

Multimodal lesion network mapping for prediction of sensorimotor behavior in stroke patients

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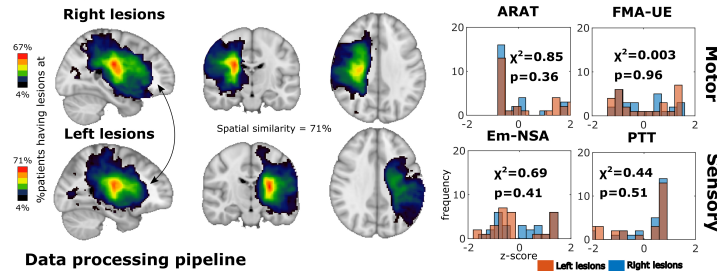
Introduction

- Beyond the characteristics of a brain lesion, such as its etiology, size or location, Lesion Network Mapping (LNM) has shown that similar symptoms after a lesion reflects similar dis-connectivity pattern, thereby linking symptoms to brain networks [1,2,3,4].
- We extend LNM by using a multimodal strategy, combining functional and structural networks from 1000 healthy participants from the Human Connectome Project.
- We applied multimodal LNM to 54 stroke patients (two cohorts joined; N1 = 29, N2 = 25) with the aim of predicting sensorimotor behavior (Motor: ARAT & FMA-UE; Sensory: Em-NSA & PTT) [5].

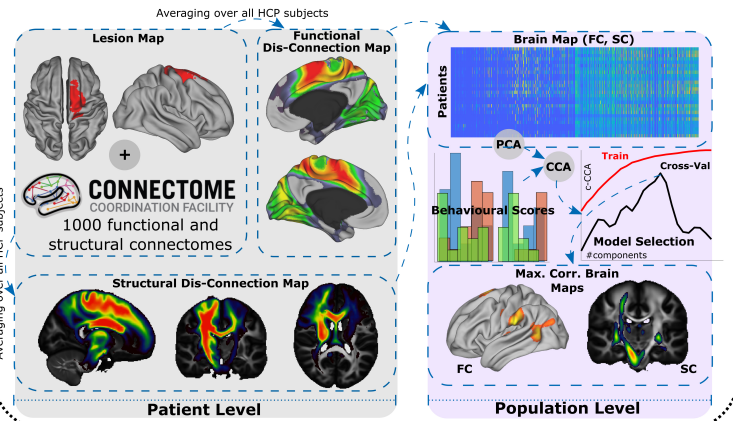
Materials & methods

VARIABLE, UNITS	MEAN	SIGMA	RANGE
AGE, YEARS	68.78	13.98	28 – 92
MALES/FEMALES	25/29	NA	NA
TIME BETWEEN STROKE AND ASSESSMENT, DAYS	25.61	20.32	4 – 64
LESION SIZE, CM ³	45.71	58.95	0.30 – 255.94
ARAT	15.20	19.52	0 – 57
FMA-UE	26.22	20.61	0 – 59
EM-NSA	28.57	14.21	0 – 40
PTT	6.68	2.95	1.8 – 11

No imaging, nor behavioral differences in left vs. right hemisphere lesions



Data processing pipeline



Conclusions

- 1 The multimodal analysis reveals how functional connectivity maps contribute more than structural connectivity maps in the prediction of sensorimotor behavior.
- 2 The maximal association between behavioral outcome and multimodal LNM suggest an equal contribution of sensory and motor coefficients, in contrast to the unimodal analyses where the sensory contribution dominates in both structural and functional maps.
- 3 When looking at each modality individually, the performance of the structural connectivity maps strongly depends on whether sensorimotor performance was corrected for lesion size, in contrast to the maps of functional connectivity that performed similarly irrespective of any correction for lesion size.
- 4 With and without lesion size correction, multimodal but not unimodal analyses, had a better sensorimotor behavioral representation.

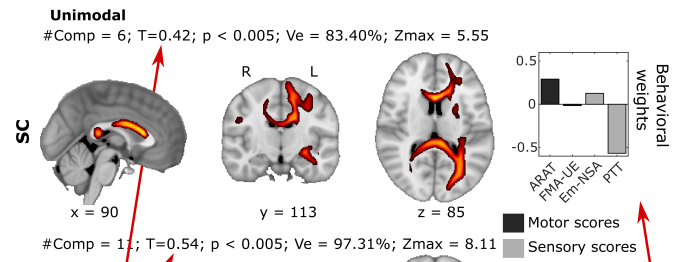
Abbreviations: ARAT = Action Research Arm Test; Em-NSA = Erasmus-modified Nottingham Sensory Assessment; FC = Functional Connectivity; FMA-UE = Fugl-Meyer assessment - upper extremity; PTT = Perceptual Threshold of Touch; SC = Structural Connectivity; T = Maximum significant correlation; Ve = Variance explained

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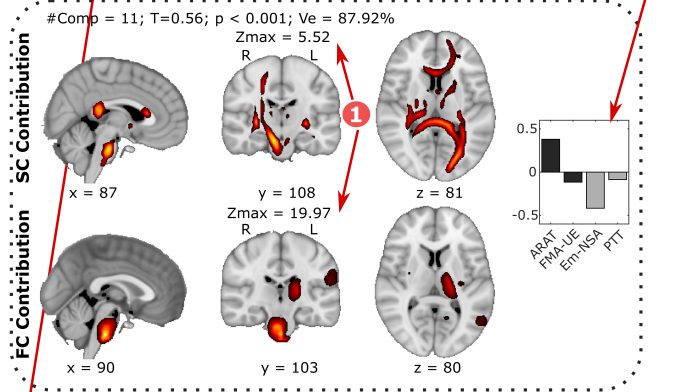


Results

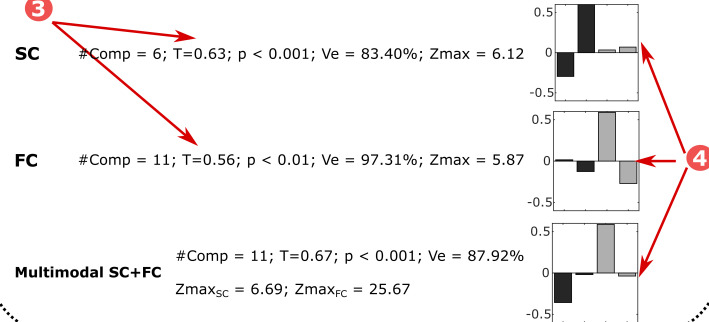
Correcting data by lesion size



Multimodal SC+FC



Not correcting data by lesion size



References

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