Chronic activation across development alters ventral hippocampal projections

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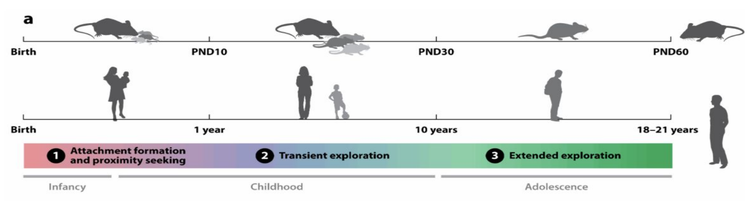
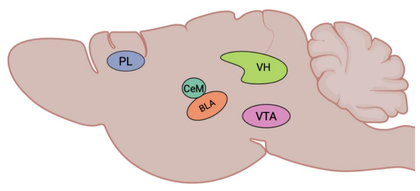
Introduction

- Adolescence is marked by high plasticity in ventral hippocampus (VH), amygdala, and prefrontal cortex. Stress and emotional reactivity peak during this developmental window.



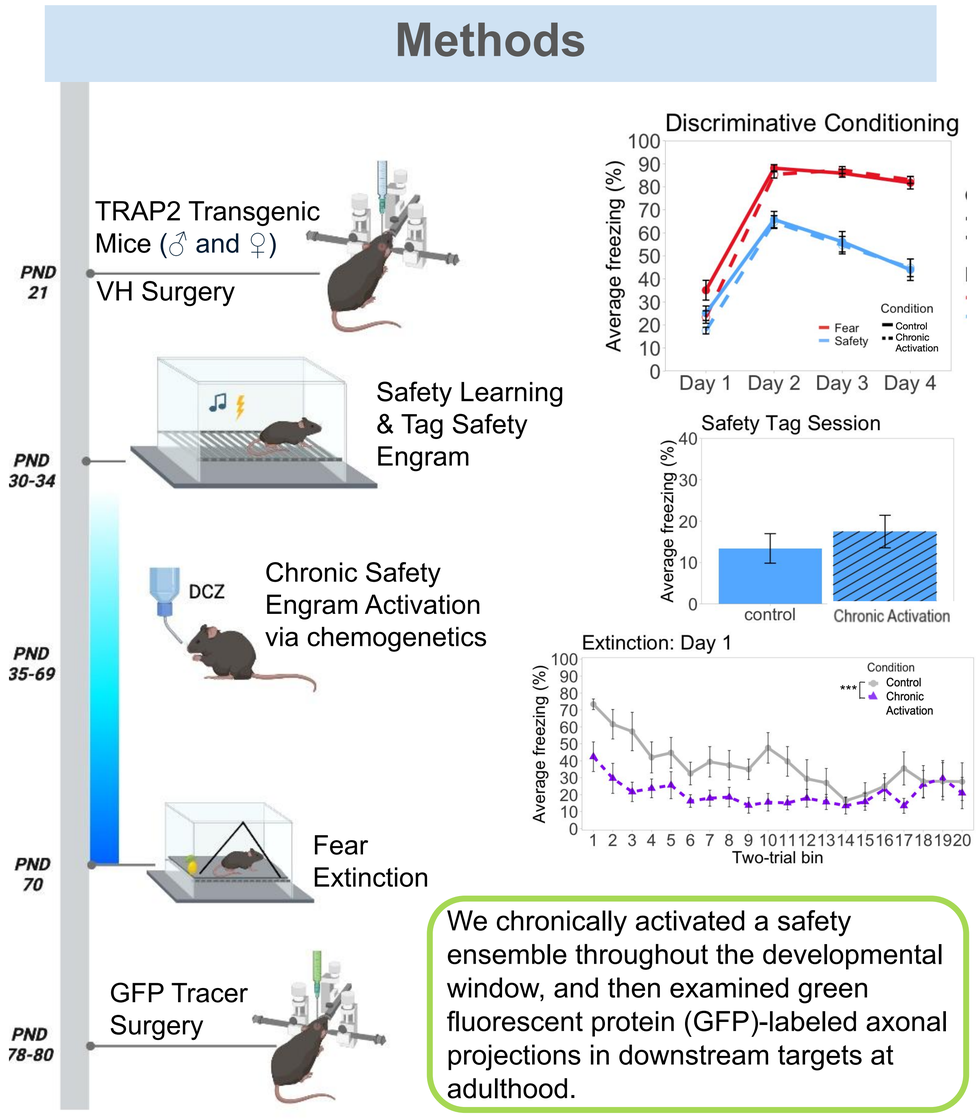
- The VH helps form emotional memories and sends projections to other brain regions involved in fear and safety processing: basolateral amygdala (BLA), central amygdala (CeM), prelimbic cortex (PL), and ventral tegmental area (VTA).
- Previous studies demonstrate alterations to VH-BLA and VH-VTA circuitries impacts anxiety-like behaviors.



Aim

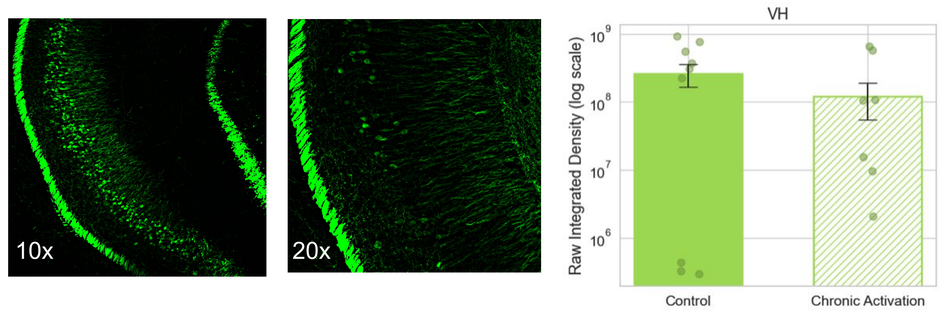
This study aimed to elucidate how chronic developmental activation of a VH safety engram alters the density of downstream axonal projections to the BLA, CeM, PL, and VTA.

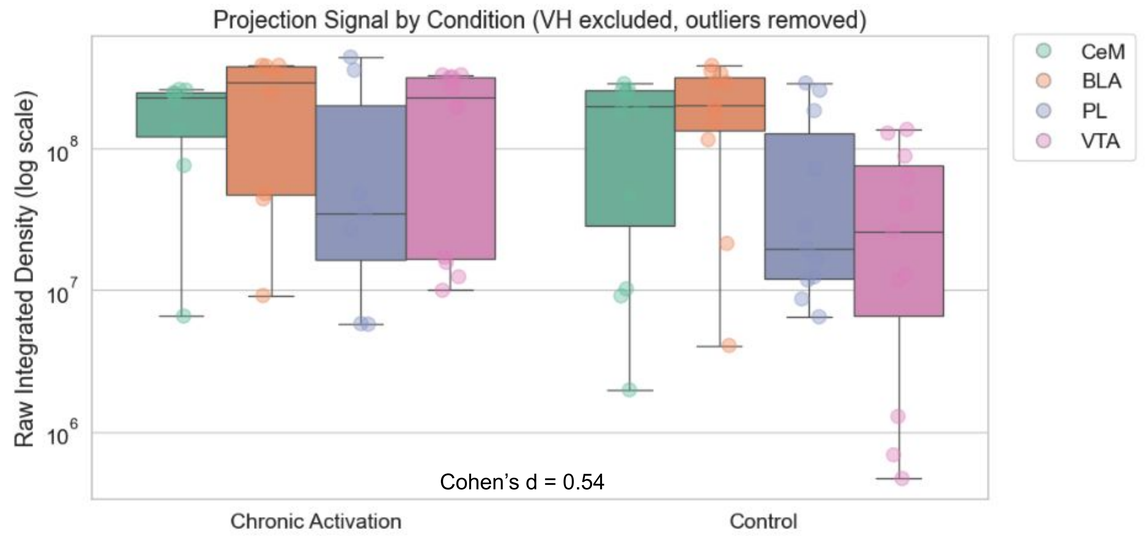
Methods



We chronically activated a safety ensemble throughout the developmental window, and then examined green fluorescent protein (GFP)-labeled axonal projections in downstream targets at adulthood.

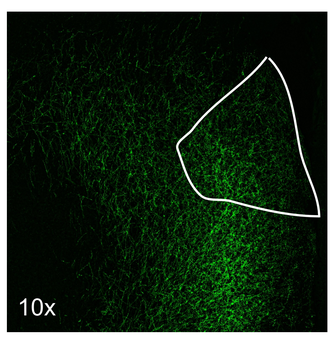
No significant difference in virus administration to VH

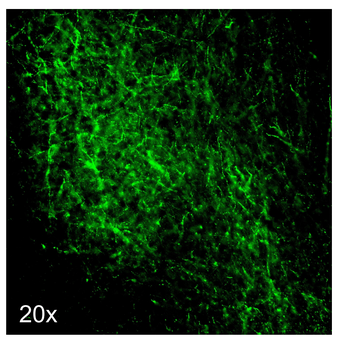


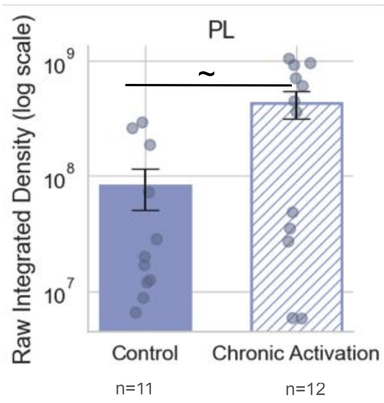


There is an overall **medium effect** of the chronic activation across all regions.

Prelimbic Cortex

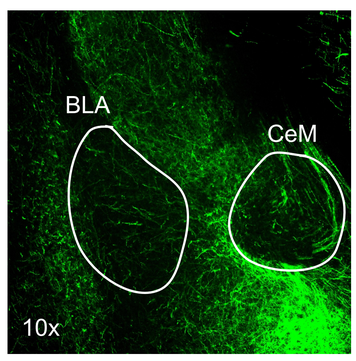




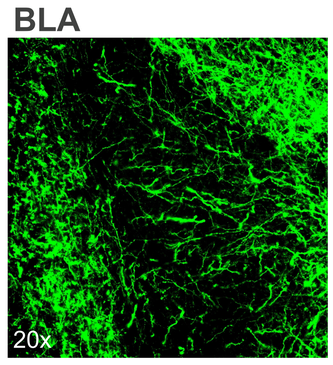


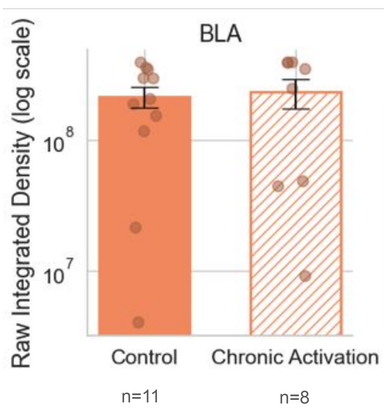
There were **marginally** more projections from the VH to the PL in the chronic activation group as compared to controls.

BLA & CeM



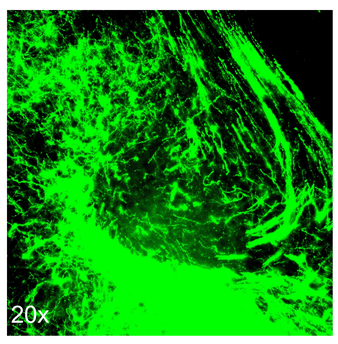
BLA

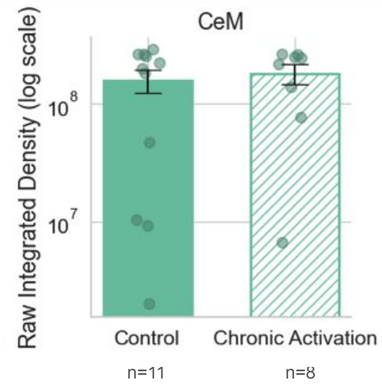




No difference in projections from the VH to the BLA between conditions

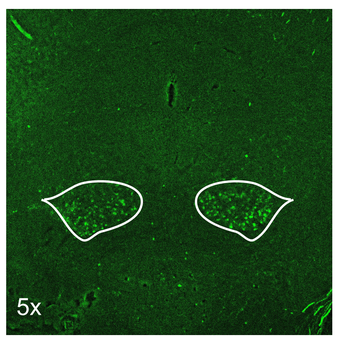
CeM

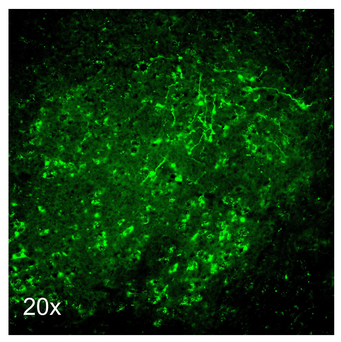


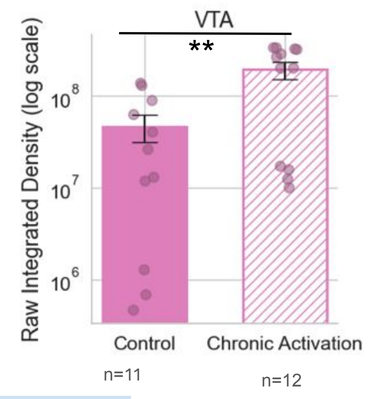


No difference in projections from the VH to the CeM between conditions

VTA







There were **significantly** more projections from the VH to the VTA in the chronic activation group as compared to controls.

Discussion/Conclusion

- Chronic VH activation mice appear to have had a greater amount of projections from the VH to the PL (marginally significant) and VTA (significant) than the controls. This could suggest an integral role of these circuitries in fear and safety processing.
- Chronic VH activation mice and control mice did not exhibit statistically significant differences in BLA and CeM projections. This raises questions about the role of this circuitry in fear and safety processing.
- A potential future direction could be to study projections after an inhibitory period or examine projections after activation of a negative or neutral ensemble.

Funding/Acknowledgements

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