

Introduction

- Maternal experiences of childhood maltreatment often lead to increased offspring risk¹⁻³, including neurodevelopmental and behavioral problems^{3,4}.
- Brain mechanisms may account for intergenerational effects of maternal maltreatment, with data showing associations between maternal maltreatment history and newborn infants' brain structure^{5,6}.
- We aim to examine if maternal experiences of childhood maltreatment are associated with infant white matter microstructure of the corpus callosum (CC) and the corticospinal tract (CST).
- We hypothesize that infants of mothers with a maltreatment history have altered brain connectivity in the CC, which is responsible for high-order cognitive functions, but not in the CST, which is a white matter motor pathway.

Methods

Participants:

- 45 mother-infant dyads were included.
- Infant age: M=11.68 months, SD=5.9 months.

Neuropsychological Testing:

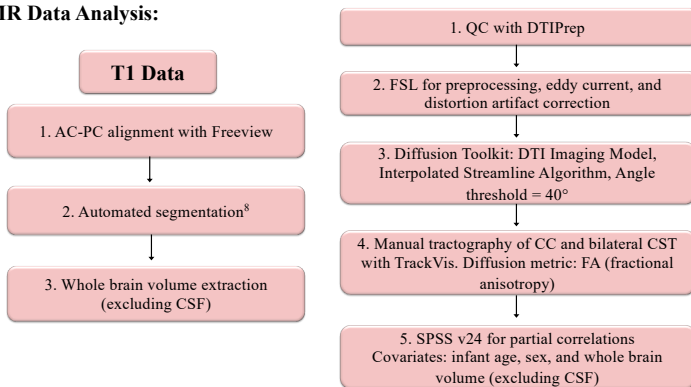
- Mothers completed the Maltreatment and Abuse Chronology of Exposure Scale (MACE)⁷.

MRI Acquisition:

- Infant MRIs were performed with 3T Siemens at BCH (64-ch head coil). No sedation was used.
- Imaging parameters:
 - T1-weighted sequence: voxel size=1x1x1mm, TE=1.69-2.37ms, TR=2500-2540ms, TI=1450ms, FOV=180-192mm².
 - Diffusion-weighted sequence: 60 gradient directions at b=1000s/mm², 4 b=0s/mm² volumes, voxel size=2x2x2mm, TE=89-90ms, TR=4300-5700ms, FOV=96mm².

DWI Data

MR Data Analysis:



Results

- There were significant negative correlations between the FA value of the CC and the following MACE scores: multiple forms of abuse/neglect, severity, witnessing interparental violence, peer physical abuse, emotional neglect, and physical neglect. There were no significant correlations between the FA values of the bilateral CST and the MACE scores. There was a correlation with a p-value that was below p<0.05 (FA right CST with sexual abuse, p=0.04, r=0.348), but it did not survive FDR correction.

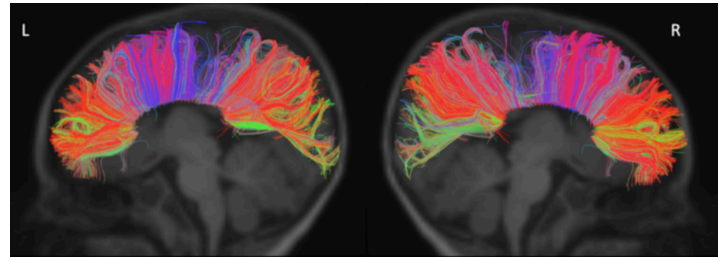


Figure 1. CC reconstruction based on diffusion MRI tractography. Images show the CC as viewed from left and right hemisphere for one child (age: 15 months, female), displayed on a T1-weighted image.

Correlation Between FA value of CC and MACE scores

MACE Subscale	p-value	r-value
Multiple forms of abuse/neglect	0.006	-0.455
Witnessing interparental violence	0.001	-0.528
Peer physical abuse	0.004	-0.477
Emotional neglect	0.007	-0.451
Physical neglect	0.003	-0.48
Severity	0.005	-0.46

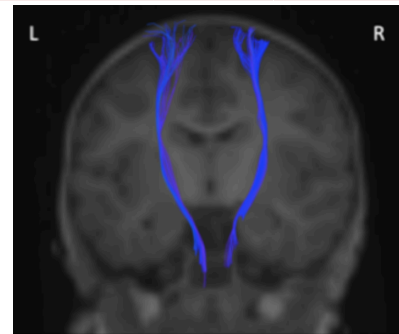


Figure 2. CST reconstruction based on diffusion MRI tractography. Images show the CSTs as viewed from the posterior on the coronal image for one child (age: 15 months, female), displayed on a T1-weighted image.

Conclusions

- These findings suggest that infants of mothers who have suffered childhood maltreatment have diffuse alterations in white matter connectivity within the CC and CST.
- While history of maltreatment in a mother may alter the microstructure of the offspring's white matter pathways that take part in higher-order cognitive processes, pathways responsible for more basic functions, such as motor pathways may be less affected.

References

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