The social default mode network mediates the impact of infant regulatory problems on adult social-emotional problems

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Introduction

Infant regulatory problems (RPs), i.e. problems with crying, feeding, and/or sleeping, are associated with social-emotional problems in childhood[1,2,3]. It is unclear, however, whether these problems persist into adulthood and if so, what brain systems may mediate them.

The default mode network (DMN) supports both interoceptive regulation and social-emotional abilities[4].

We hypothesized that adults with a history of infant RPs show more social-emotional problems, which are mediated by functional alterations of the DMN.

Materials and methods

Participants
- Were recruited as part of the Bavarian Longitudinal Study
- Adults with and without a history of multiple and/or persistent RPs (Ø age: 28 y, 50% males)

Social-emotional problems
- Measured by the Young Adult Self Report (YASR)
- Outcome: T-scores
- Collected in 79 RPs and 254 non-RPs adults

Default Mode Network
- Measured by resting-state functional magnetic resonance imaging
- Outcome: Intrinsic functional connectivity (iFC), Z-scores
- DMN iFC based on seed-based partial correlations using functionally defined seeds derived from independent component analysis
- Collected in a subset of participants: 49 RPs and 71 non-RPs adults

Results
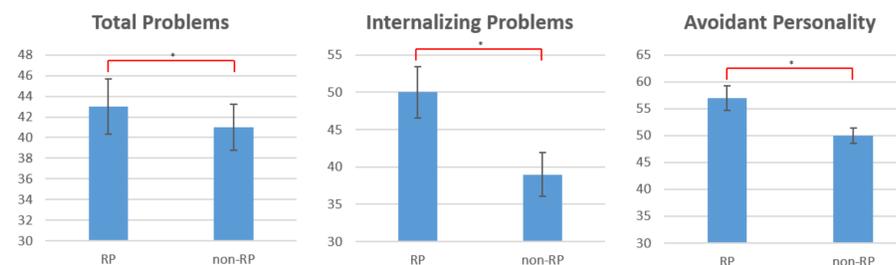
Figure 1. Individuals with a history of infant RPs show more social-emotional problems in adulthood than those without RPs.

Bar plots show mean T-scores with 95% confidence intervals (p < 0.05, Bonferroni adjusted)

A. The DMN in adults with and without a history of infant RPs

- ● Never RPs
- ● Multiple/persistent RPs
- ● Never RPs ∩ multiple/persistent RPs
- ● Social DMN
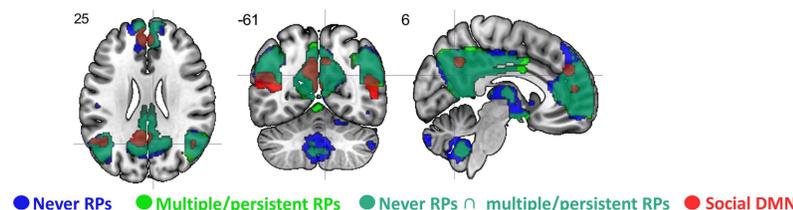
B. Between-group differences in DMN iFC overlap with the social DMN

- ● Multiple/persistent RPs < Never RPs
- ● Social DMN
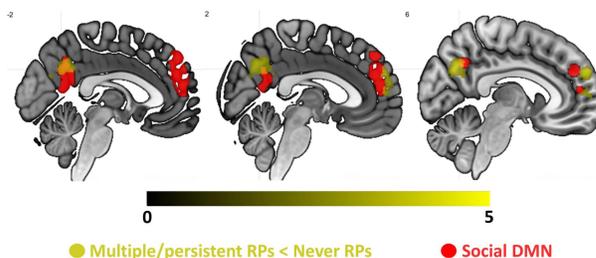
C. Dose effect of infant RPs on DMN iFC
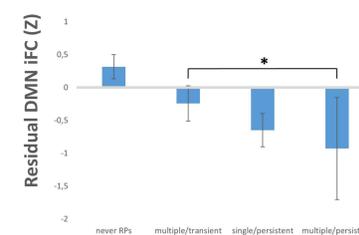
D. DMN iFC correlates with avoidant personality traits
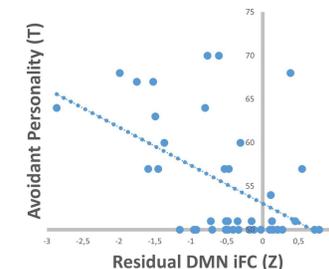
Fig 2. RPs-related iFC differences in DMN overlap with the social-DMN[5] and are associated with social-emotional problems.
A. One-sample t-tests of the DMN (p<0,05, FWE-corrected). B. Two-sample t-test (p<0,05, FWE-corrected). C. One-way ANCOVA within adults with infant RPs. Bar plots show mean residual DMN iFC with 95%-confidence intervals.
D. Spearman's rank correlation: r = − 0.42, p = 0.006.

c = 2.07 ± 1.27

a = -0.12 ± 0.02

b = -13.40 ± 5.31

c´ = 0.54 ± 1.40
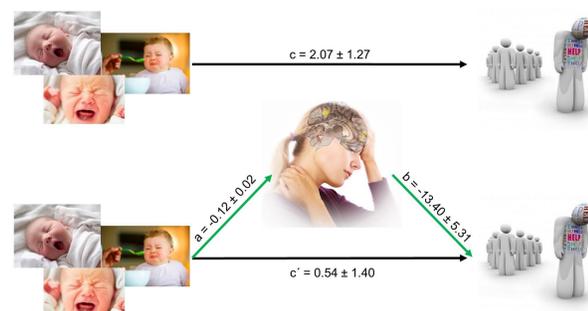
Fig 3. Decreased DMN iFC in the precuneus and medial prefrontal cortex mediates the association between infant RPs and avoidant personality traits.
Displayed are the total effect (c), direct effect (c') and indirect effect (a*b) for the triangular relationship of infant RPs (left), adult avoidant personality traits (right) and residual DMN iFC (middle).

Conclusions

Results provide evidence that individuals with a history of infant RPs have more social-emotional problems in adulthood, which are mediated by functional alterations of the social-DMN.

Those individuals with both multiple _and_ persistent RPs show most pronounced DMN iFC decreases in adulthood, suggesting a dose effect of infant RPs on DMN iFC.

The persistency of RPs and the social-DMN may be potential targets to attenuate long-lasting social-emotional problems in individuals with a history of infant RPs.

References

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Acknowledgments

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