INVESTIGATING THE NEUROANATOMICAL AND BEHAVIORAL CONSEQUENCES OF MOTHERHOOD

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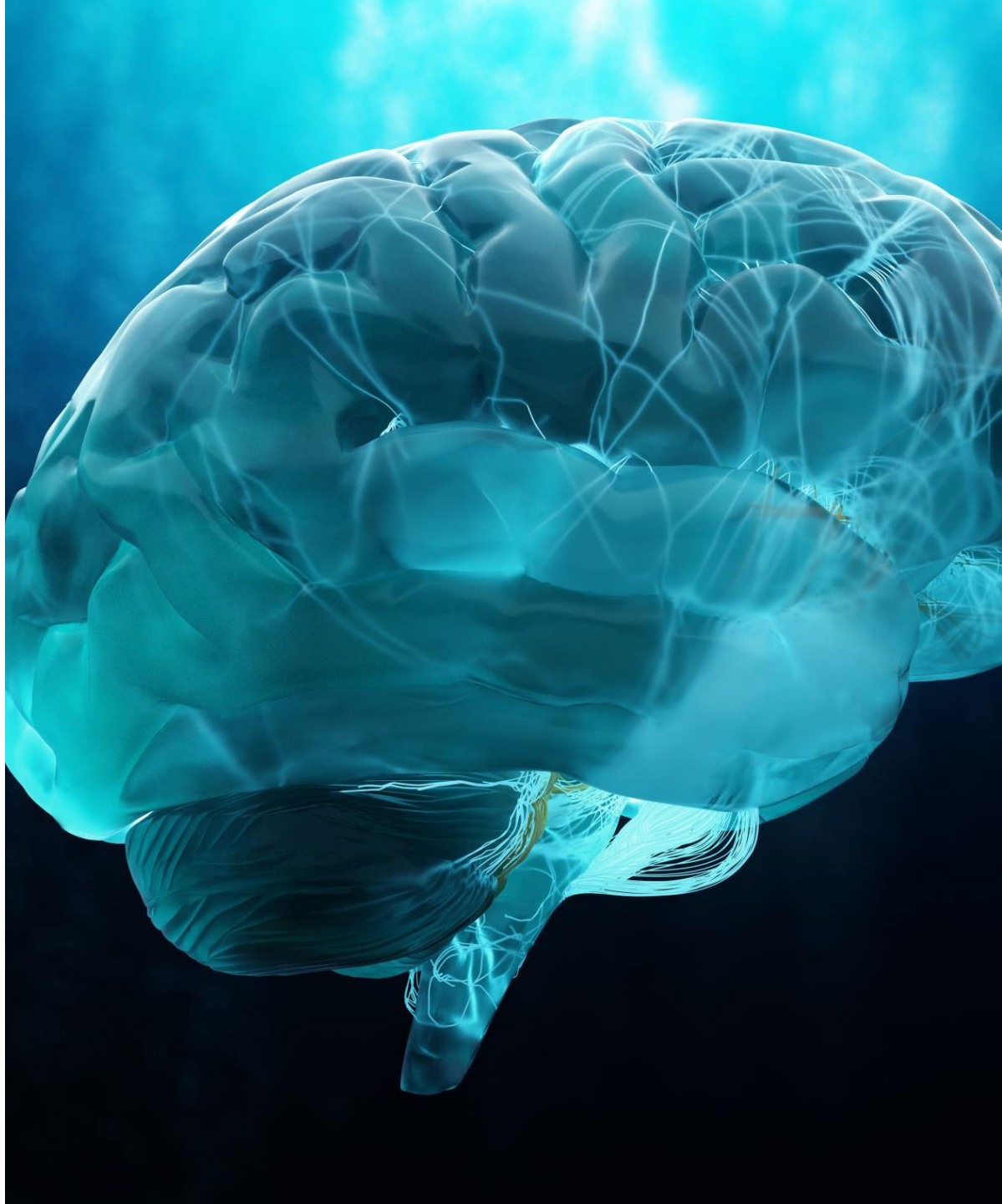


INTRODUCTION

The female body undergoes hormonal changes from puberty to menopause. Many women, not all, also experience pregnancy

Hormonal changes can lead to behavioral conditions, including “Mommy Brain”, characterized as memory deficits during pregnancy and sometimes post-partum

The hippocampus, a key region for memory made up of various subregions including the dentate gyrus, is regulated by neurotransmitters including GABA

The GABA-A receptor, composed of various subunits including the delta subunit, plays an important role in modulating inhibition

INTRODUCTION

Significant increases in hormones, specifically progesterone during pregnancy, causes the upregulation of GABA-A receptor proteins that decrease neuronal activity

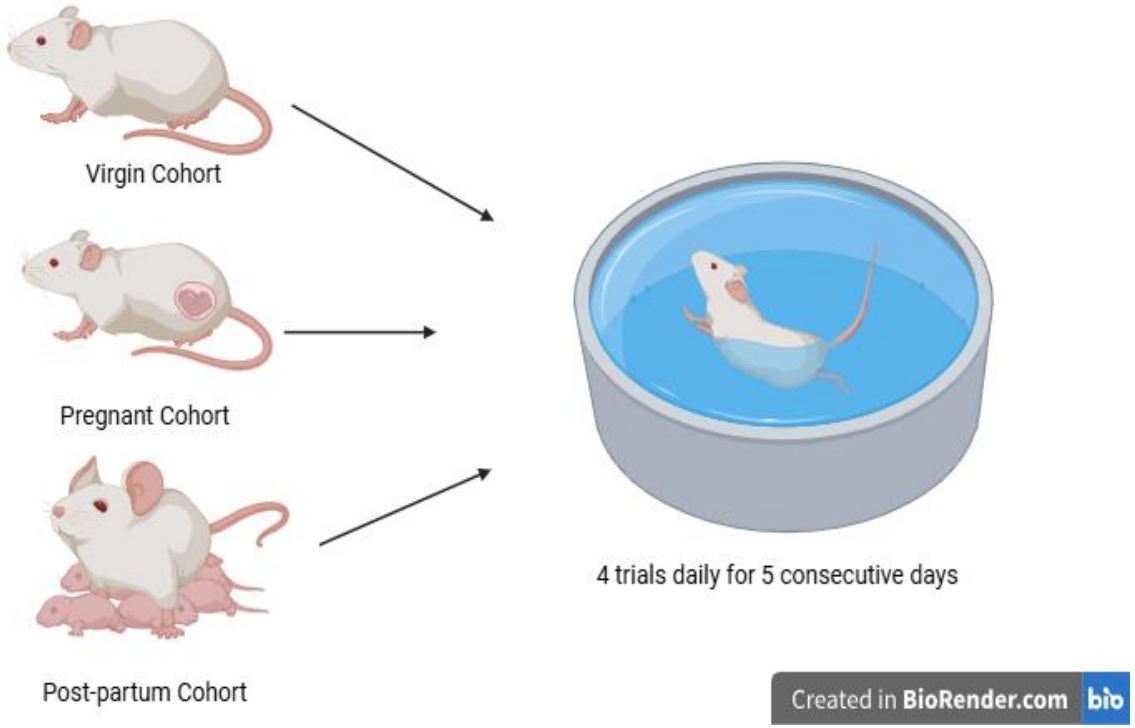
When the concentration of progesterone increases, a particular subunit (delta subunit) of the GABA-A receptor changes

This increased inhibition within the dentate gyrus of the hippocampus can result in memory deficits in what is observed to be “Mommy Brain”

RESEARCH QUESTION

Does pregnancy impact memory and how does delta subunit concentration of GABA-A receptors change before, during, and after pregnancy?

METHODS


Virgin Cohort
Pregnant Cohort
Post-partum Cohort
4 trials daily for 5 consecutive days
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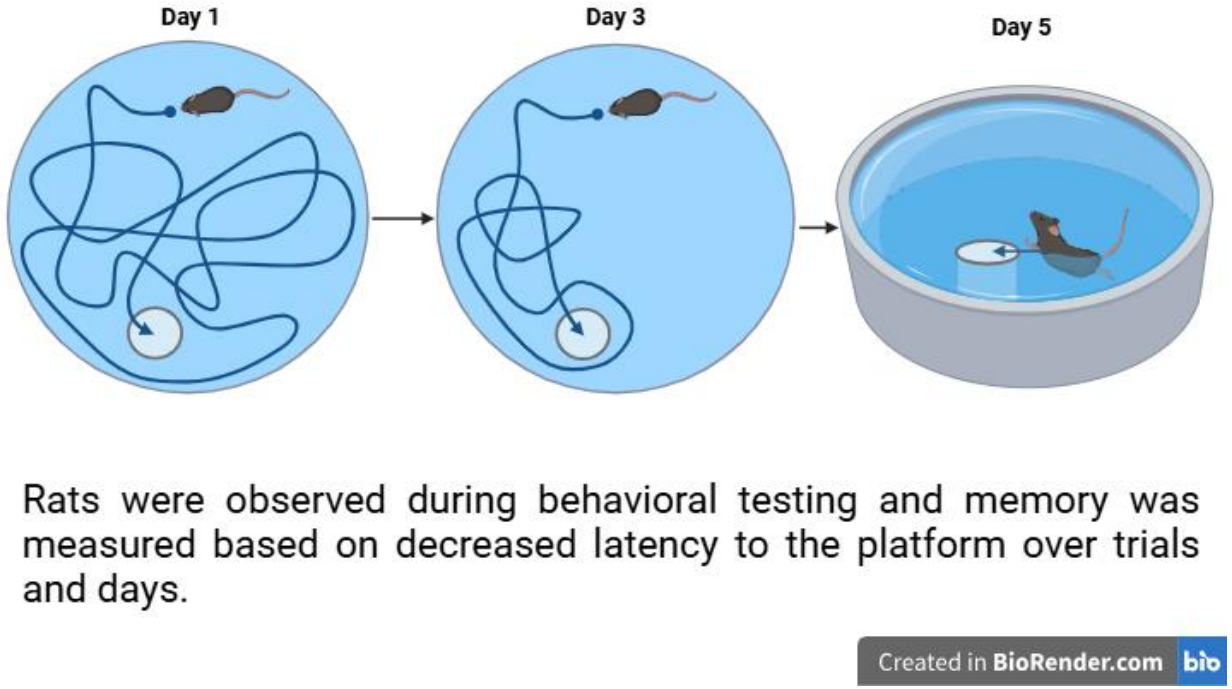
Day 1
Day 3
Day 5
Rats were observed during behavioral testing and memory was measured based on decreased latency to the platform over trials and days.
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BEHAVIORAL RESULTS

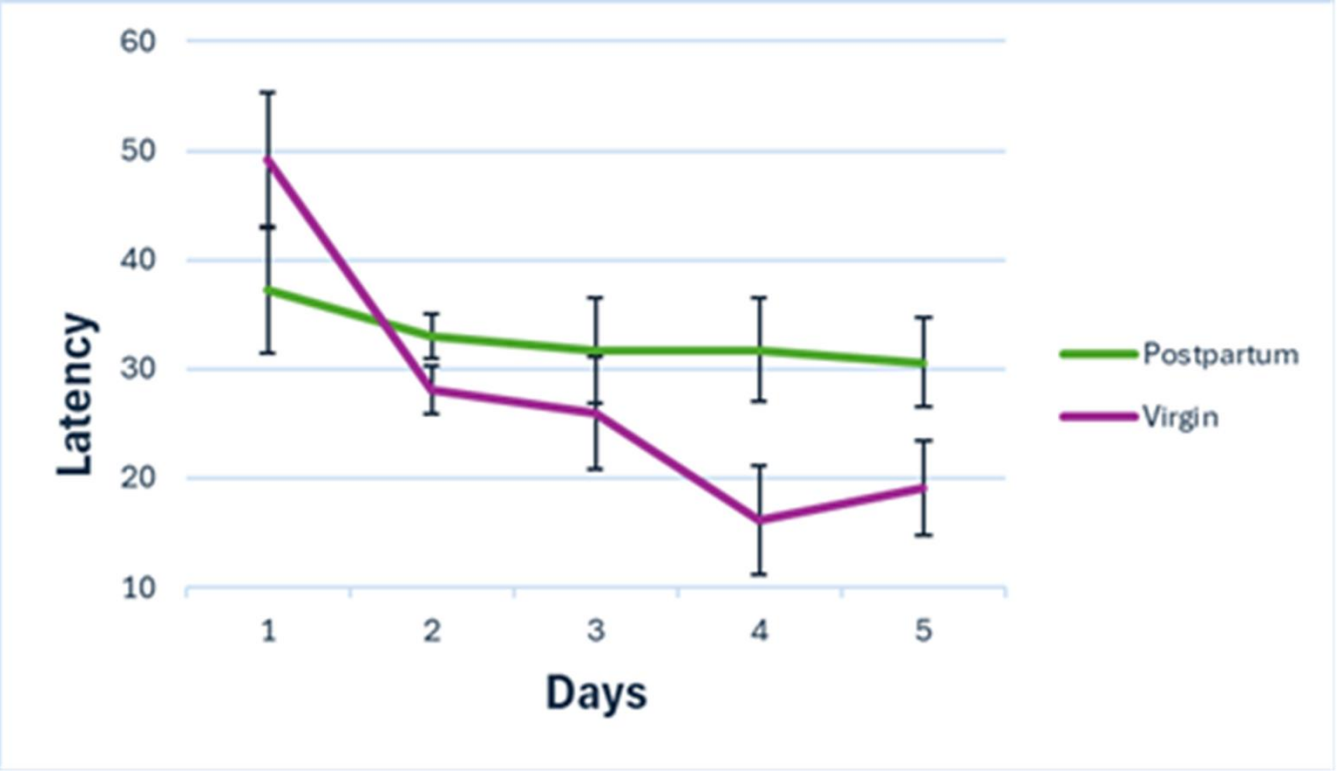
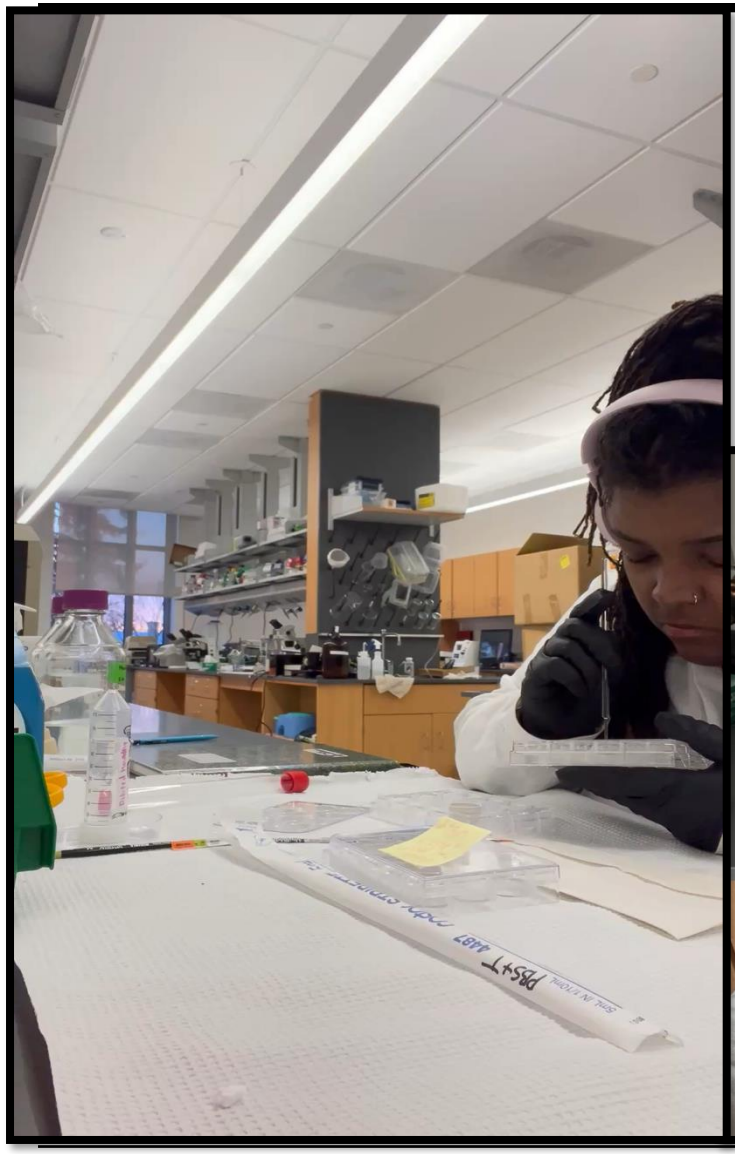
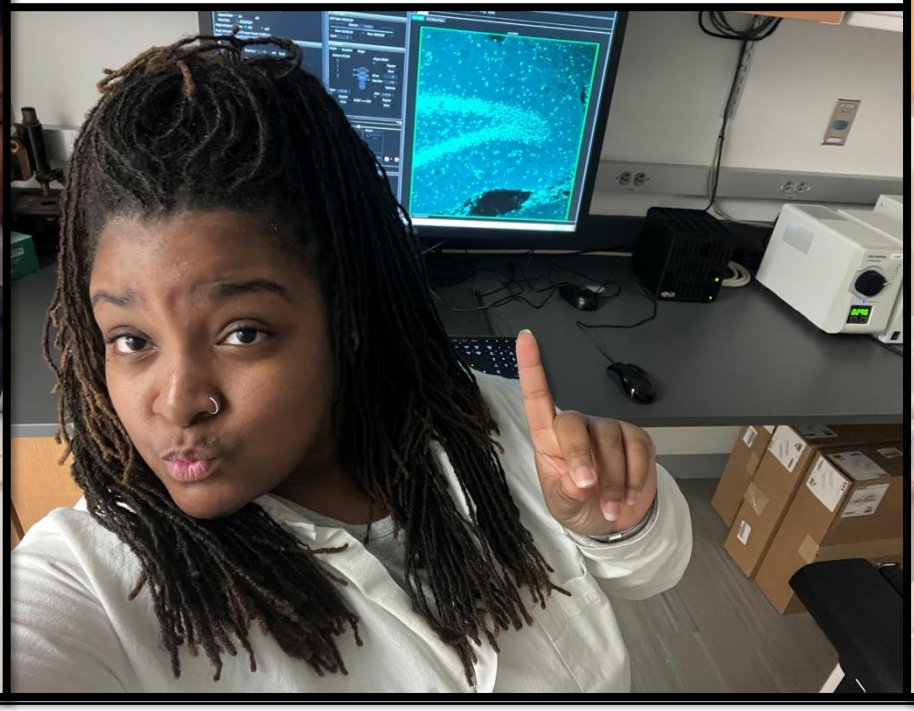


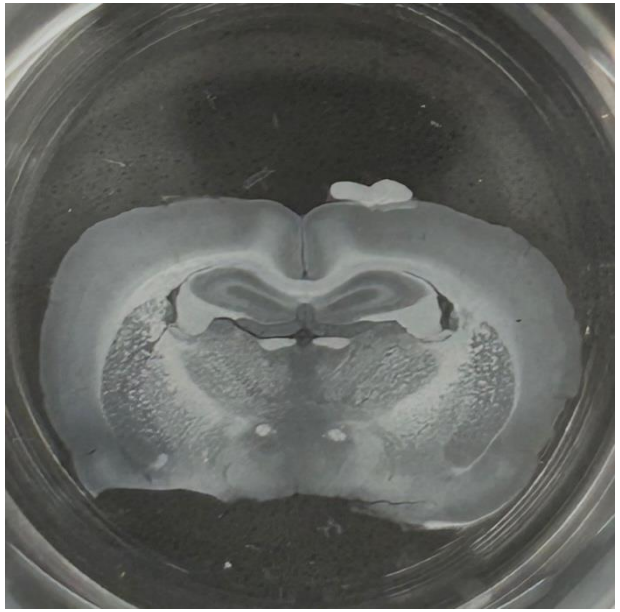
Figure 2 Latency to platform in MWM over five days of testing for postpartum and virgin Sprague-Dawley female rats. There was a significant interaction effect of learning over days, $p = 0.035$. Error bars indicate standard error of the mean (SEM)

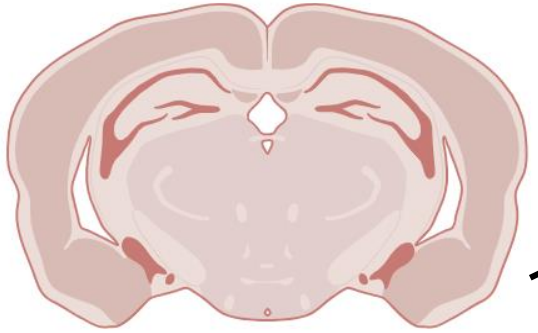
CELLULAR METHODS





CELLULAR RESULTS





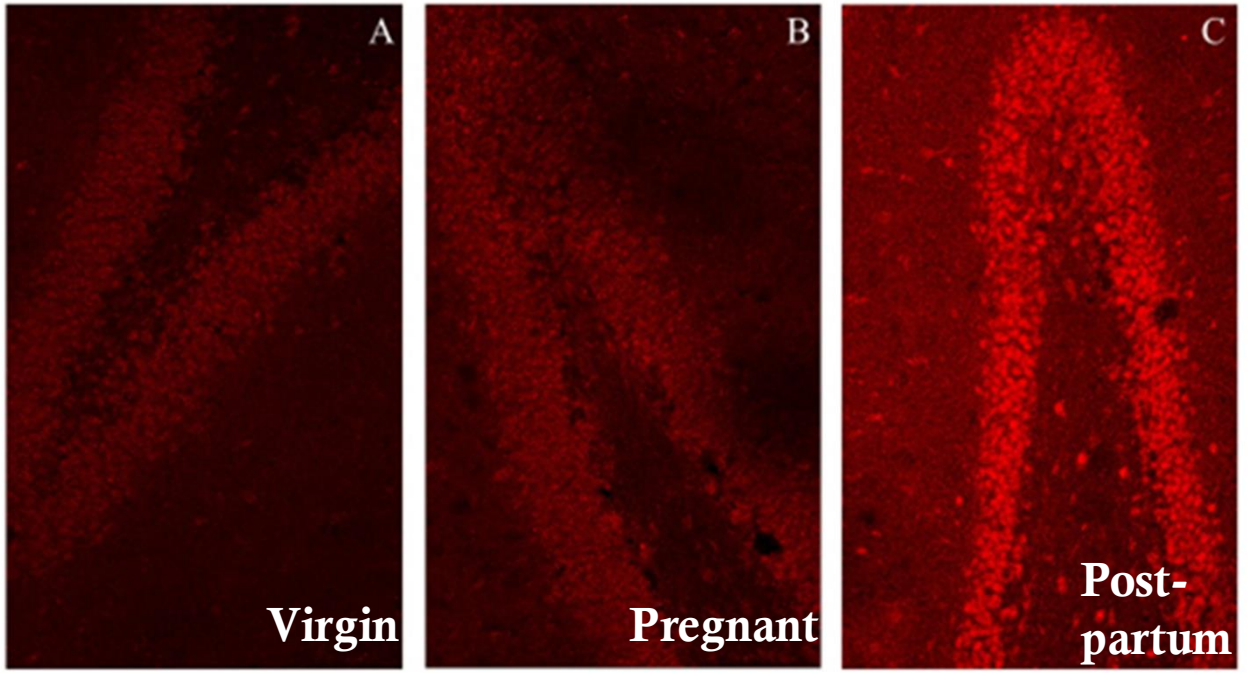


Figure 4 Representative images of the dentate gyrus with fluorescence illuminating the delta subunit. A. Virgin rat. B. Pregnant rat. C. Postpartum rat.

CELLULAR RESULTS

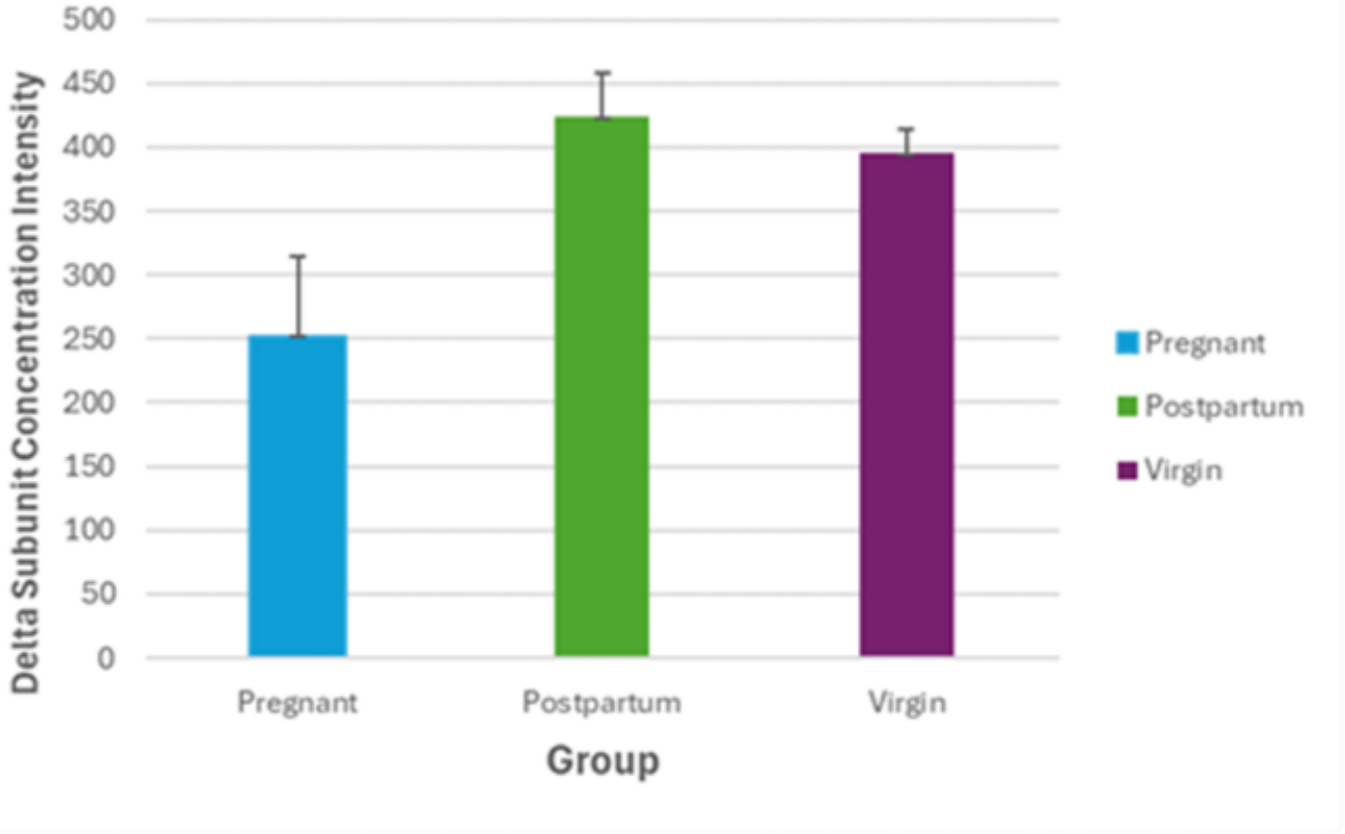


Figure 3 The concentration of the delta subunit measured through brightness intensity for virgin, postpartum, and pregnant brain sections, sourced from the dentate gyrus ($p = 0.332$). Error bars indicate SEM

FINDINGS AND FUTURE DIRECTIONS

- The Postpartum group did not learn. This rodent model for “Mommy Brain” supports anecdotal evidence that motherhood impairs memory

Future Behavioral Research

- Include data analysis of virgin, postpartum and pregnant females
- Emphasize memory differences at various maternal stages

Future Cellular Research

- Observe the activity of GABA-A receptors prior to conception, during pregnancy and postpartum using electrophysiology
- Investigate how these cellular changes in activity correlate with memory changes by pairing the cellular method with a hippocampally-dependent task.

TAKE HOME MESSAGE

Our evidence indicates that pregnancy can change behavior emphasizing the importance of listening to the concerns of mothers during maternal periods and beyond

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