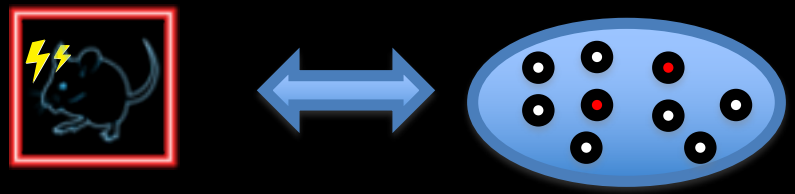
# Criteria for identifying a putative neural correlate of memory

Observe

Learning => Neural Activity

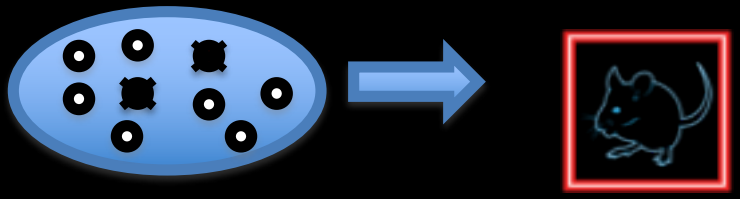


Correlation

(Eichenbaum, 2016)
(Hasselmo et al. 2002)
(Reijmers et al. 2007)

Perturb

Block neurons => Block memory

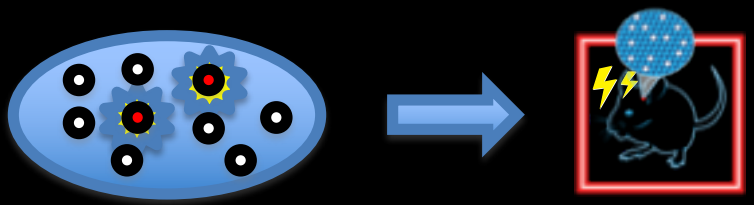


Necessity

(Han et al, 2009)
(Denny et al. 2014)
(Tanaka et al. 2014)

Mimic

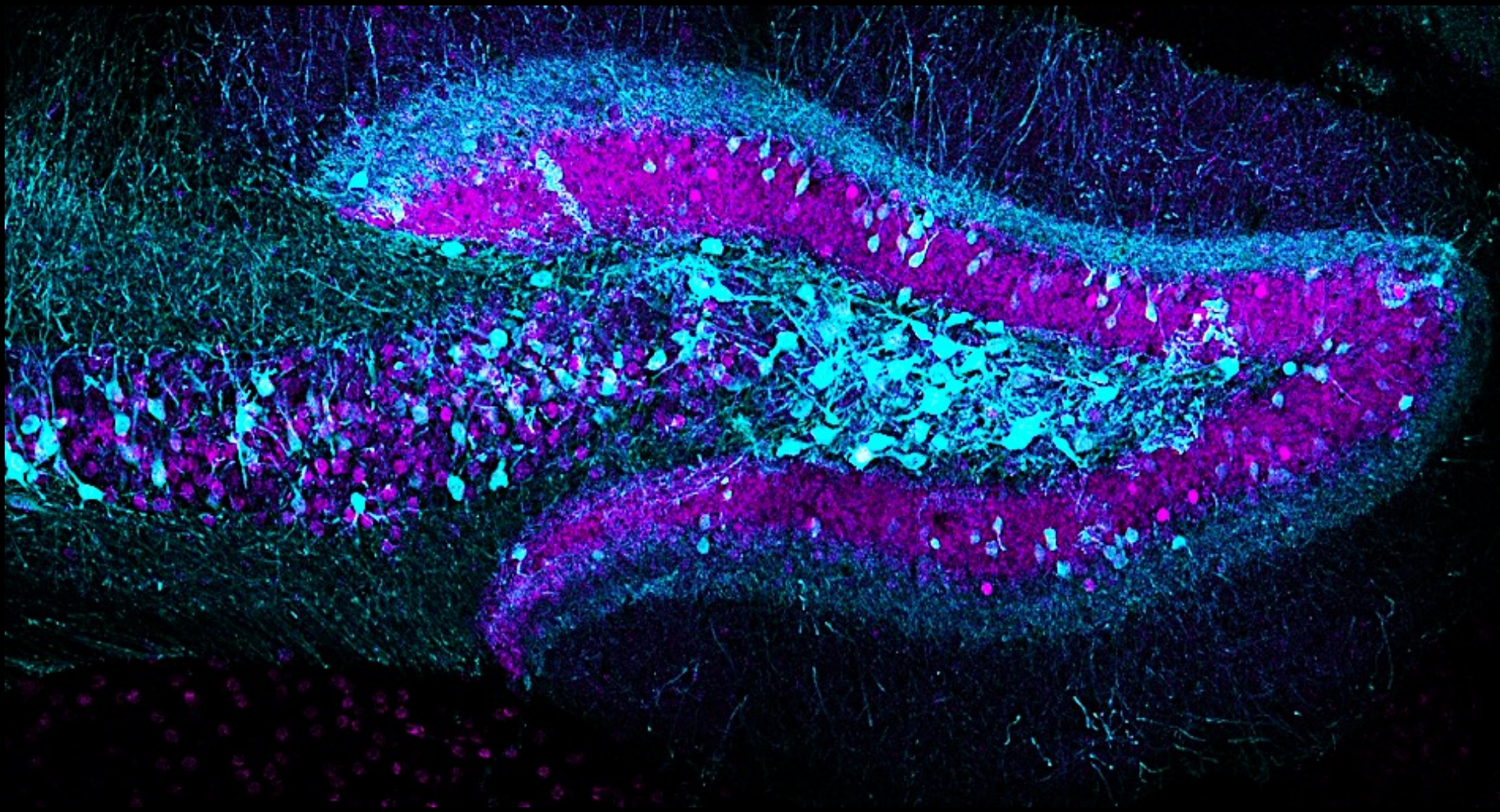
Activate neurons => Activate memory



Sufficiency

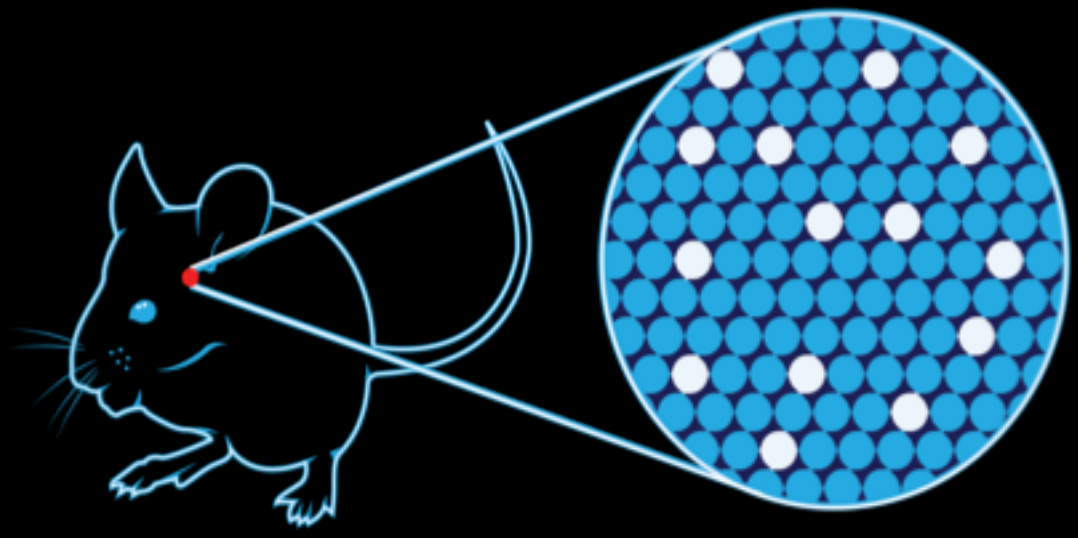
(Ramirez et al. 2013)
(Josselyn et al. 2015)
(Tonegawa et al. 2015)

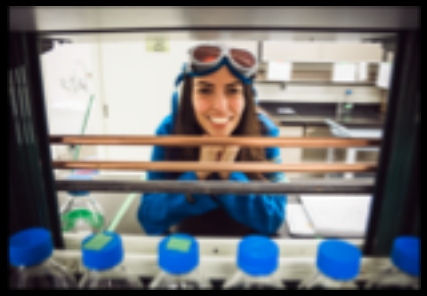
(Martin and Morris, 2000)

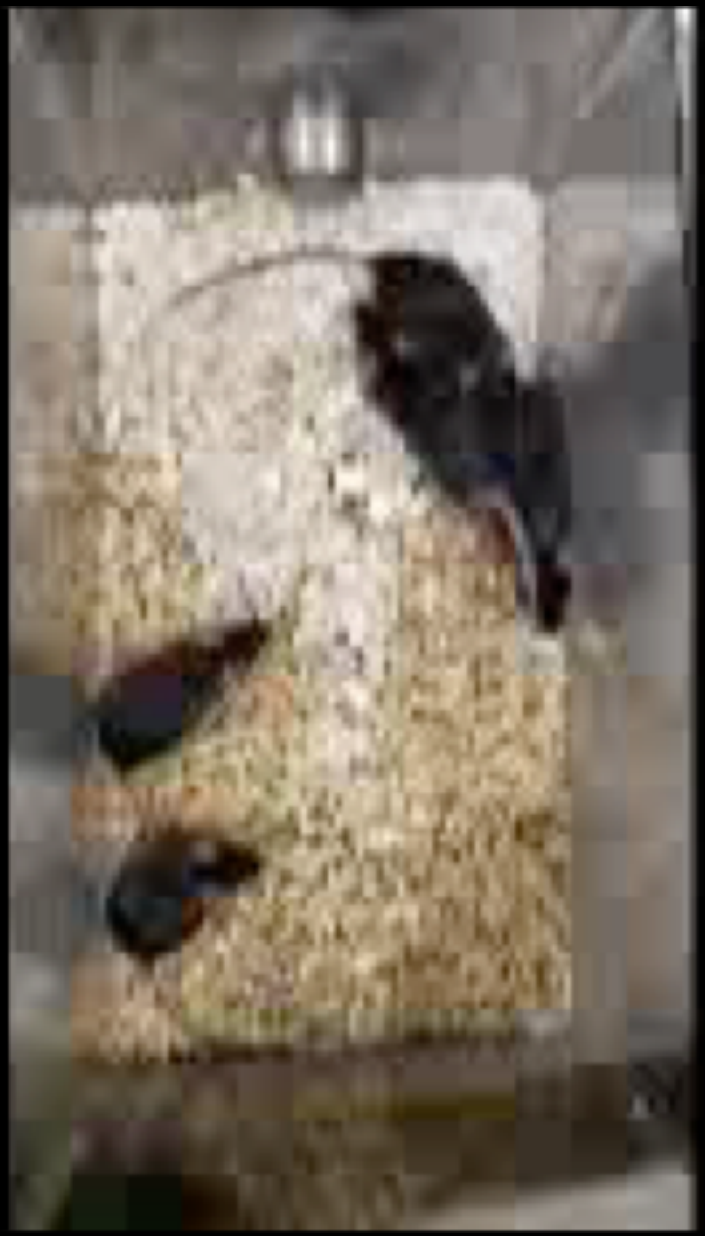


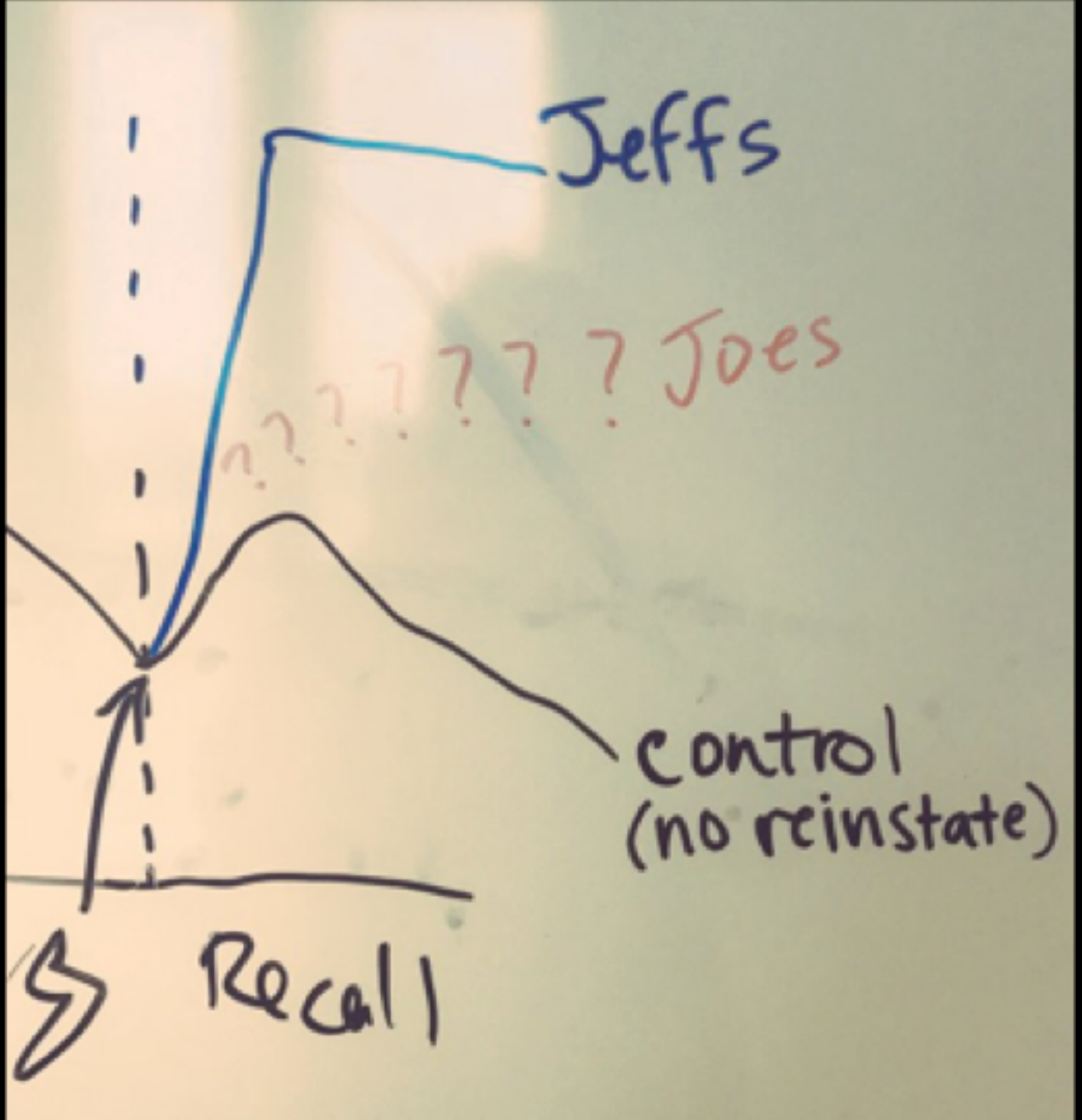
# Hypothesis

Cells active during the formation of an aversive social experience are sufficient to drive aversive behavioral outputs








Jeffs
????????? Joes
control
(no reinstate)
Recall

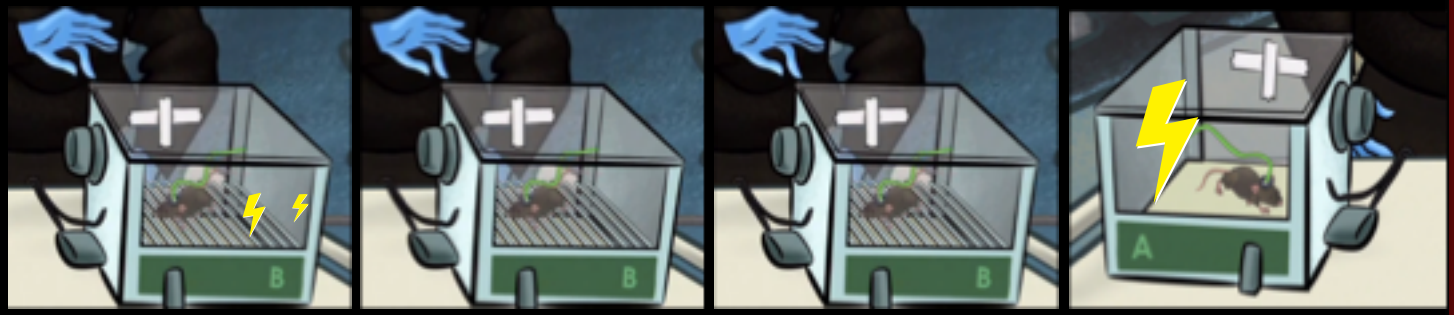
Fear Conditioning

Extinction

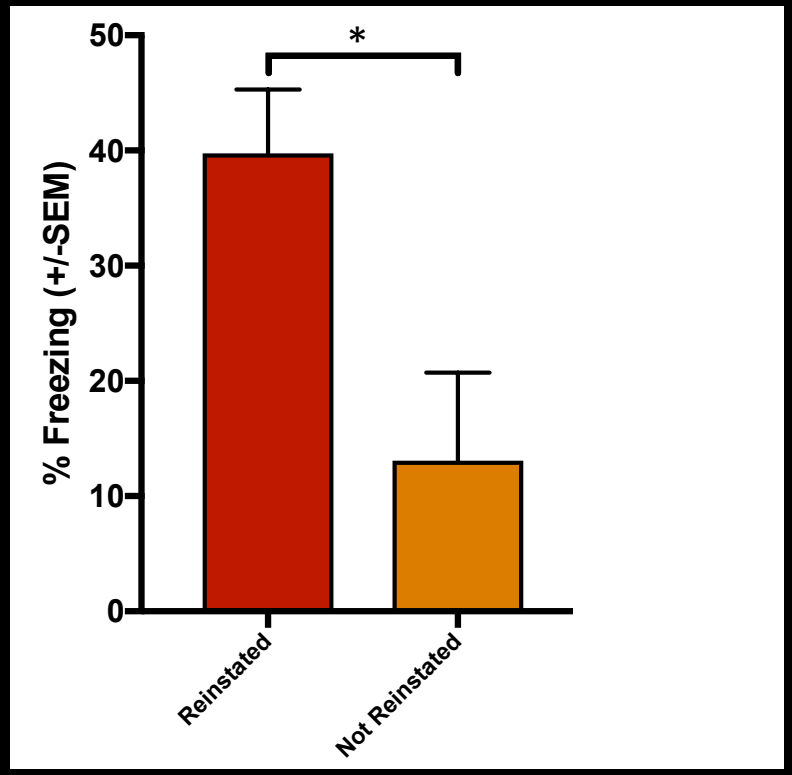
Extinction

Immediate Shock

Reinstatement



Place Jeff In Homecage



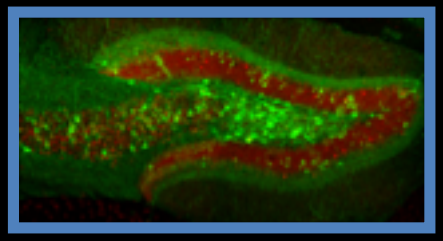
Fear Conditioning

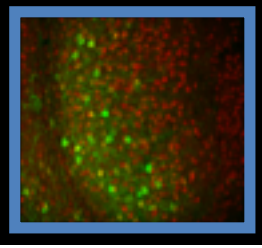
Extinction

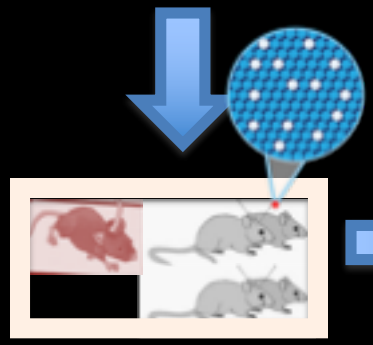
Extinction

Immediate Shock

Optical Activation

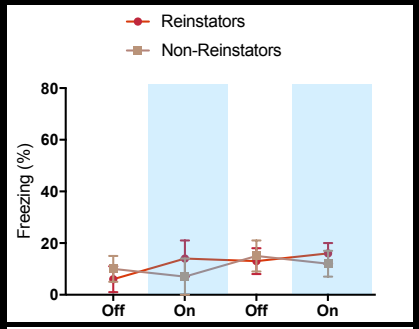


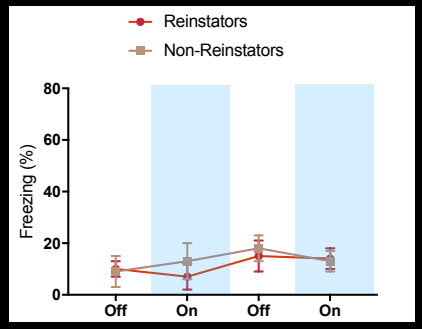




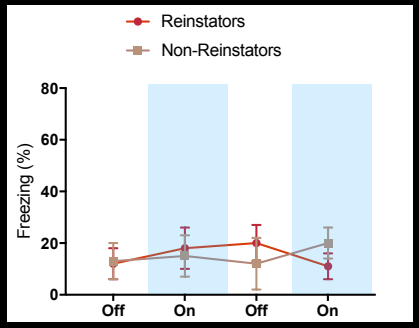
Reinstatement

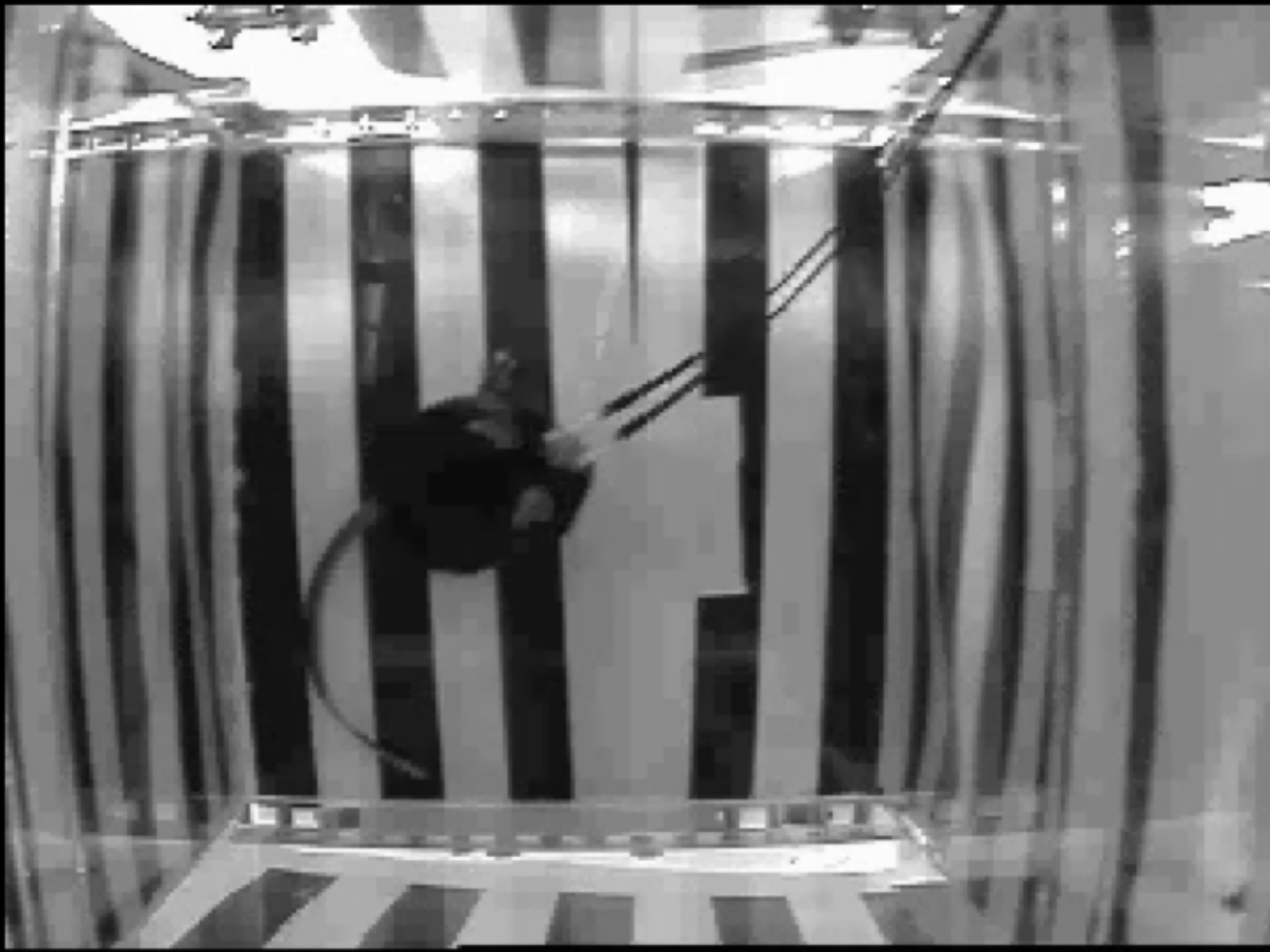
20 hz




4 hz





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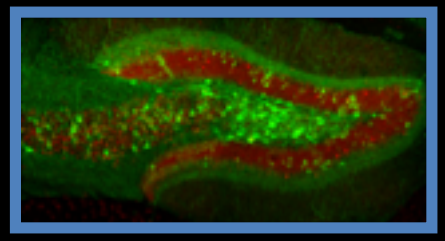
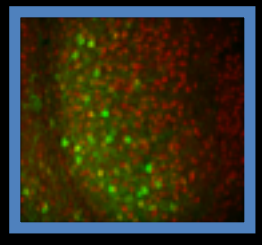
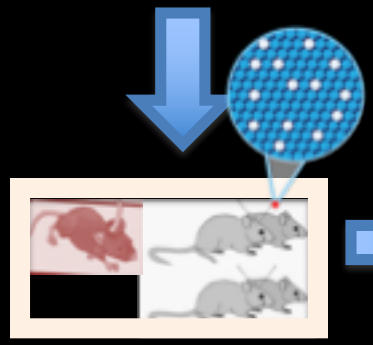


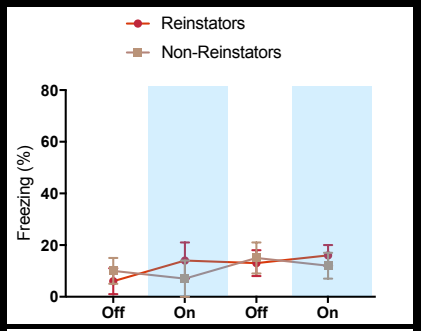


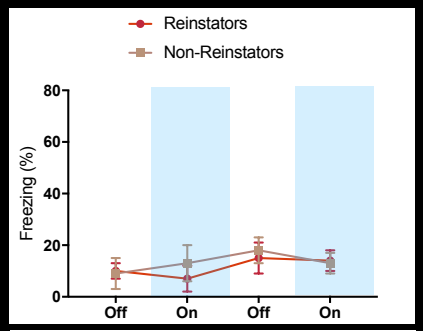


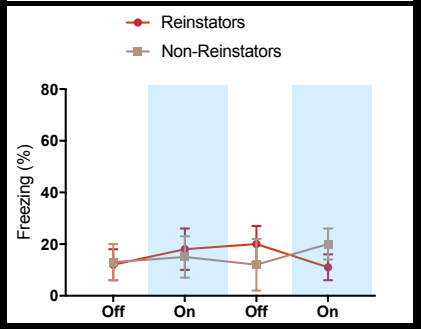
Reinstatement

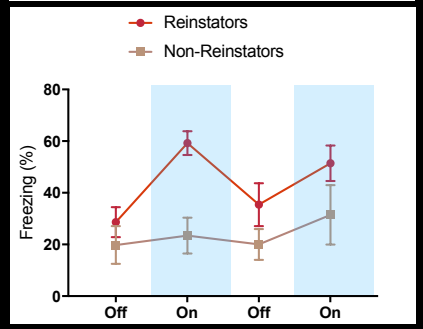
20 hz

4 hz



Fear Conditioning

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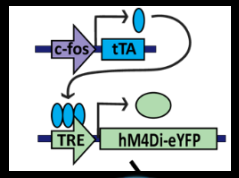
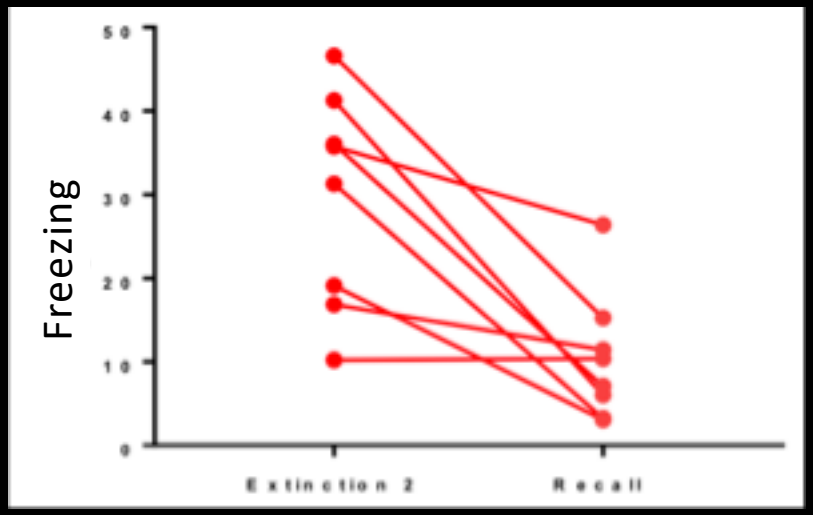


+ CNO

Reinstatement



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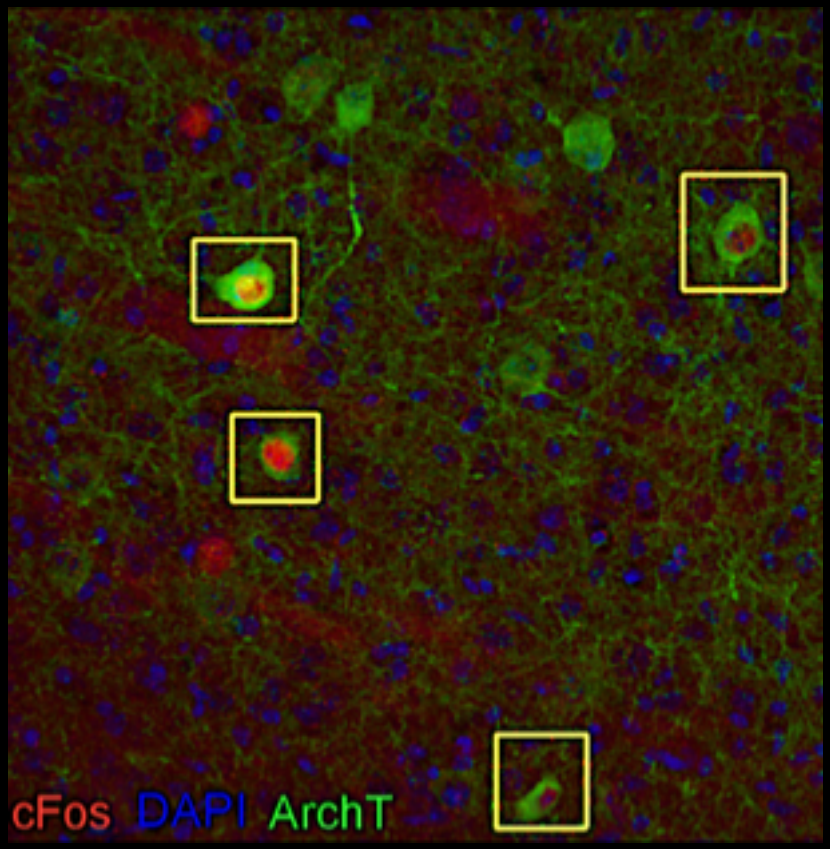
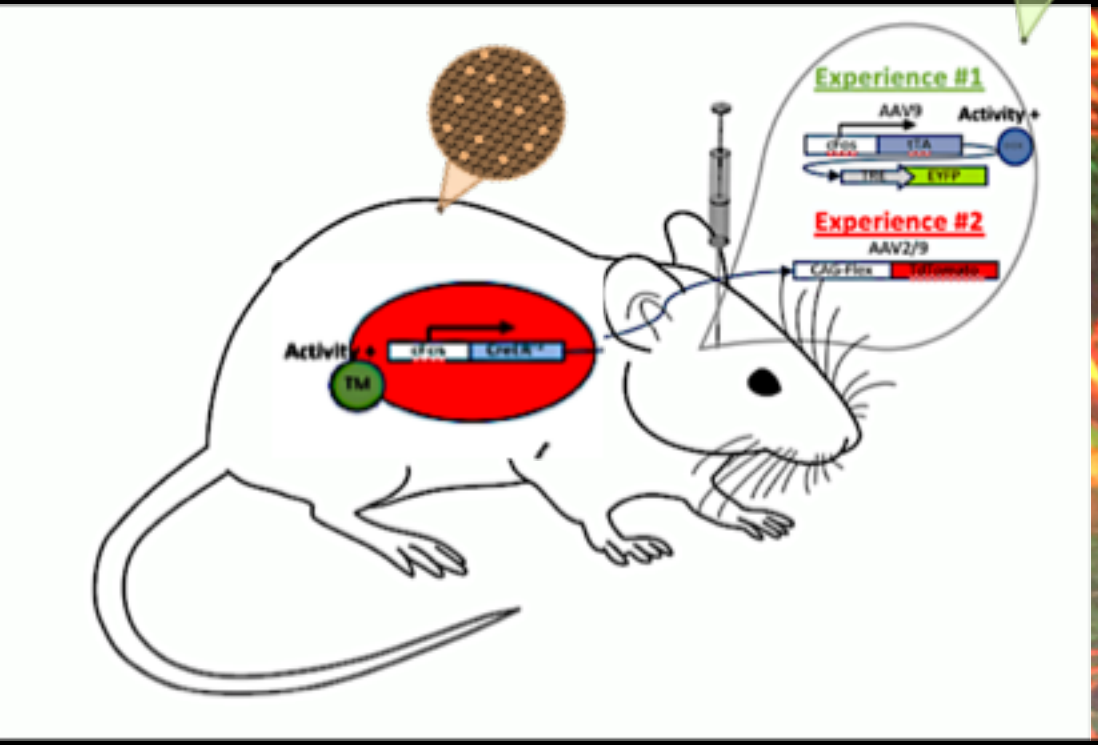
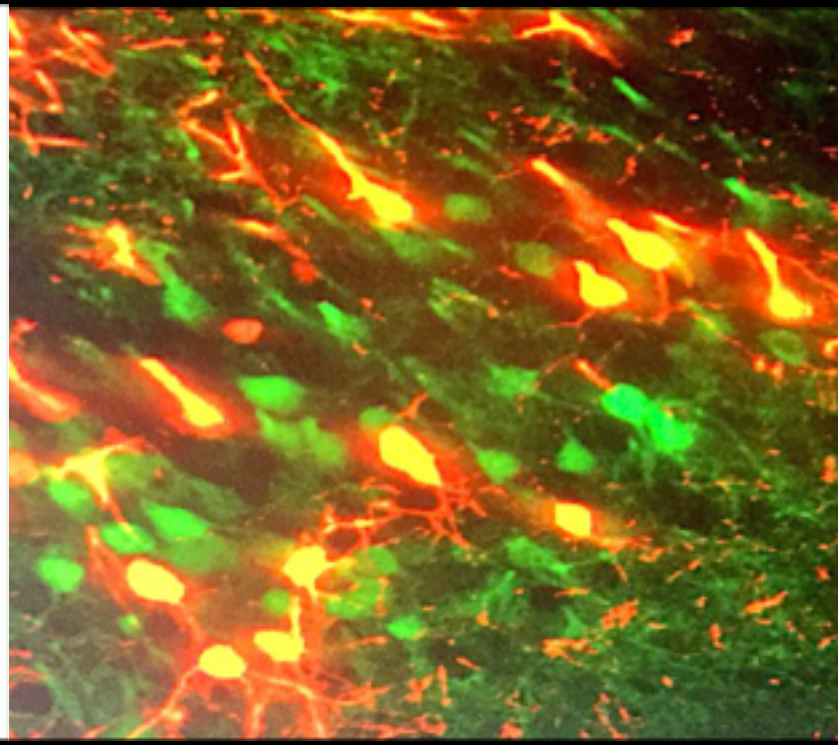


Perfuse 1.5 hours later


Experience #1
AAV9
Activity +
EYFP
Experience #2
AAV2/9
Activity +
TM



## Follow up experiments:

1) Introduce Jeff's pheromone cues

2) Introduce an aggressive non-Jeff

3) Introduce Jeff to a non-fear conditioned cage

4) Replay Jeff's vocalizations

5) Apply physical stress to Joe's

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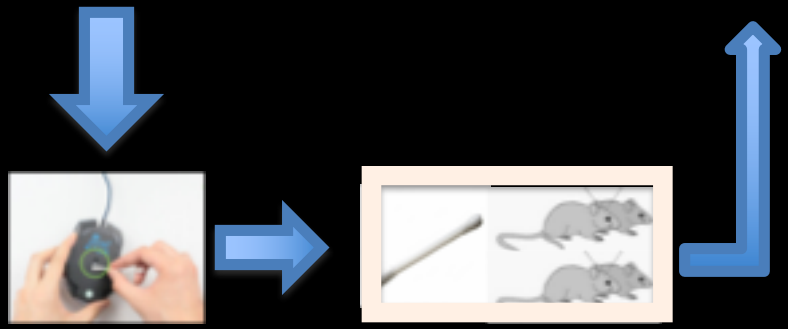

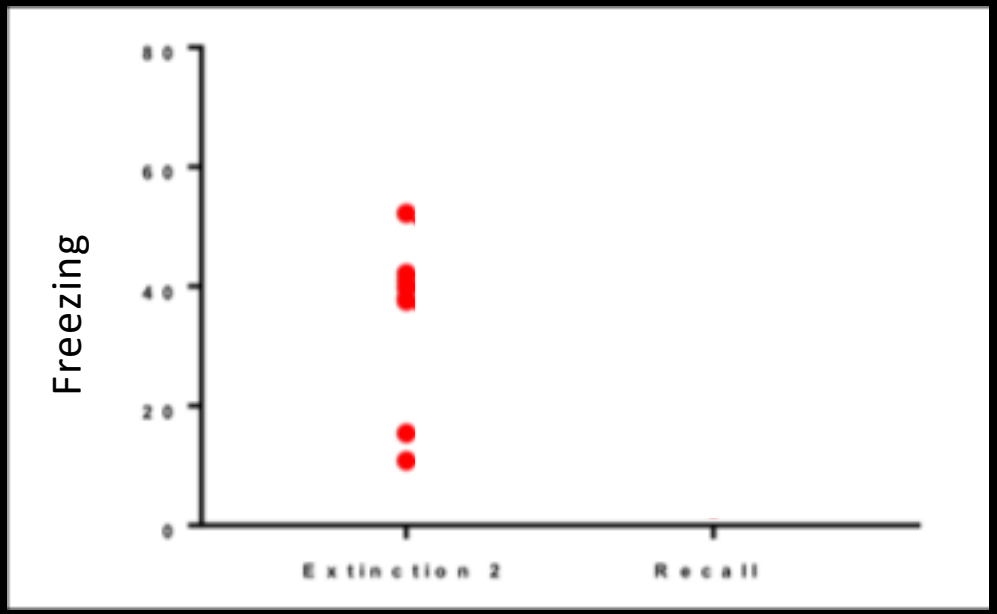

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