Paradigm	Phase 1	Phase 2	Test
Standard conditioning	————	CS ₁ -US	CS ₁
Sensory preconditioning	CS ₂ -CS ₁	CS ₁ -US	CS ₂
Second-order conditioning	CS ₁ -US	CS ₂ -CS ₁	CS ₂

Answer: the order that the two CSs are paired.

S-S vs S-R theory

What would the S-S and S-R theorists say is going on in *second-order conditioning*?

S-S theorists:

- The dog associates the tone with:
- The dog associates the light with:

S-R theorists:

- the dog associates the tone with:
- the dog associates the light with:

S-S vs S-R theory

Answers:

S-S theorists:

- The dog associates the tone with *food*
- The dog associates the light with *the tone (and therefore with the food)*

S-R theorists:

- the dog associates the tone with *salivation*
- the dog associates the light with *salivation*

S-S vs S-R theory

What would the S-S and S-R theorists say is going on in *sensory preconditioning*?

S-S theorists:

- The dog associates the light with:
- The dog associates the tone with:

S-R theorists:

- the dog associates the light with:
- the dog associates the tone with:

S-S vs S-R theory

Answers:

S-S theorists:

- The dog associates the light with *the tone*
- The dog associates the tone with *food*

S-R theorists:

- the dog associates the light with ???
- the dog associates the tone with *salivation*

Moral – S-R theory cannot easily explain sensory preconditioning!