

# NOGIN-Workshop

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The  
neurobiology  
behind  
bond disruption



# Mother-infant Dyad

The evolutionary and neurobiological origin  
for the capacity to form social bonds

Susceptible to any kind of perturbation

Oxytocin (Oxt) and Corticotropin-releasing  
factor (CRF) are mediators

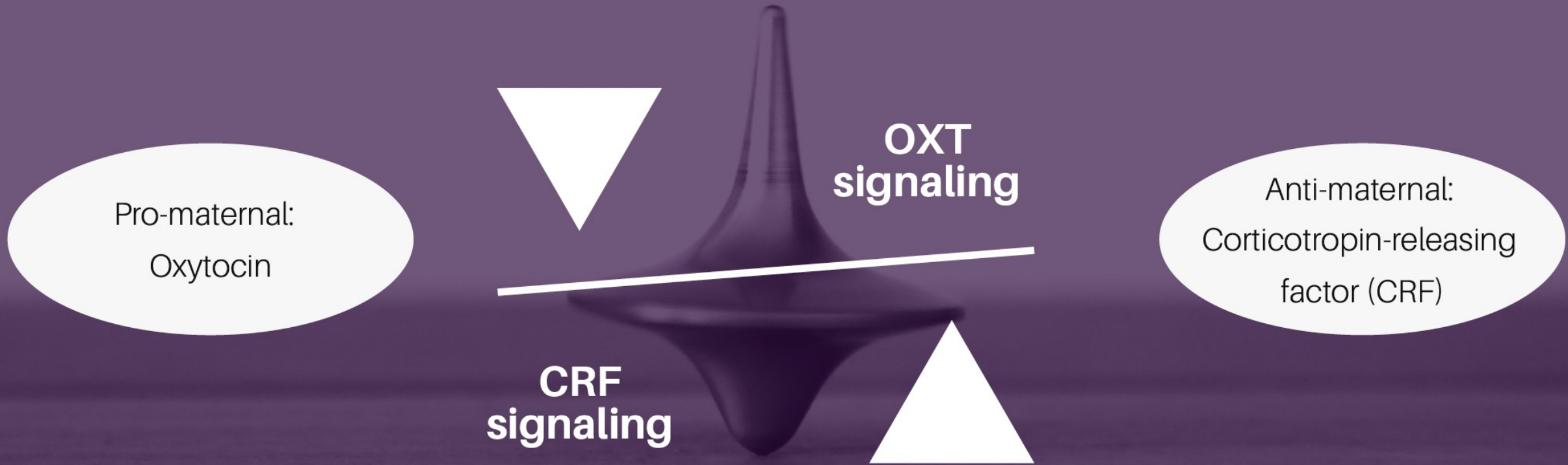


# Infant loss

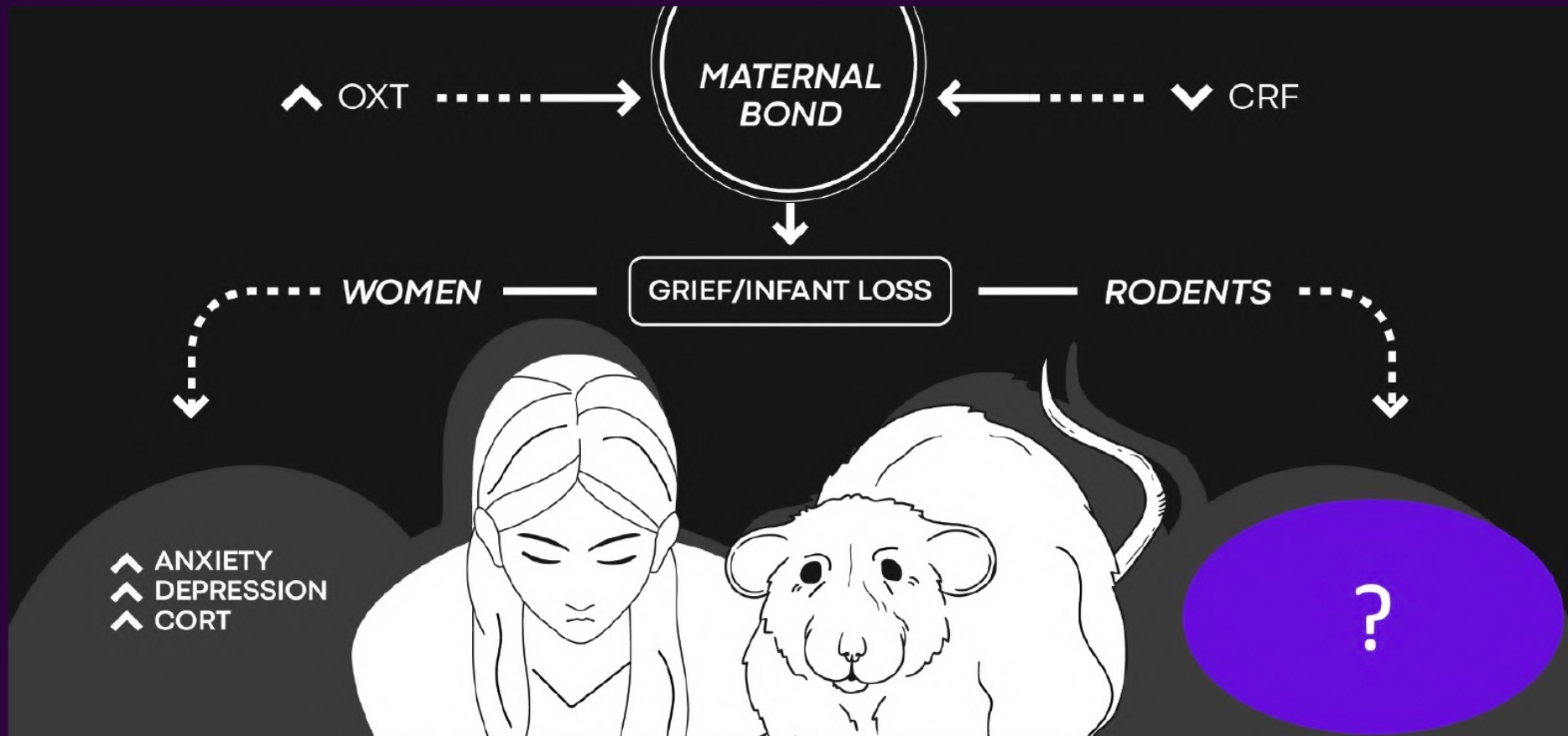
- Up to 94% of bereaved parents develop PGD
- Prolonged grief disorder is comorbid with depression, anxiety, and PTSD
- No specific treatment



# Maternal brain



# Hypothesis



# Towards an animal model of offspring loss

Control



Separated



# Towards an animal model of offspring loss

Control



Separated



Virgin



**Short term:**

1, 3, 6 days

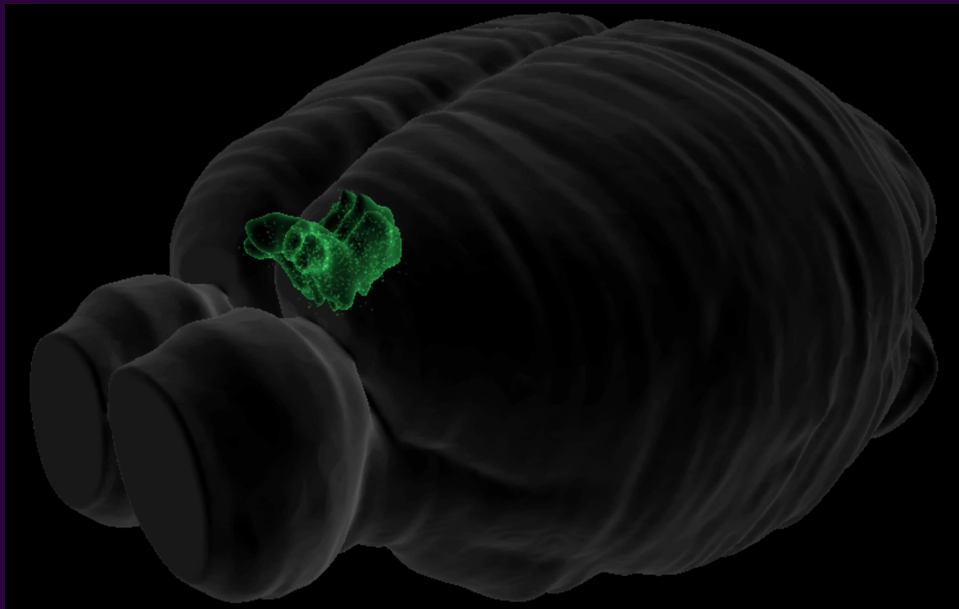


Does  
offspring loss  
impact  
neuronal  
activity?

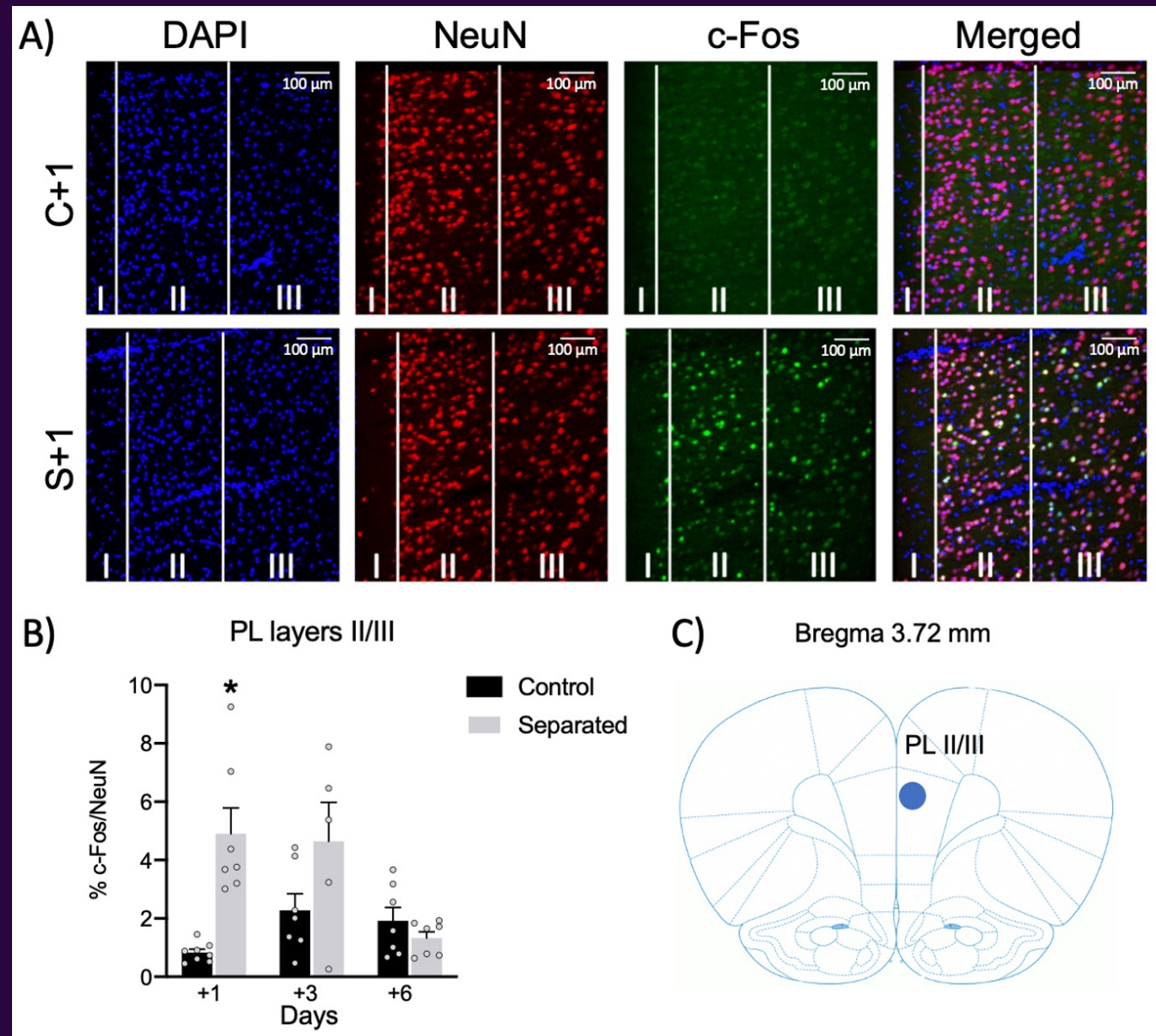


# Increased neuronal activity in the PL

Superficial layers I/II/III

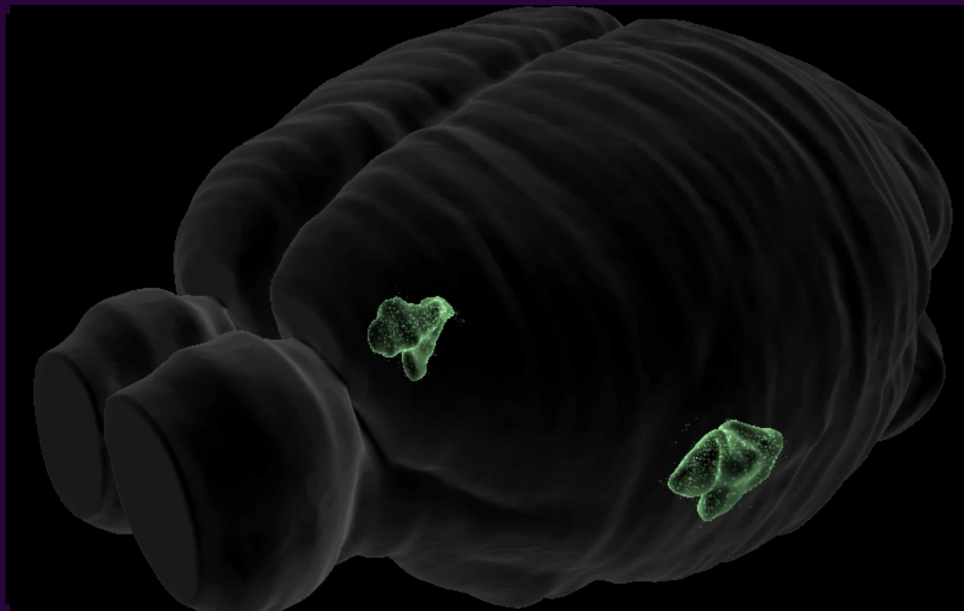


Demarchi et al, in preparation

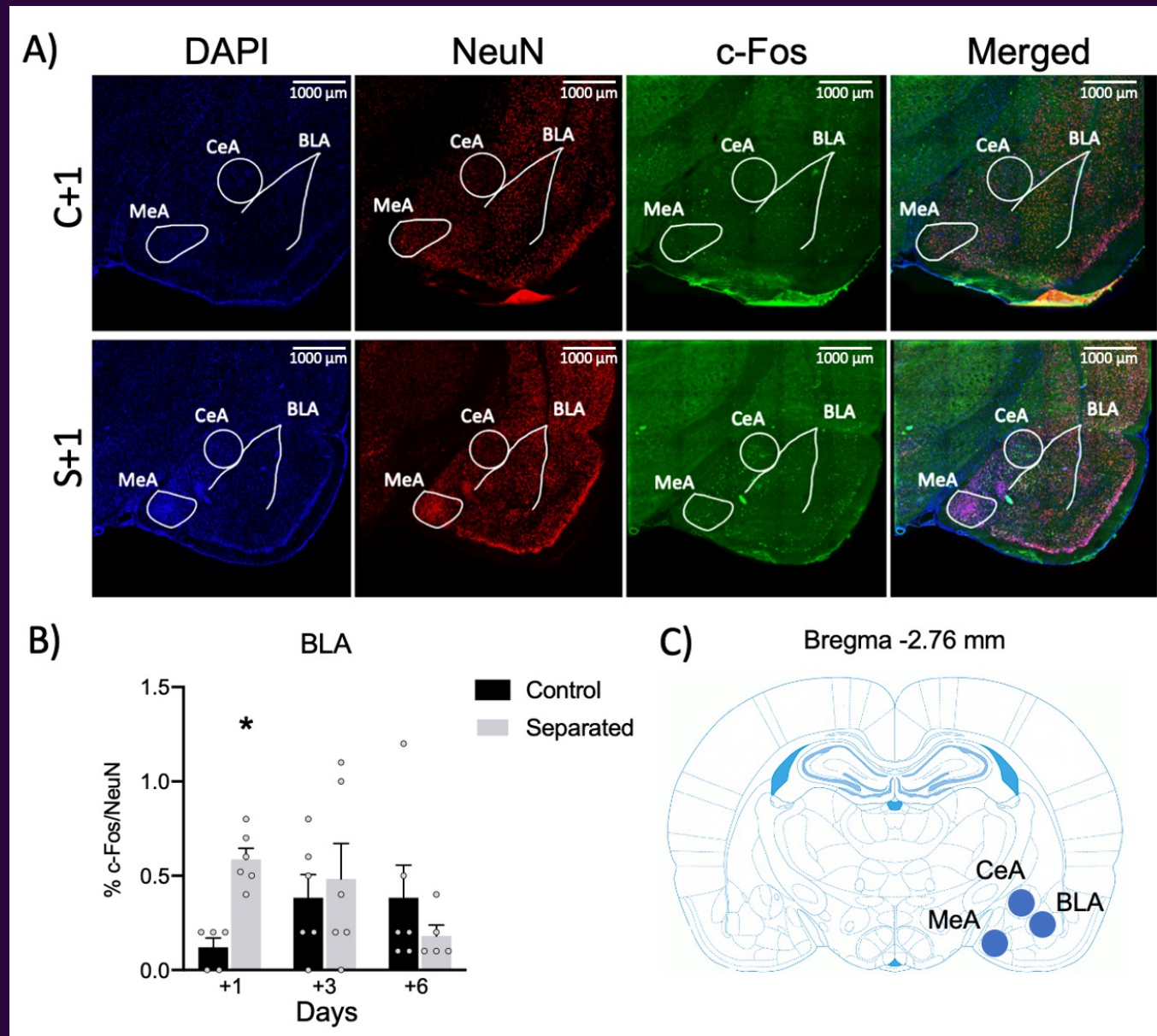


# Increased neuronal activity in the BLA

Basolateral amygdala

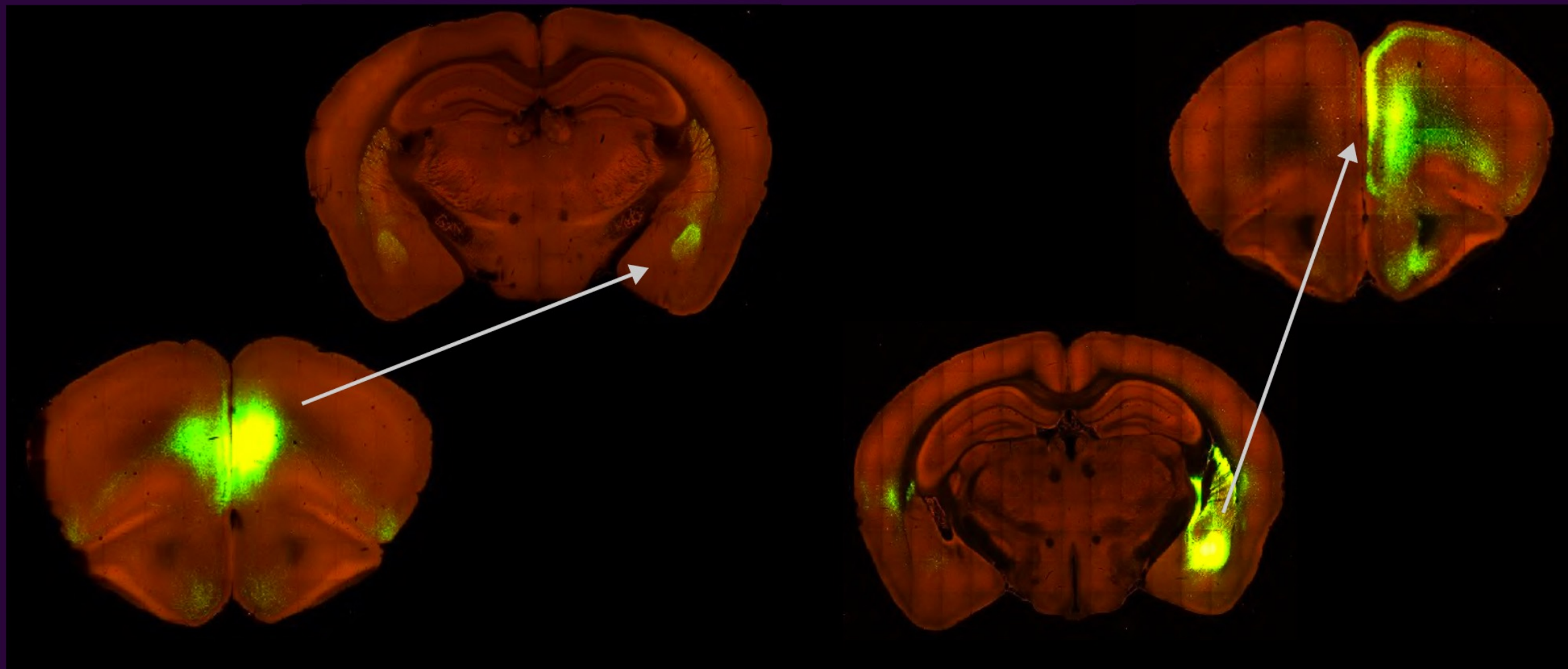


Demarchi et al, in preparation

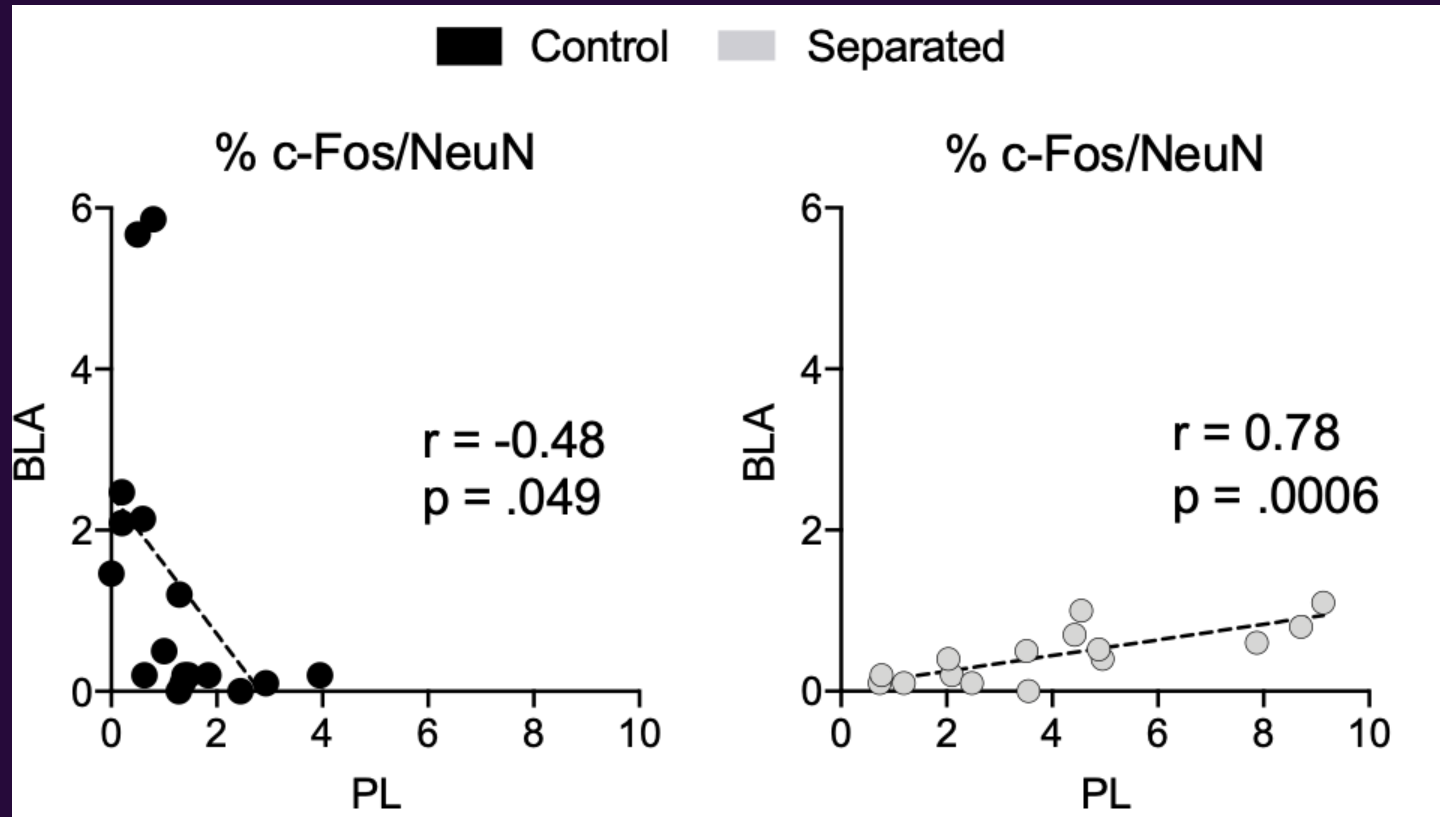


PL → BLA

BLA → PL






# Activation pattern

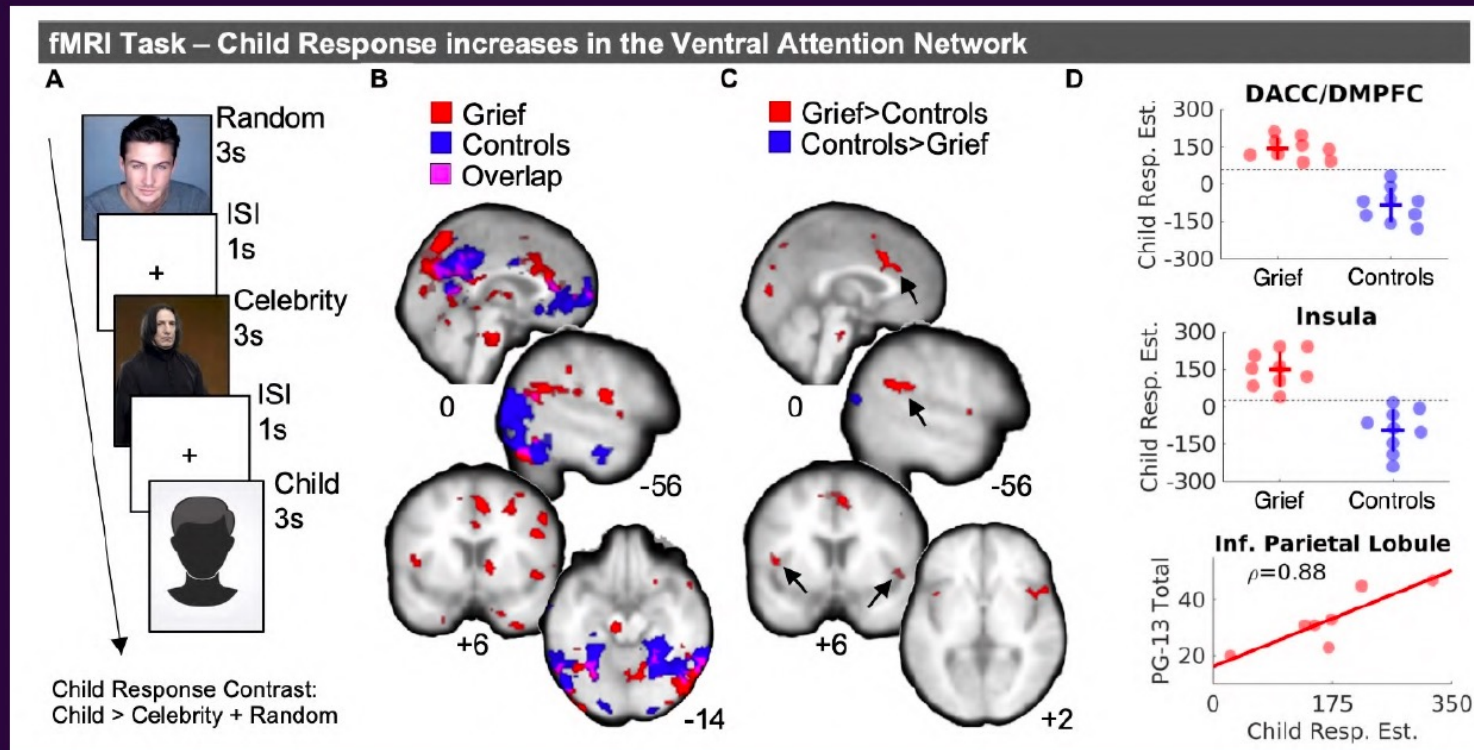


# Why do mothers never stop grieving for their deceased children? Enduring alterations of brain connectivity and function

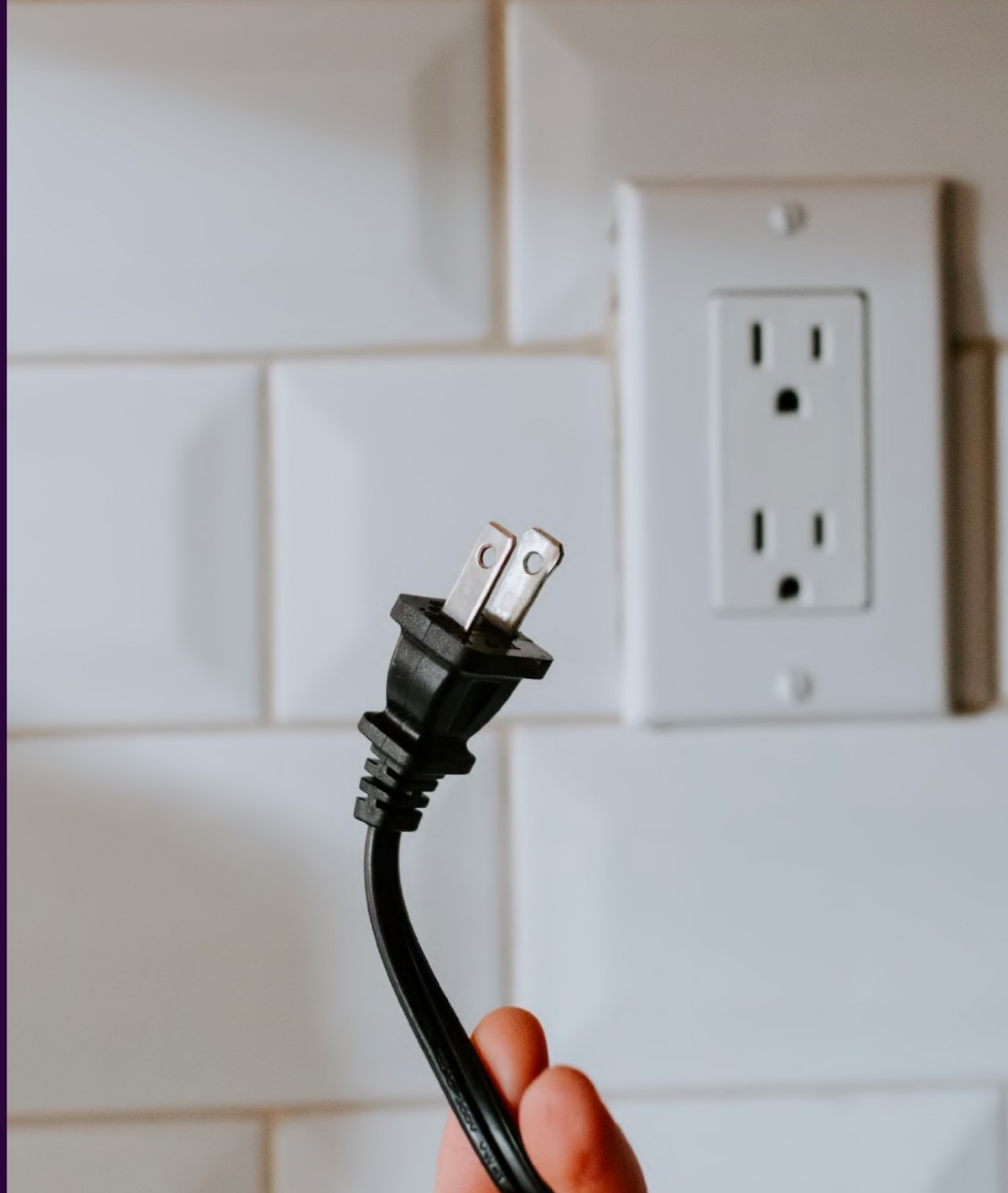
Sarah M. Kark<sup>1,2</sup>, Joren G. Adams<sup>1,2</sup>, Mithra Sathishkumar<sup>1,2</sup>, Steven J. Granger<sup>1,2</sup>, Liv McMillan<sup>1,2</sup>, Tallie Z. Baram<sup>1,3,4\*</sup> and Michael A. Yassa<sup>1,2,4\*</sup>

# Increased Amygdala Activations during the Emotional Experience of Death-Related Pictures in Complicated Grief: An fMRI Study

Manuel Fernández-Alcántara<sup>1,2,3</sup> , Juan Verdejo-Román<sup>1,4,\*</sup> , Francisco Cruz-Quintana<sup>1,3</sup>, Miguel Pérez-García<sup>1</sup>, Andrés Catena-Martínez<sup>1</sup>, María Inmaculada Fernández-Ávalos<sup>2</sup> and María Nieves Pérez-Marfil<sup>1,3</sup> 

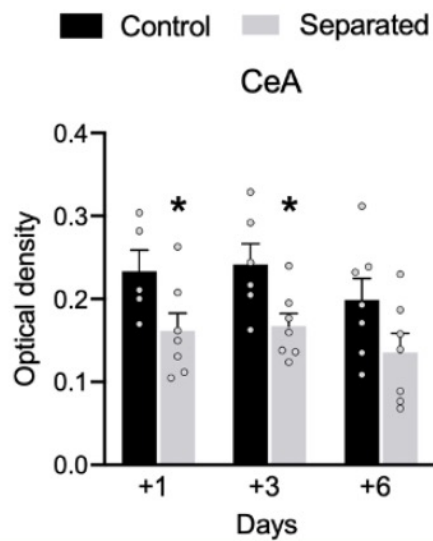
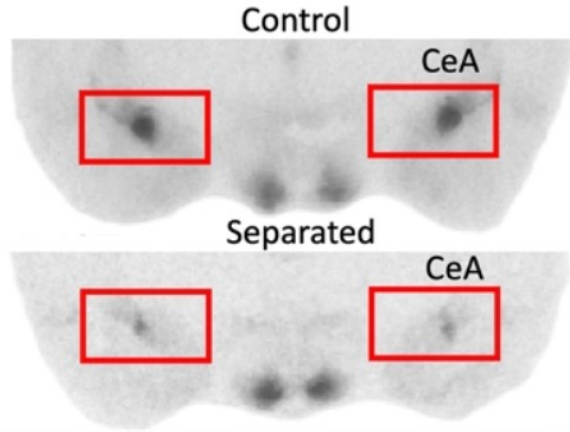


Does offspring  
loss impact  
oxytocin receptor  
binding?

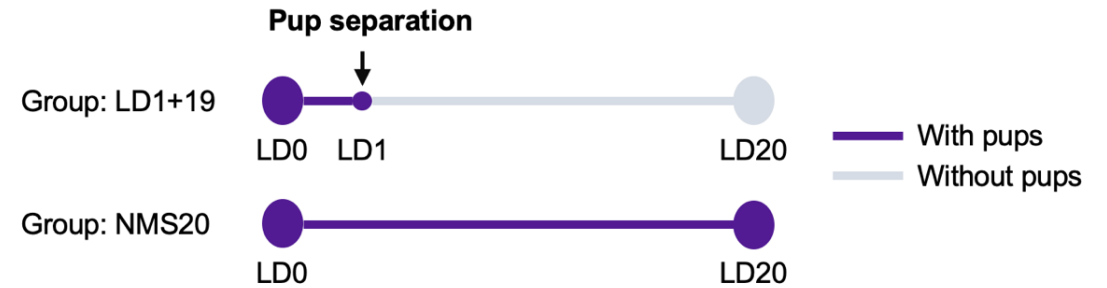


# Altered Oxytocin receptor binding

## Short-term



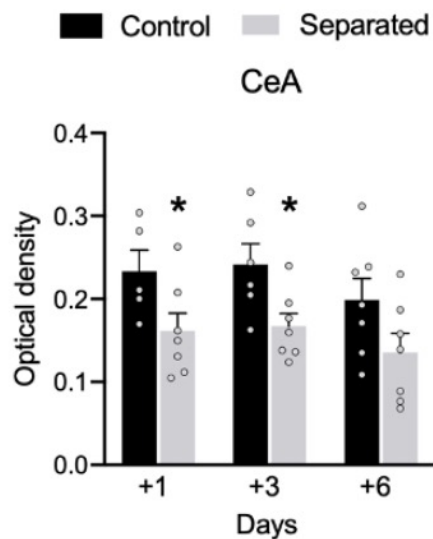
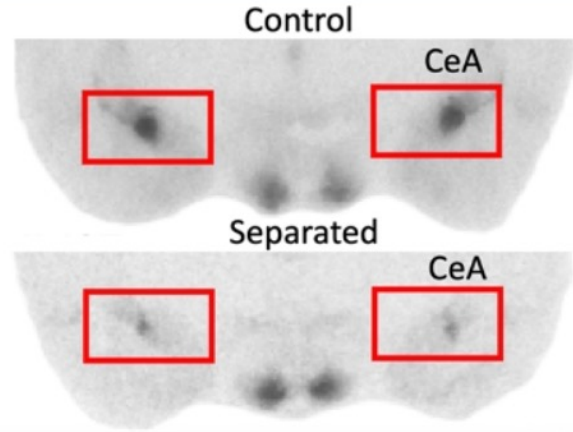
## Long-term



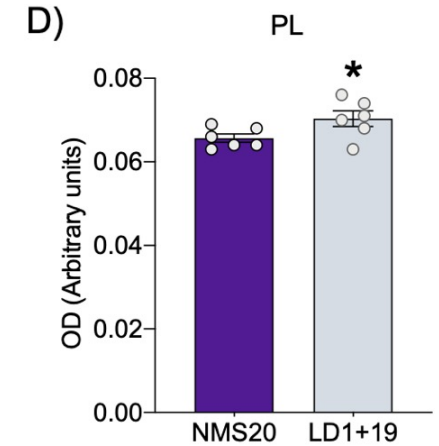
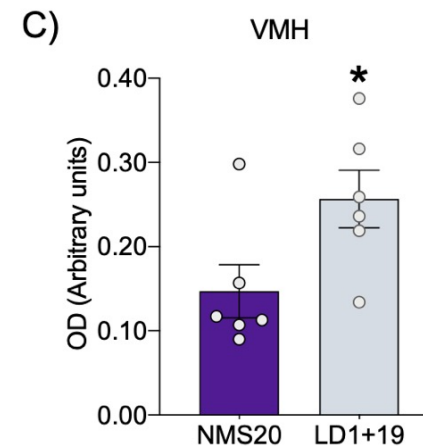
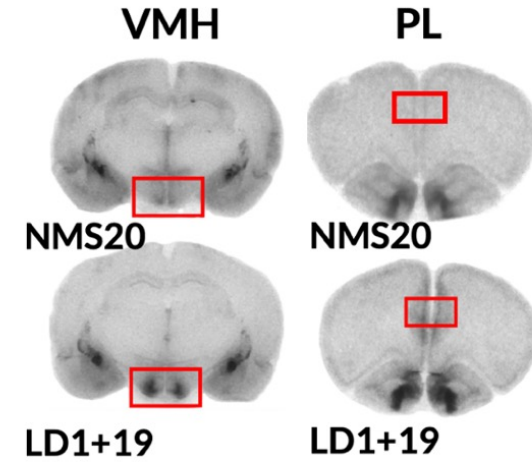


# Altered Oxytocin receptor binding

## Short-term

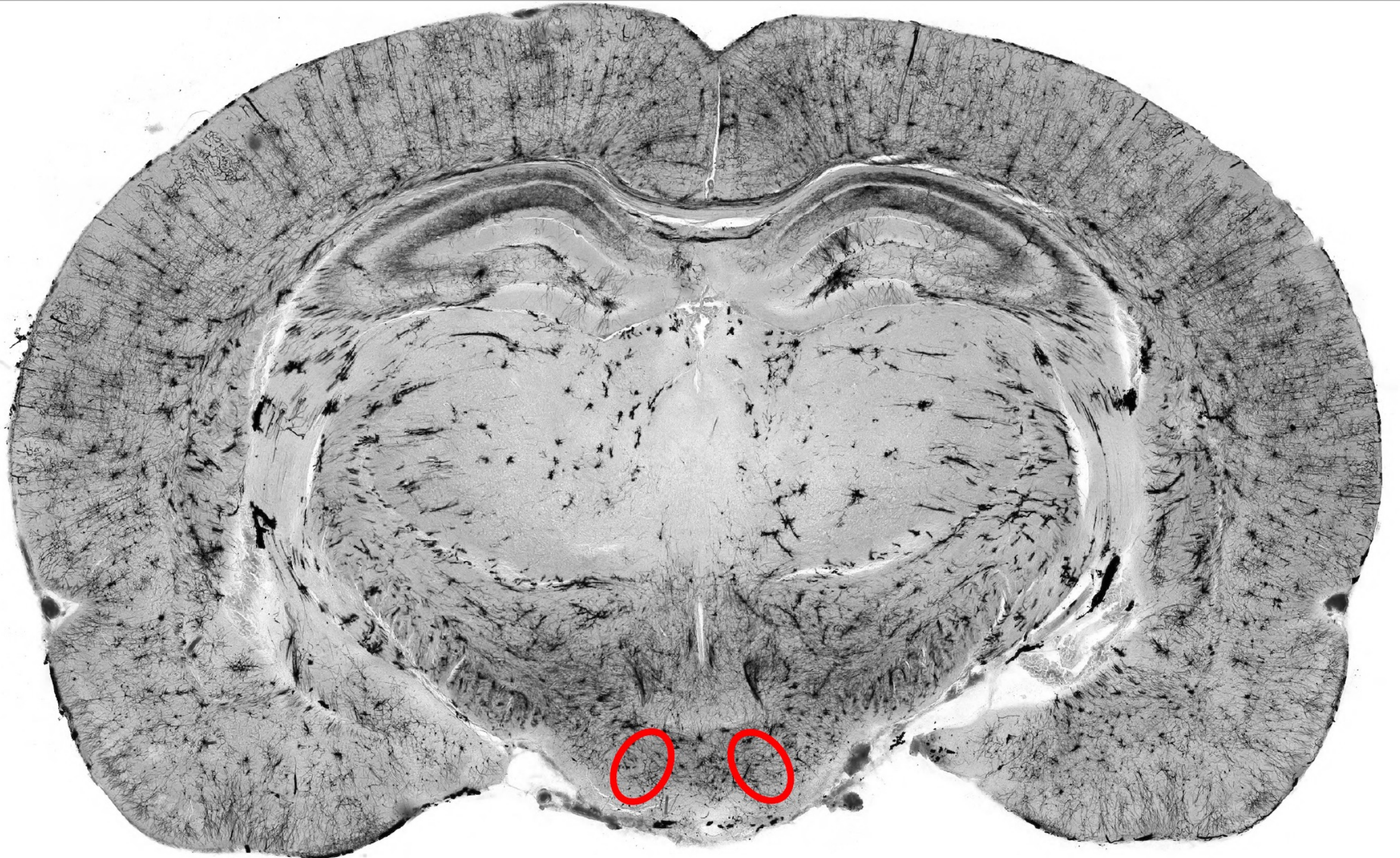


## Long-term

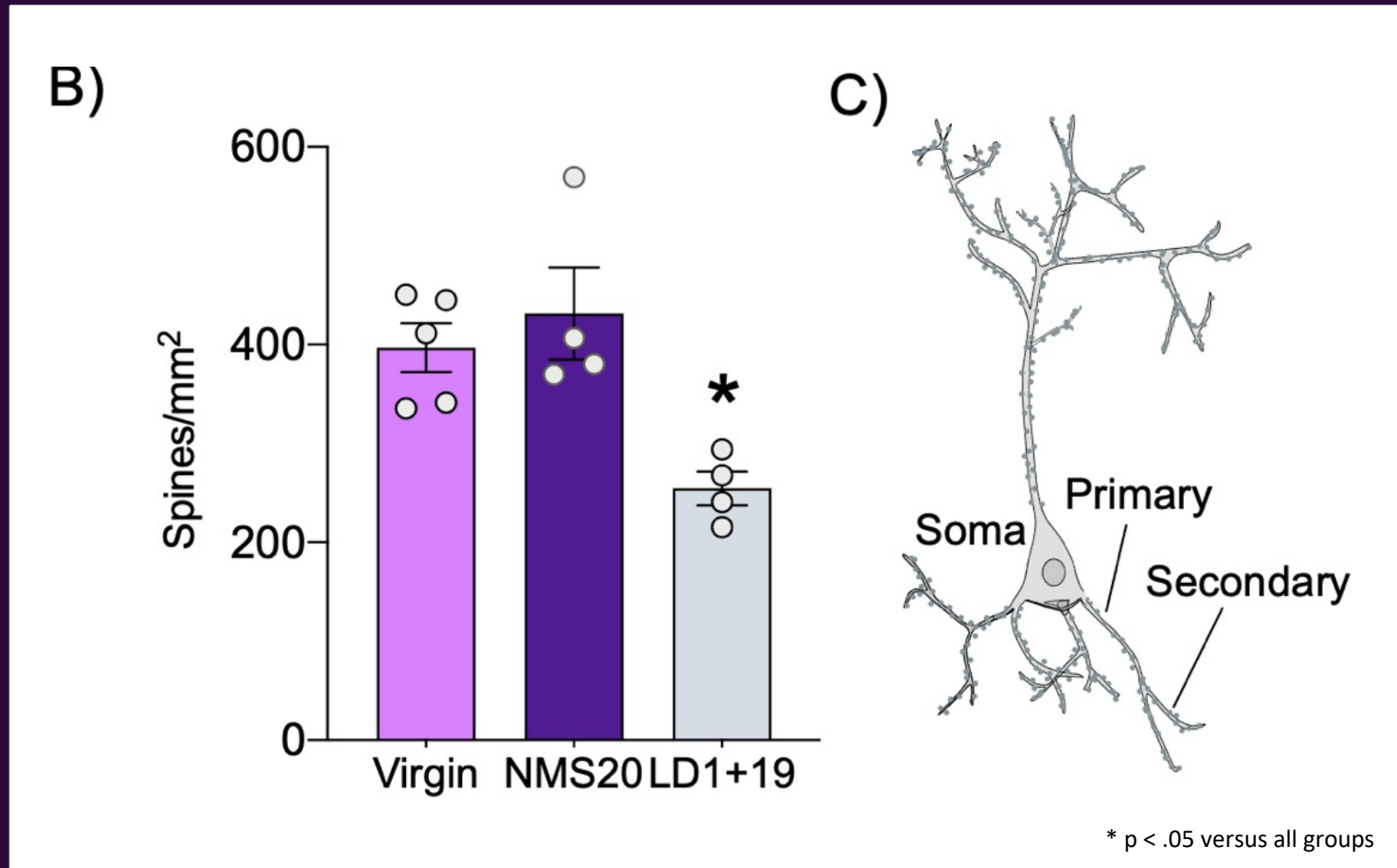


Does offspring  
loss impact  
dendritic spines?





# Decrease in dendritic spines



Does offspring  
loss impact  
mother's  
emotionality?



# Offspring loss impact mother's emotionality



Control



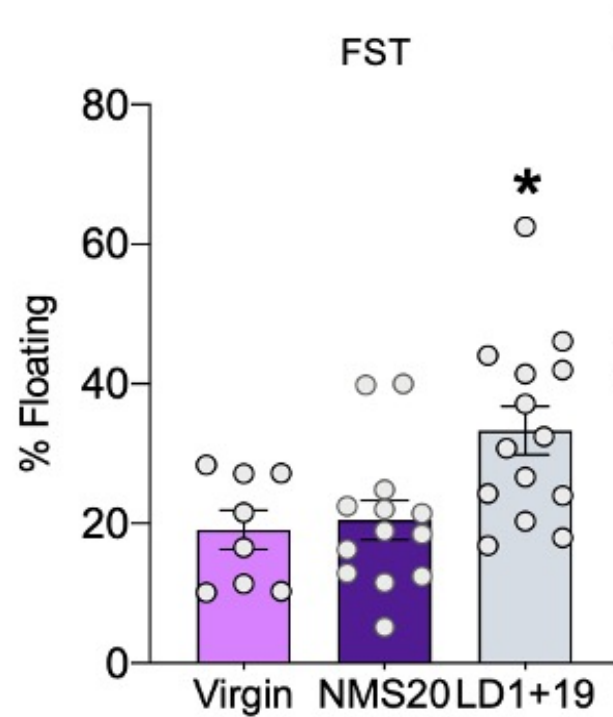
Separated

# Offspring loss impact mother's emotionality

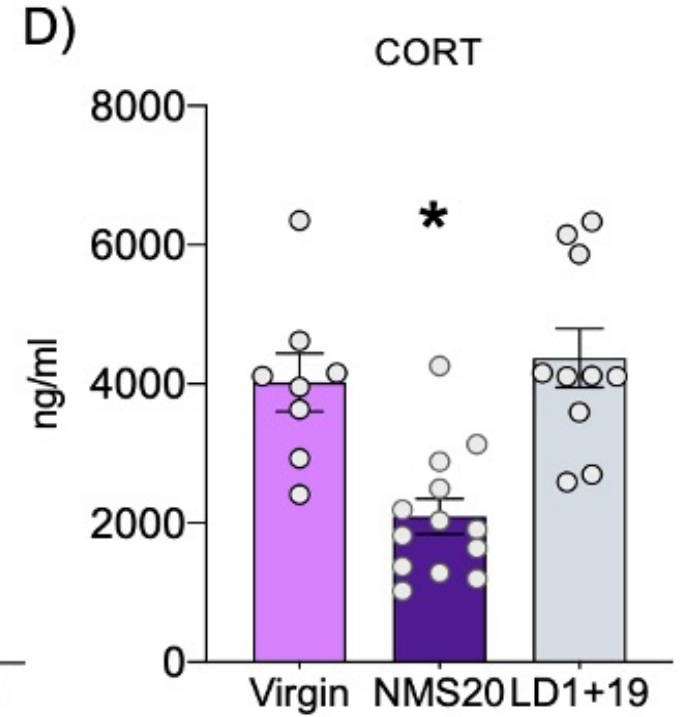
Forced swim test



C)



D)

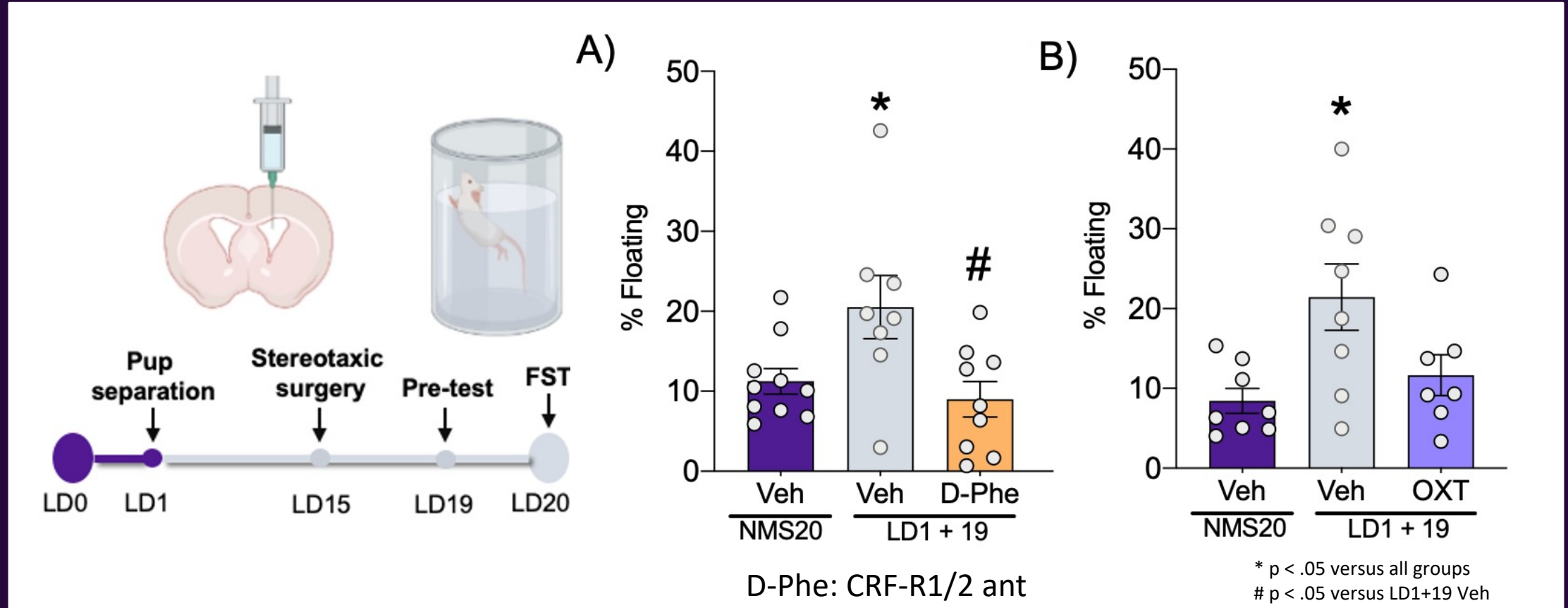


# Pharmacological manipulation





# CRF-R1/2 antagonist rescued impaired phenotype



# Conclusion

Development of an animal model for the investigation of maternal grief

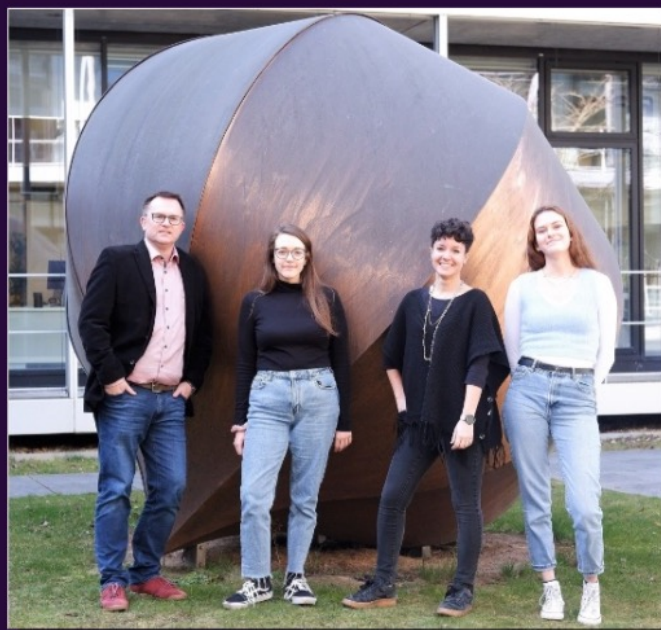
Offspring loss negatively impacts the mother's rat emotionality

Oxytocin, CRF and neuroplasticity are affected by the experience

The blocking of the CRF systems rescued the impaired phenotype

## Prof. Oliver Bosch

Dr. Jodi Pawluski  
Alice Sanson  
Emma Rocaboy  
Maria Breitkopf  
Lucia Saller  
Miriam Schwarz  
Sofia Pena-Pena  
Anna-Lena Boos  
Tamina Gebhardt



GRK members



Neumann Lab

Thanks for the  
attention

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Universität Regensburg