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Introduction

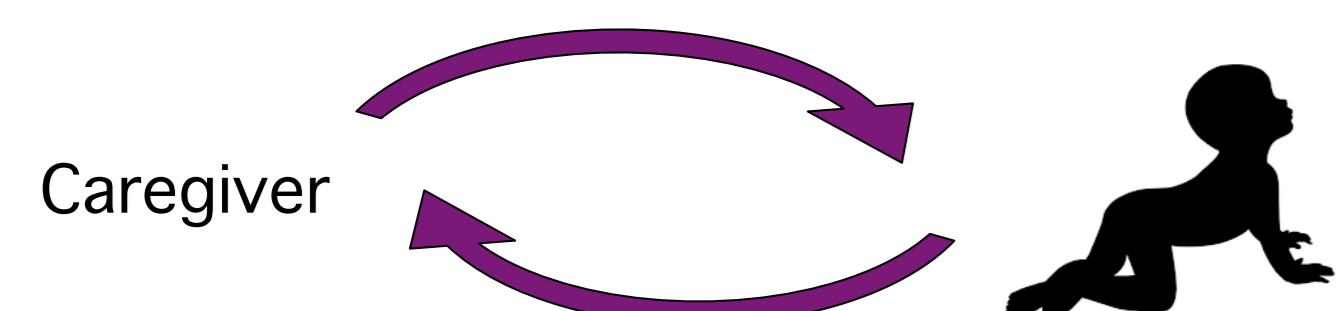
Parent-child attachment

- Child attachment behaviors: seek caregiver proximity
- Attachment quality: modulated by caregiver responses (ex. sensitivity)



Attachment security: Fluid balance between

1. Child exploration of the environment



2. Appropriate reliance on the caregiver for support when needed

Attachment security associated with

- Cognitive, social, and emotional development
- Brain morphology

Background

Attachment quality and grey matter volume (GMV)

- Higher attachment quality in infancy → Larger grey matter volume in frontal and temporal regions (our sample ¹)
- Larger amygdalar GMV in adulthood ^{2, 3}

Attachment-related constructs and white matter volume (WMV)

- Higher parental sensitivity in early childhood → Larger total white matter volume ⁴
- Maltreated children vs. controls → Reduced total WMV ⁵
- Reduced corpus callosum volume ⁶

No study has yet investigated the association between attachment security and WMV

The current study

- Preliminary analyses
- This study aimed to explore the associations between attachment security in infancy and regional and total WMV in late childhood in a community-based sample

Method

Participants

- 33 children (13 boys) and their mothers were assessed when children were
- 15 months (T1; M = 15.65, SD = 0.97, range = 14.50 – 18.00)
 - 10 years (T2; M = 10.59, SD = 0.46, range = 10.0 – 11.67)

Measures

Attachment security (T1; Attachment Q-Sort ⁷)

- Observation 70-90 min at the family home
- 90 items: 9 clusters of 10 items each



- Ex: “Child clearly shows a pattern of using mother as a base from which to explore. Moves out to play; returns or plays near her; moves out to play again, etc”
- Observed sort is correlated to a criterion sort representing the prototypical securely attached child
 - Score: (highly insecure) -1 to 1 (highly secure)
- ICC = .72

Structural Magnetic Resonance Imaging (T2)

Acquisition

- Standard 3D T1-weighted whole-brain protocol

Pre-processing

- CAT12 ⁸, MATLAB
- Pediatric template ⁹
- Smoothing 8 mm FWHM



Statistical analyses

- Multiple regressions were performed in SPSS to predict total WMV based on attachment security
- Multiple regressions were performed in CAT12, MATLAB, to predict regional WMV based on attachment security
 - TFCE toolbox, FWE correction

Results

Total white matter volume

- Children more securely attached to their mother in infancy had smaller total WMV in late childhood ($\beta = -.22, p = .001$)

Regional white matter volume

Table 1. White matter regions negatively associated with attachment security, controlling for child age, sex, pubertal status, total ICV, and maternal education

White matter regions	MNI coordinates	k	T
Right hemisphere			
CC, SLF, and cingulum	-12, 33, 14	8369	8.39
Left hemisphere			
SLF and corona radiata	34, -12, 40	4640	5.39

Notes. CC = corpus callosum. SLF = superior longitudinal fasciculus. $p < .05$, corrected.

- Children more securely attached to their mother in infancy have smaller WMV in several brain regions in late childhood
- No positive associations were found

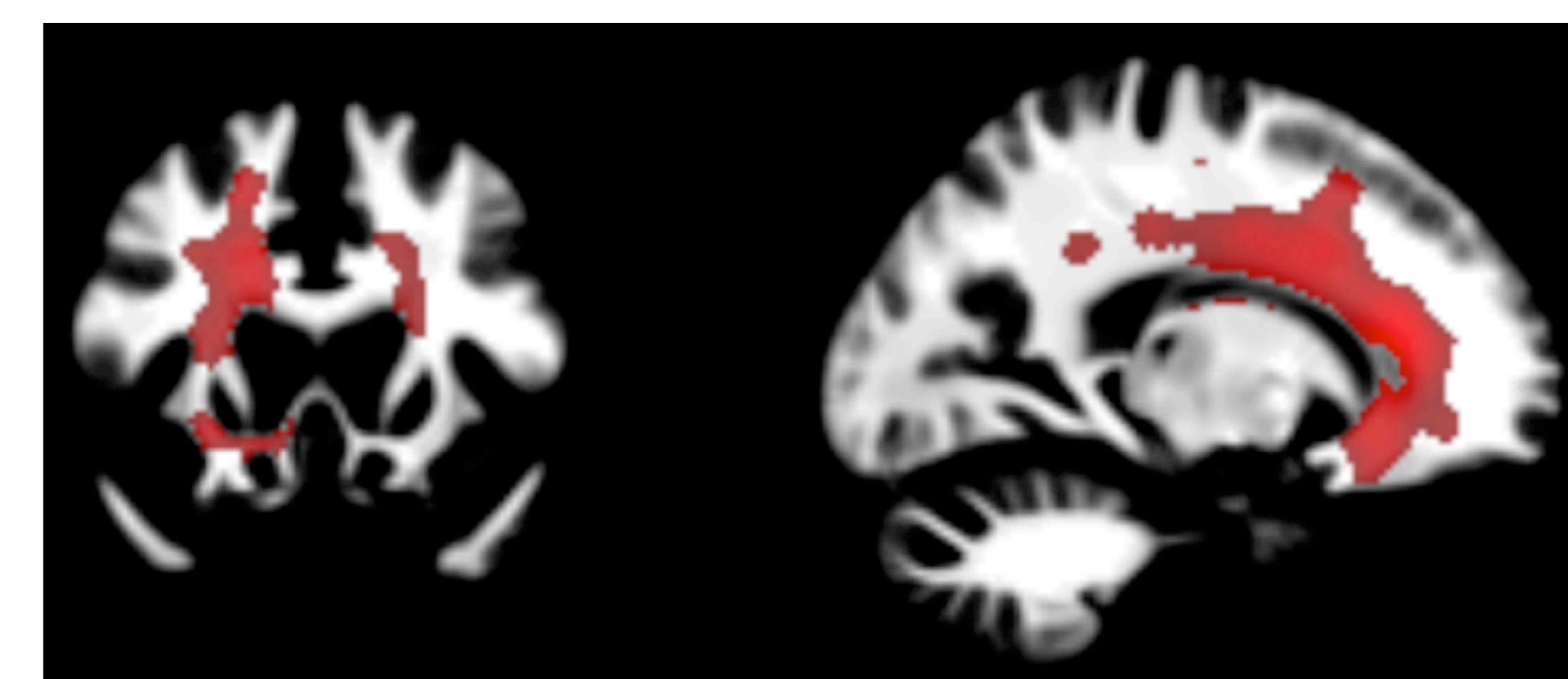


Figure 1. WMV in regions depicted in red are linked to attachment security

Conclusion

We expected that

↑ attachment: ↑ optimal brain development

However, our results are inconsistent with past research

- ↓ WMV in late childhood is associated with adversity (maltreatment ^{5, 6}, preterm birth ¹⁰)
- Higher levels of parental sensitivity are linked to ↑ WMV ⁴

Proposed explanations

- Smaller = Better? ¹¹ → White matter tracts more specialized?
- Developmental timing? ¹² → WMV is increasing in late childhood
- Small sample size? (sampling error) → Similar results with $n = 41$

Future directions

DTI analyses

- Does smaller WMV reflect more specialized fiber tracts?

Explore associations between WMV and outcomes

- Does smaller WMV relate to better cognitive, social, and emotional outcomes?

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