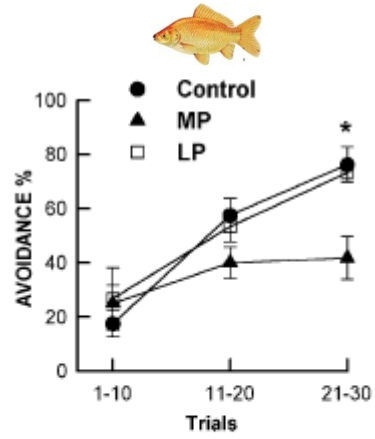
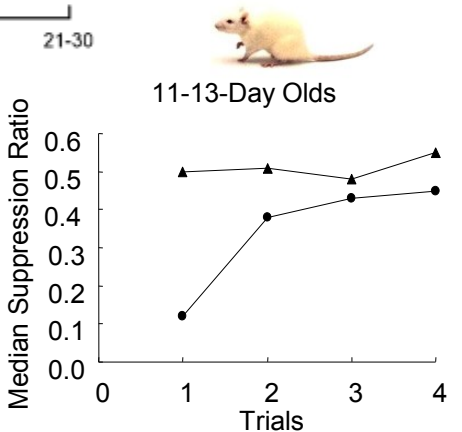


# Fear conditioning: General characterization

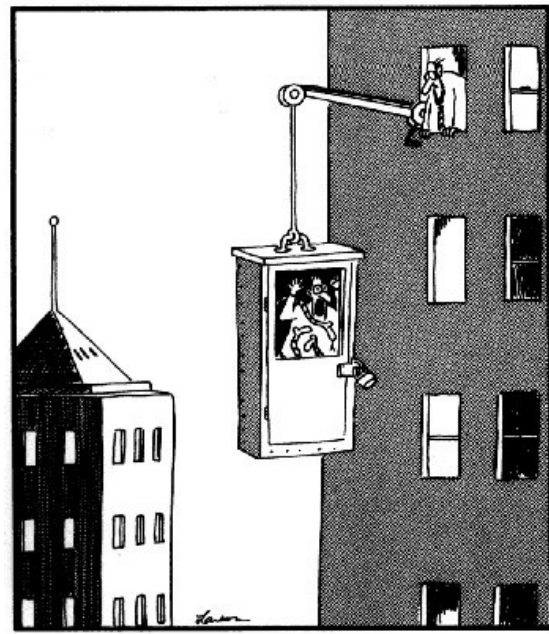
- General across species.
- Present since early in mammalian development.
- Facial expression in humans is recognizable across cultures.
- Well-defined training protocols for experimental analysis.
- Related to phobias, anxiety, panic disorder, and PTSD.



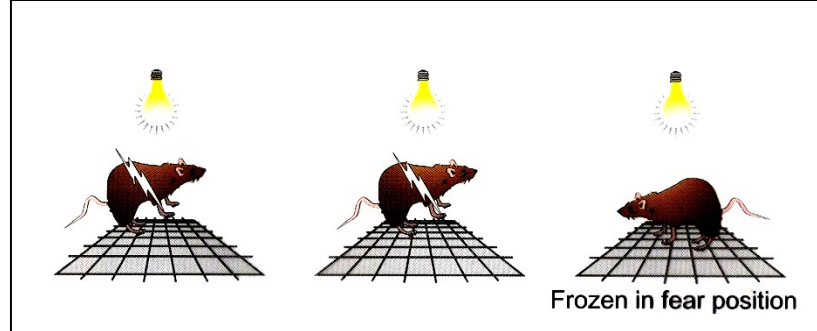
Portavella et al., 2004, Neurosci Let, 362, 75-8.



Coulter et al., 1976, JEP: Anim Behav Proc, 2, 48-56.

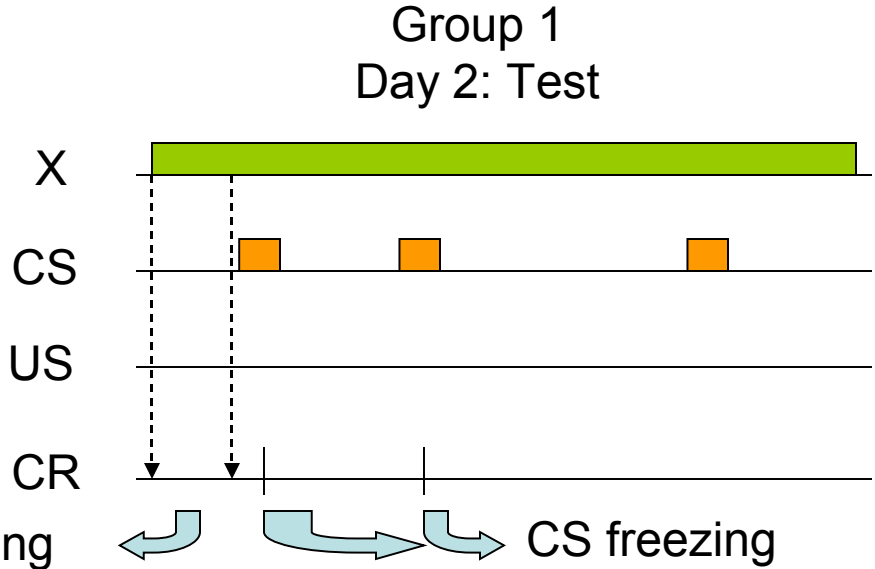
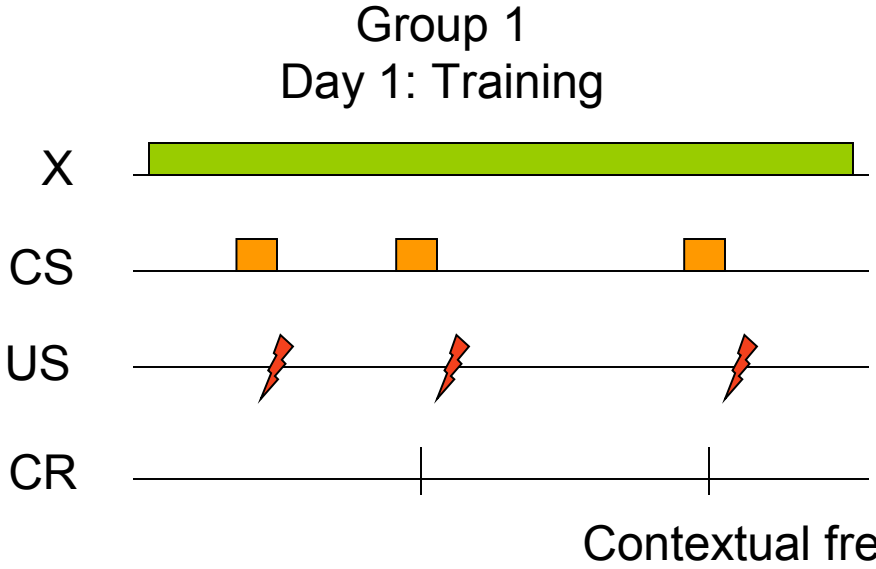


# Fear conditioning (freezing): discrete CS

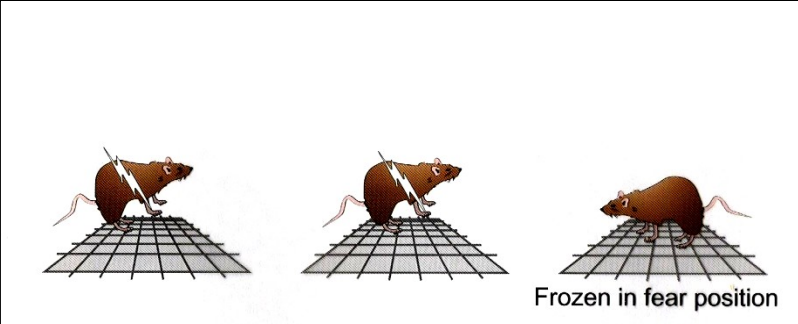


| Group | Training | Test  |
|-------|----------|-------|
| 1     | X: A+    | X: A? |
| 2     | X: A, +  | X: A? |

X, █ : training context  
 A, █ : discrete CS  
 +, : pain induced by shock  
 CR: freezing

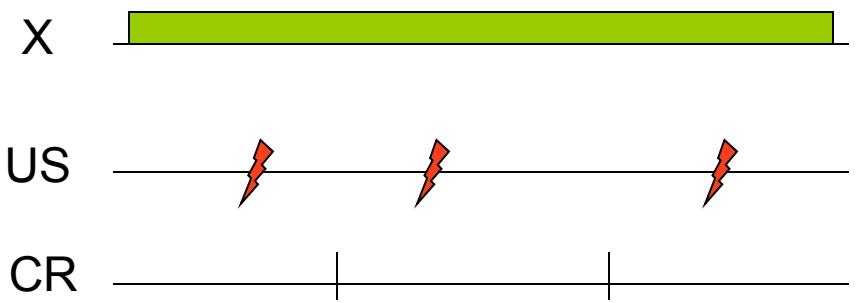


# Fear conditioning (freezing): contextual



| Group | Training | Test |
|-------|----------|------|
| 1     | X: +     | X: ? |
| 2     | Y: +     | X: ? |

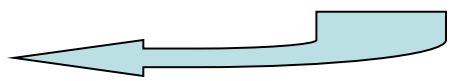
Group 1  
Day 1: Training



Group 1  
Day 2: Test



Contextual freezing



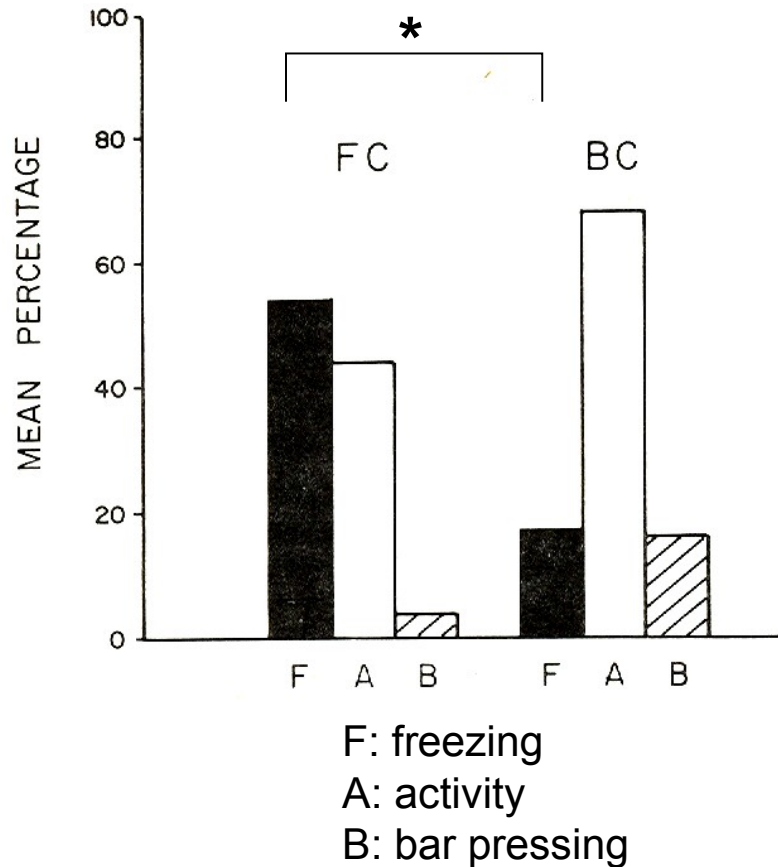
# Freezing and instrumental suppression

| Group | Instrumental    | Pavlovian | Baseline Recovery | Test     |
|-------|-----------------|-----------|-------------------|----------|
| -     |                 |           |                   |          |
| FC    | X:R→O (VI 90 s) | Y: T+     | X:R→O             | X: T:R→O |
| BC    | X:R→O (VI 90 s) | Y: +T     | X:R→O             | X: T:R→O |

Time-sampling observations (once every 3 s)

| Category                  | Description   |
|---------------------------|---|
| <u>Freezing</u> .....     | Body immobility and the absence of vibrissae movement associated with sniffing. |
| <u>Bar-pressing</u> ..... | Activity in contact with the bar.   |
| Food-cup behavior.....    | Activity in contact with the food cup.  |
| Drinking.....             | Mouth contact with the drinking tube  |
| <u>Activity</u> .....     | Active behaviors not falling into the other categories.                         |

# Freezing and instrumental suppression



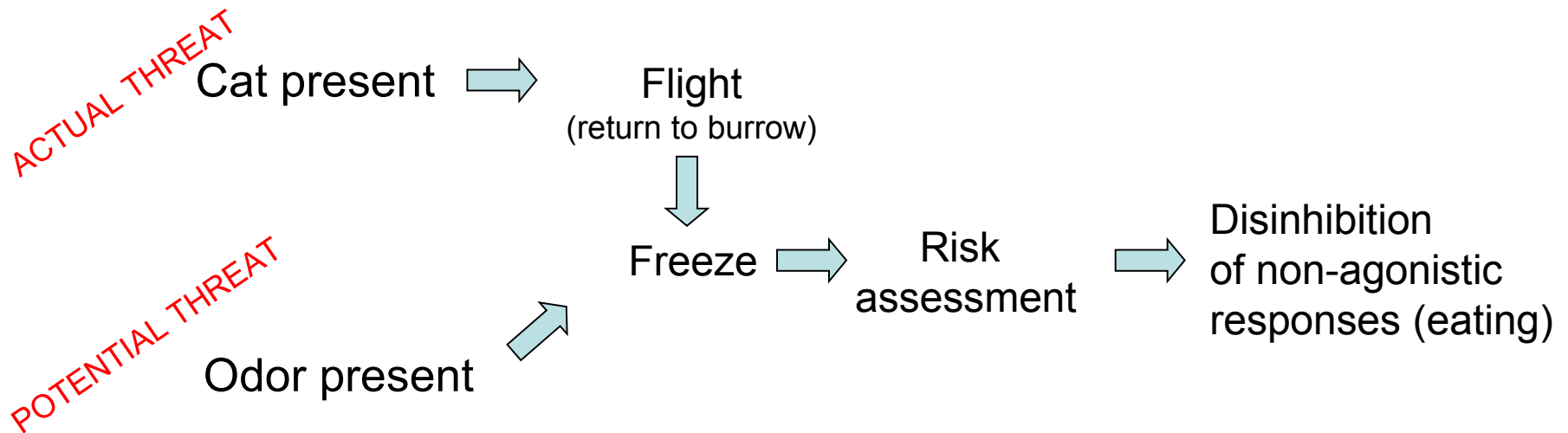
- More freezing in FC than in BC.
- Both groups together, significant negative correlation between freezing & bar-pressing.
- Thus, suppression of bar-pressing reflects freezing.
- BC may be a conservative control group, since it may generate inhibitory conditioning.



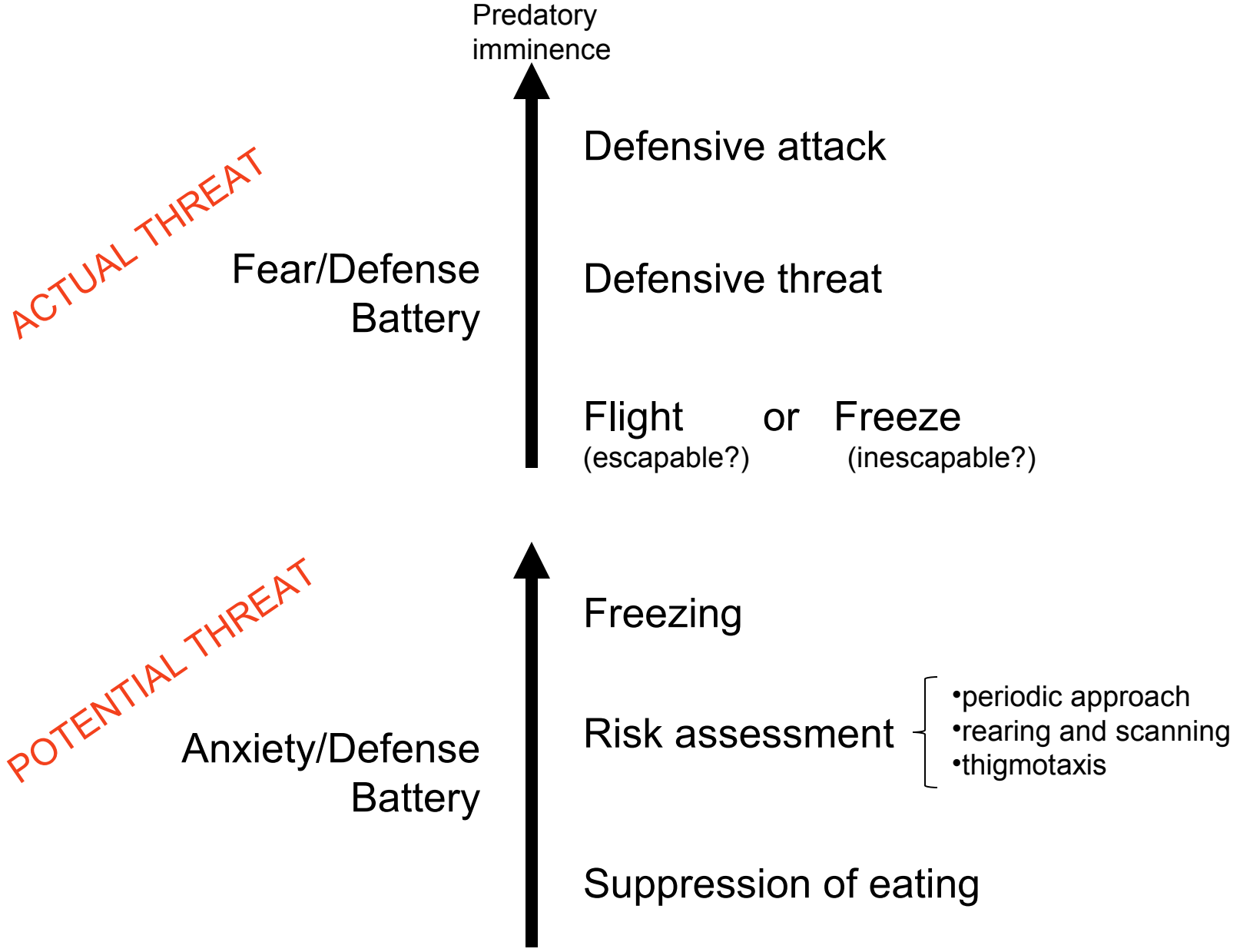
## Defensive behavior system

- The administration of shock causes pain, which is analogous to the interaction with a predator.
- In a naturalistic situation, a cat may substitute for pain, and cat odor for a CS for pain.
- What behaviors are aroused under these two conditions?

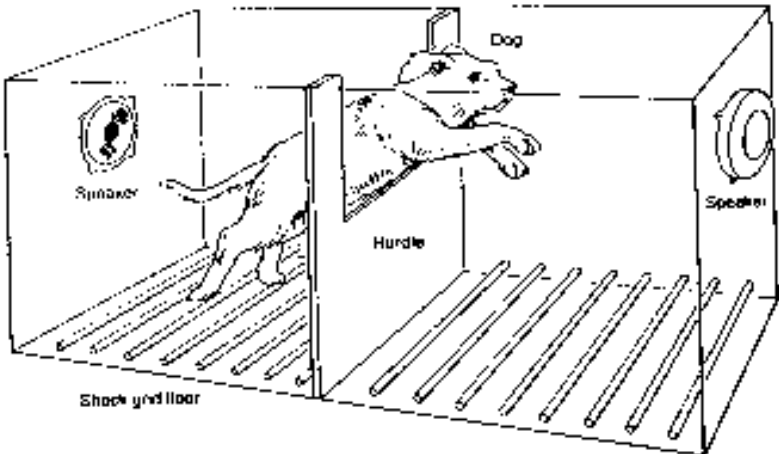
### Stream of defensive behavior:



# Fear and anxiety batteries



# Learned helplessness: the triadic design



Phase 1

Phase 2

Groups

(White cubicle)

(Shuttle box)

Escape

Escape training (64) 6 mA

(10) Escape-Avoidance

Normal

No training

(10) Escape-Avoidance

Yoked

Inescapable: (64) 6 mA

(10) Escape-Avoidance