The Role of Ventral Hippocampal CA1 Region in Memory of Acute Social Defeat

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Introduction

Social Memory

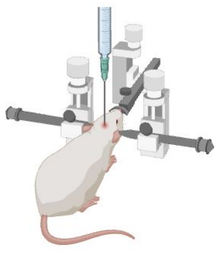
The ability of an individual to identify another individual of the same species. Impaired in several psychiatric conditions, including anxiety, autism spectrum disorder, and schizophrenia.

Why vCA1?

- Major downstream target of CA2
- Implicated in fear related behavior

Role of vCA1 in social memory with negative valence?

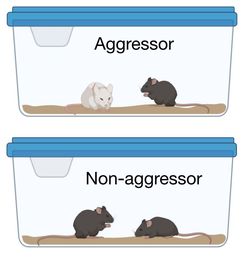
Behavioral Paradigm



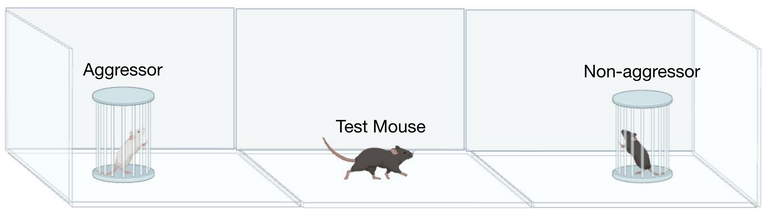
Stereotaxic Injection

Control Group: Red fluorescent
Experimental Group: Conditionally inhibitory receptor → hm4di

The agonist of the inhibitory receptors (CNO) was applied during the learning stage to selectively silence vCA1 neurons



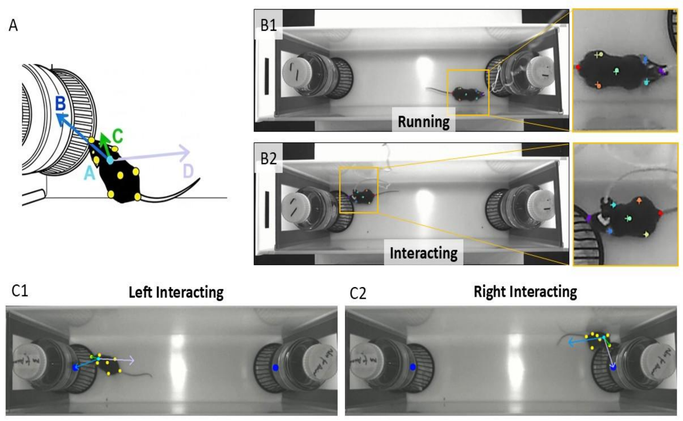
Learning Stage



Test/Recall Stage

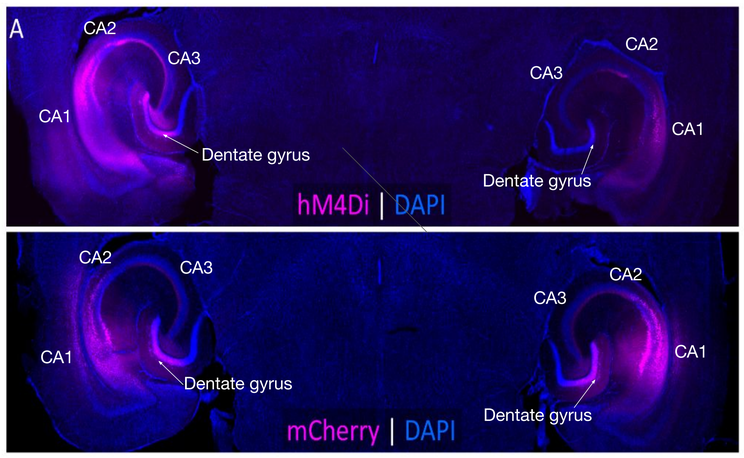
Results

Development of Machine Learning Pose-Tracking Model

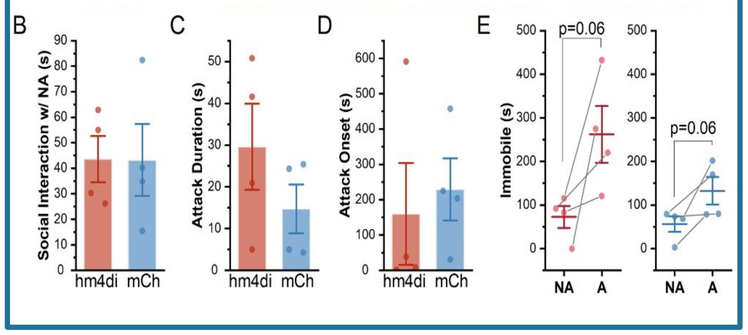


Results

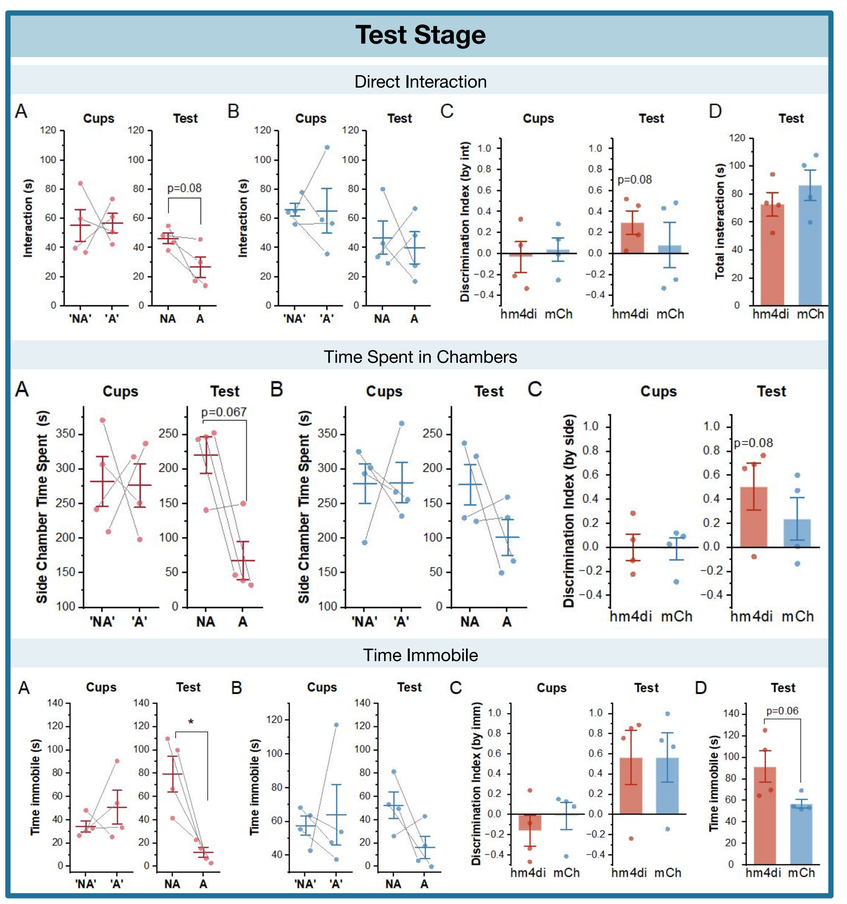
Histology Verification



Learning Stage



Test Stage



Conclusion

Inhibition of vCA1 neurons did not impair the ability of mice to discriminate against an individual associated with negative valence. However, mice in the experimental group exhibited significantly increased freezing behavior compared to the control, suggesting that vCA1 may contribute more to fear-like regulation than to the formation of social memories. These findings provide insight into the role of vCA1 in social and emotional processing and contributes to understanding the neural mechanisms behind neuropsychiatric disorders impairing social memory.

Future Directions

- Replicate the experiment across more cohorts to assess reproducibility
- Use transgenic mice to increase precision of the targeted inhibition of neurons
- Investigate fear regulation to determine whether vCA1 contributes to fear responses independently of social memory

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Scan for complete paper with references