

Does entrepreneurial experience influence brain structural connectivity?

Poster
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Introduction

Entrepreneurship unfolding in dynamic and uncertain environments requiring adaptation, recent research suggests that entrepreneurship may be associated with specific cognitive and neural characteristics. Accordingly, entrepreneurial cognition field of research is particularly interested in cognitive flexibility (CF) – the ability to adapt to uncertain and changing environments (1). Empirical work shows that entrepreneurs exhibit higher CF than managers (2). Previous studies also reported brain differences between entrepreneurs and managers in regions involved in CF and decision-making under uncertainty (2,3).

The present study investigates **whether these differences between entrepreneurs and managers extend to white-matter structural connectivity and are related to cognitive flexibility.**

Background

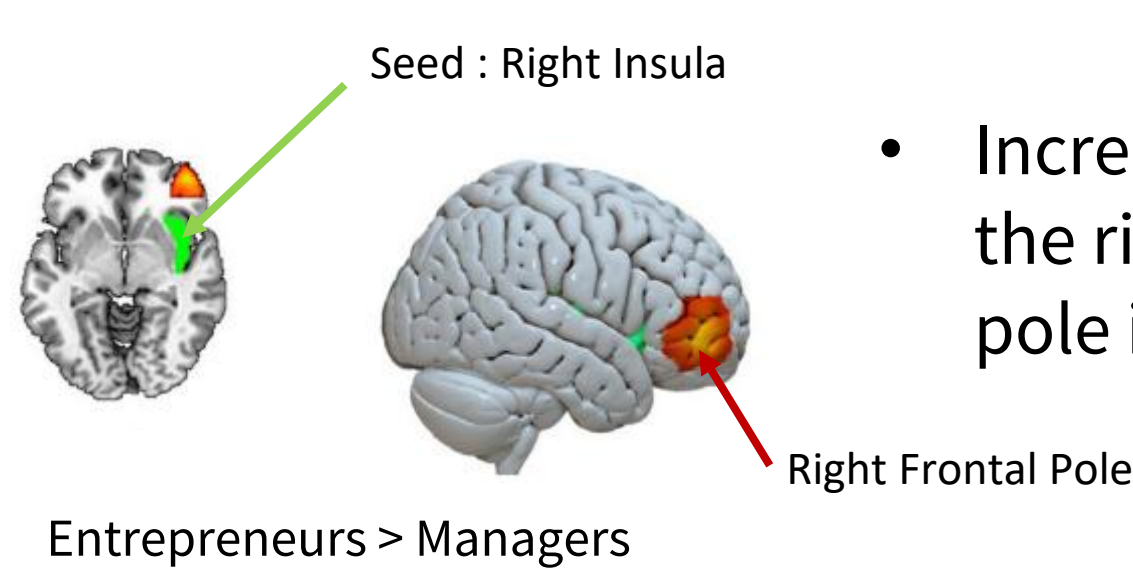
Participants

23 Entrepreneurs (≥ 3 ventures, mean age = 49.48 ± 8.17)

17 Managers (No entrepreneurial experience, mean age = 42.35 ± 7.97)

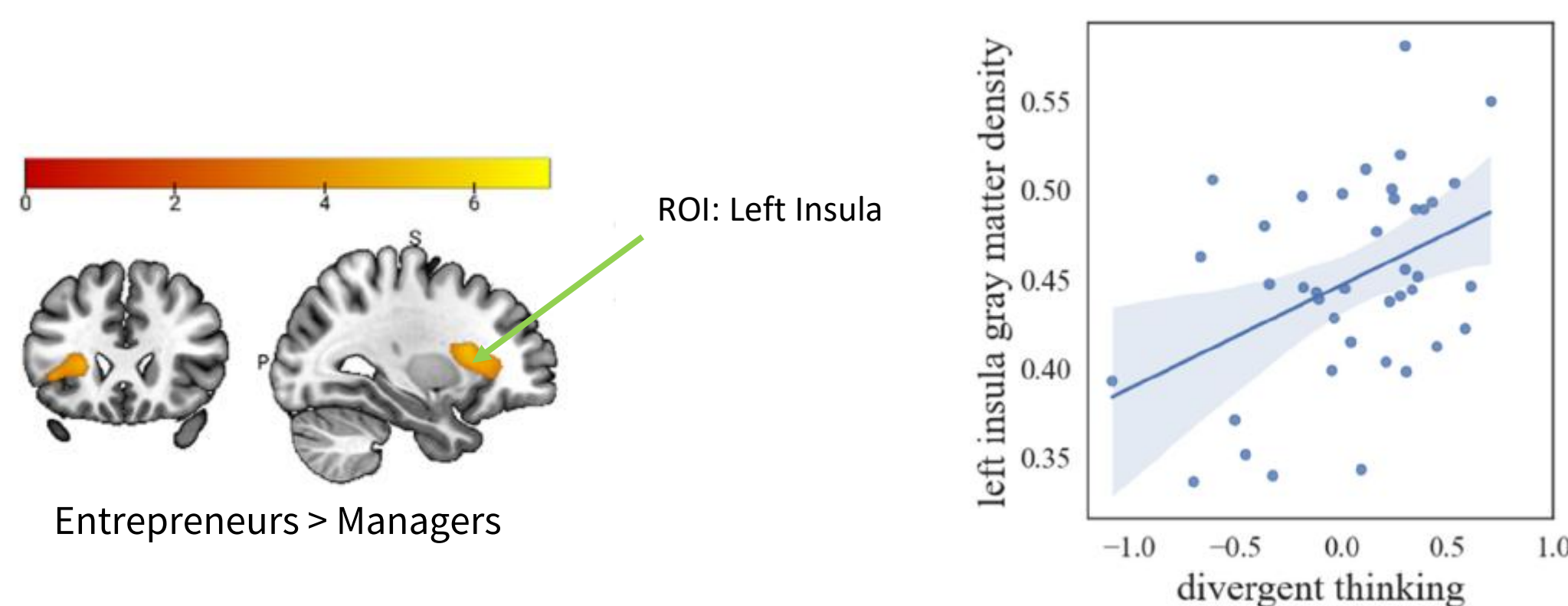
Differences in terms of age between groups ($p = 0.009$)

Ooms et al., 2023 Resting state functional connectivity



- Increased connectivity between the right insula and right frontal pole in entrepreneurs

Ooms et al., 2024 Voxel Based Morphometry



- Greater grey matter volume in the left insula in entrepreneurs
- Insula volume correlated to divergent thinking dimension of CF

→ Neural signatures of entrepreneurship in the insula - a key node for CF and uncertain decision-making –, associated with CF

Discussion

The results suggest a differential coupling between CF and white matter structure depending on whether individuals are entrepreneurs or managers. This pattern points to a subtle reorganization of white matter architecture in entrepreneurs, potentially linked to the specific cognitive demands of entrepreneurial decision-making. Moreover, the discrepancy between enhanced rIns-rFP functional connectivity (3), and the absence of significant difference of white matter structure between groups suggests a structure-function dissociation. These preliminary findings should be interpreted cautiously as the sample size remained limited ($n = 40$). FA may serve as a candidate marker for further investigation of white matter structure in relation to professional expertise and cognitive flexibility.

References

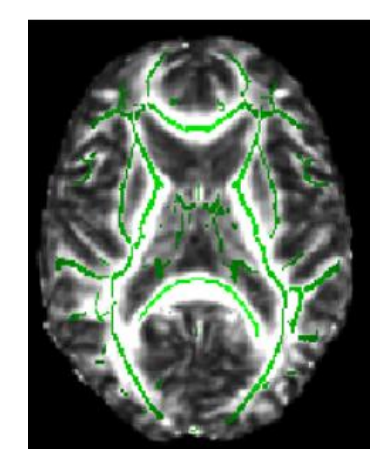
- Uddin, L. Nature Reviews Neurosciences (2021).
- Ooms, F. et al. Journal of Business Venturing Insights (2024)
- Ooms, F. et al. Entrepreneurship: Theory and Practice (2023)
- Martin, M. & Rubin, R. Psychological Reports (1995)

Present study

Participants Same sample as (2) and (3) → **23 Entrepreneurs** and **17 Managers**

1) Diffusion tensor imaging

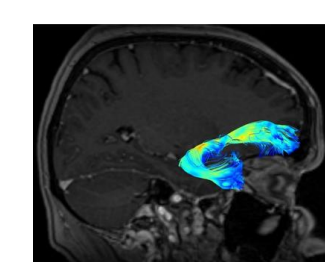
Computed Fractional anisotropy (FA), Radial diffusivity (RD) and Mean diffusivity (MD)



TBSS analysis

2) Tractography

Connectivity between the **right insula** (rIns) and **right frontal pole** (rFP)



Same ROIs as Ooms et al., 2023 (3) from Harvard-Oxford atlas

Performed in **MRtrix3**

Anatomically Constrained Tractography (ACT) with **FOD-based** streamline generation extraction of **mean streamline density, FA, RD, and MD** for ROI-connecting tracts.

Cognitive flexibility scale (4)

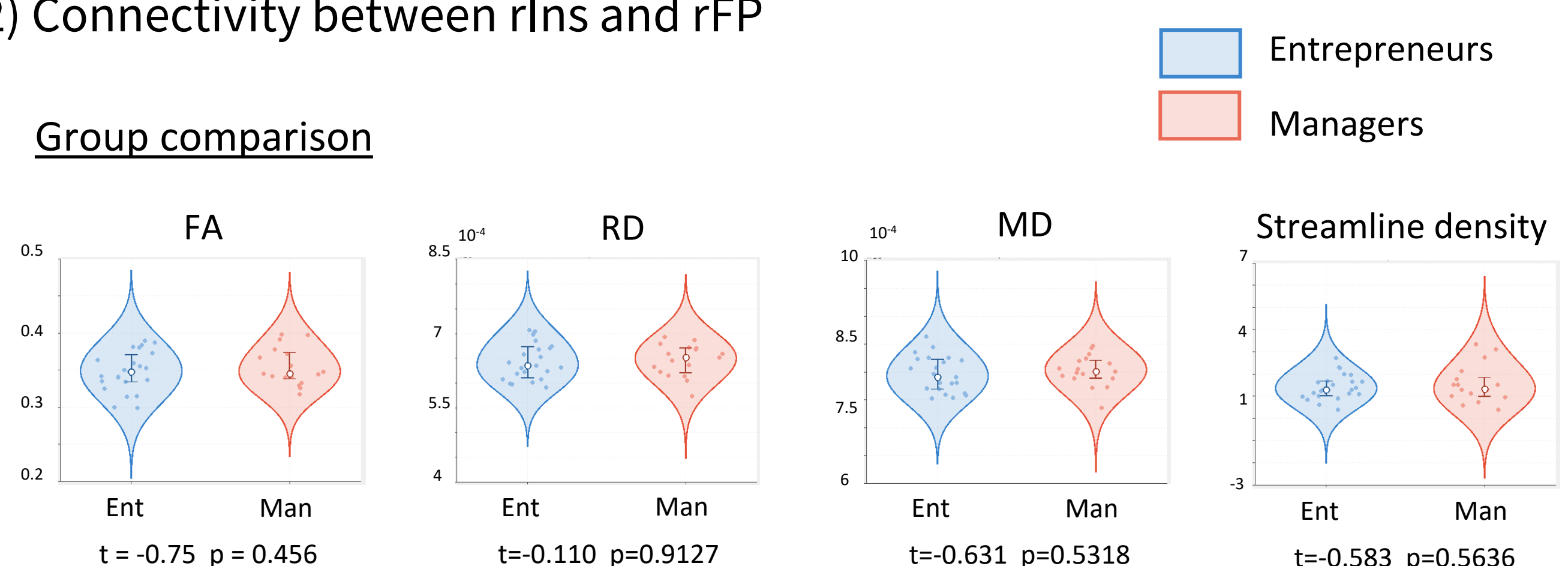
CF-DT : factor comprising items related to **divergent-thinking**

CF-DM : factor comprising items related to **decision-making**

Results

1) In **TBSS analysis**, **no significant difference** between groups across metrics

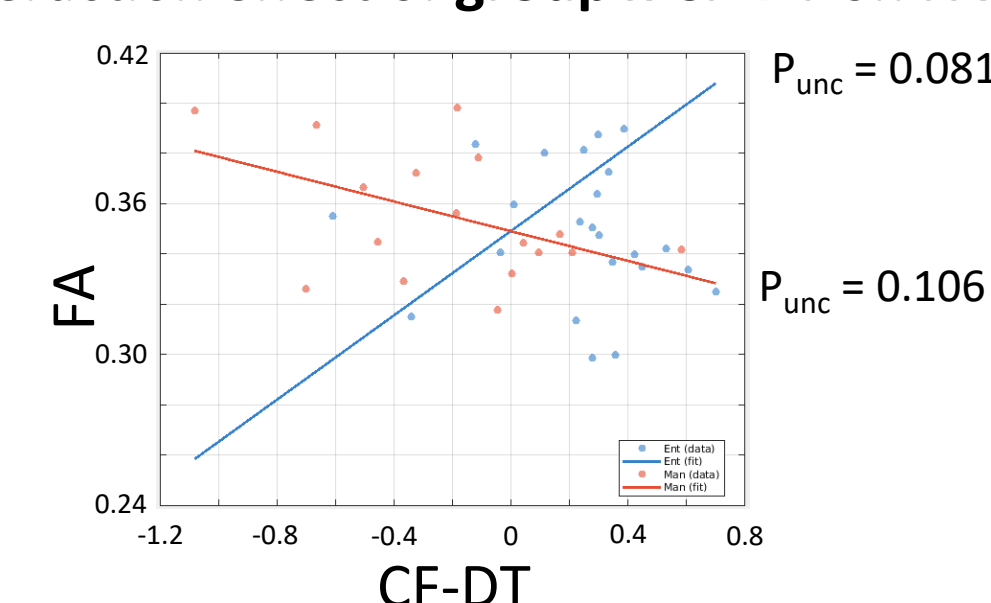
2) Connectivity between rIns and rFP



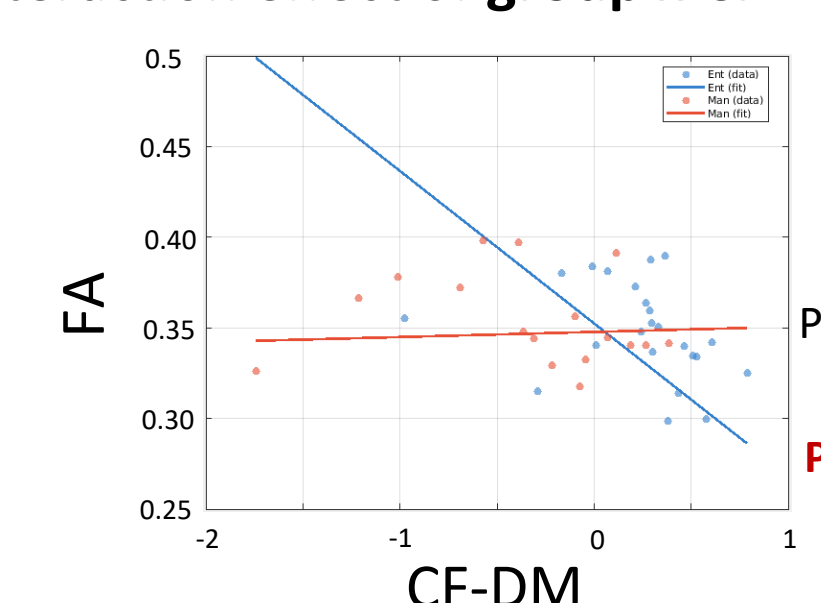
No significant difference of the connectivity of rIns-rFP between groups

Interaction group x CF

Interaction effect of **group x CF-DT** on **FA**



Interaction effect of **group x CF-DM** on **FA**



Predictor	β	SE	t	p-value
Group	0.000	0.010	0.03	0.973
CF1	0.084	0.045	1.86	0.071
CF2	-0.084	0.036	-2.31	0.027 *
Group x CF1	-0.113	0.048	-2.35	0.025 *
Group x CF2	0.087	0.038	2.26	0.030 *

Adjusted $R^2 = 0.11$; $p = 0.113$

Across groups, **CF is differently associated with FA** in tracts connecting rIns and rFP