

Anatomical correlates of line-bisection performance: what can be learnt from a game theoretical analysis?

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INTRODUCTION

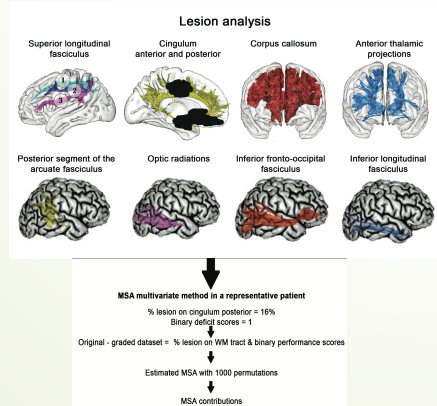
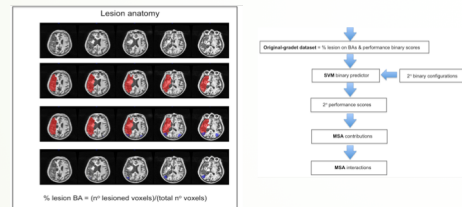
- Neglect**
- Right-brain damaged patients
 - Fail to orient and acknowledge the presence of left-sided objects or events
 - Rightward deviation in line bisection task
 - Omissions in visual search tasks
 - Predictor of long term functional dependency

- PHRC Clinical Trial**
- State-funded (APHP) Ref. PO71138
 - Large scale Multicentric (4 years)
 - Double blind and controlled
 - Chronic stroke patients
 - Registered in ClinicalTrials.gov

→What causal contributions of white matter tracts to performance in line bisection?

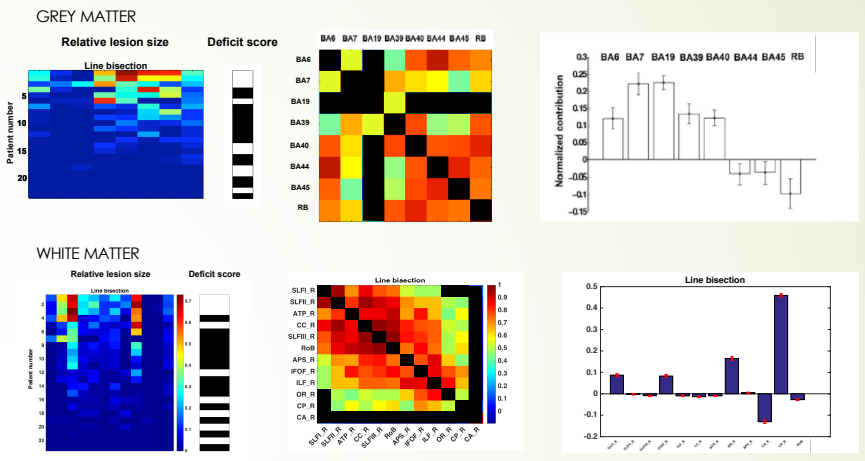
METHODS

- Patients**
- 25 right-brain damaged patients (> 2 months post-stroke)
 - Neglect paper-and-pencil battery of tests
 - Lesions analysis
 - Overlap (in %) between lesions and right-hemisphere white matter bundles: proportion of damaged tissue within a specific bundle



- Multi-perturbation Shapley value Analysis (MSA)**
- Game-theory-based method
 - Brain regions = players in a coalition game
 - Infer regional functional contributions from behavioral performance after multiple lesions
 - Keinan et al. 2004

RESULTS



Patterns of relative lesion sizes of grey and white matter regions and associated binary clinical scores across patients

Correlations between lesion patterns across grey and white matter bundles for patient samples

MSA contributions to visuo-spatial attentional orienting processes of grey and white matter tracts

	White matter (present study)	Grey matter (Toba et al., 2017)
Positive contributions	SLF I, IFOF, OR, APS, CP	BA6/FEF, BA7/IPS, BA19/IOG, BA 39/TPJ, BA40/TPJ
Negative contributions	SLF II, SLF III, ILF, CC, ATP, CA	BA44/IFG, BA45/IFG
No contribution

CONCLUSIONS

- Results characterize and specify the role of grey matter regions and disconnections in visuospatial attention disorders
- This study paves the way to identify and individualize interventional strategies using invasive and non-invasive brain stimulation technologies to probe visuo-spatial networks and improve visuo-spatial attentional outputs