Enhancing our understanding of neural mechanisms underlying tool use performance: a comparative analysis of apraxia patients and healthy older adults

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BACKGROUND

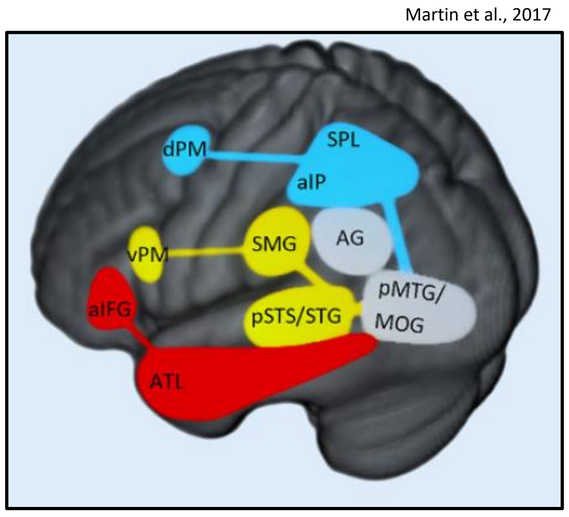
Apraxia is mainly observed in **stroke patients** with **left-hemispheric** lesions and characterized by impaired tool use performance, even though elementary motor and sensory functions are still present. Neuroimaging research shows that a left-hemispheric praxis representation network is involved in tool-related tasks in healthy individuals. However, combining fMRI data, which mainly includes young healthy individuals with lesions, mainly affecting older people, remains challenging due to uncertainty about how age-related factors may influence the praxis network.

Apraxia in **stroke** patients with **left-hemispheric** lesions **(LBD)** → **Impaired tool use performance**

Unimpaired brain of **healthy age-matched** older **individuals** → **Unimpaired tool use performance**

Two sources of information provide an **increased** and **more holistic** understanding of the **praxis representation network**

Martin et al., 2017



Investigating the **age-related influences** on the praxis representation network to conduct comparative analysis with **lesion data** from left-hemispheric stroke patients

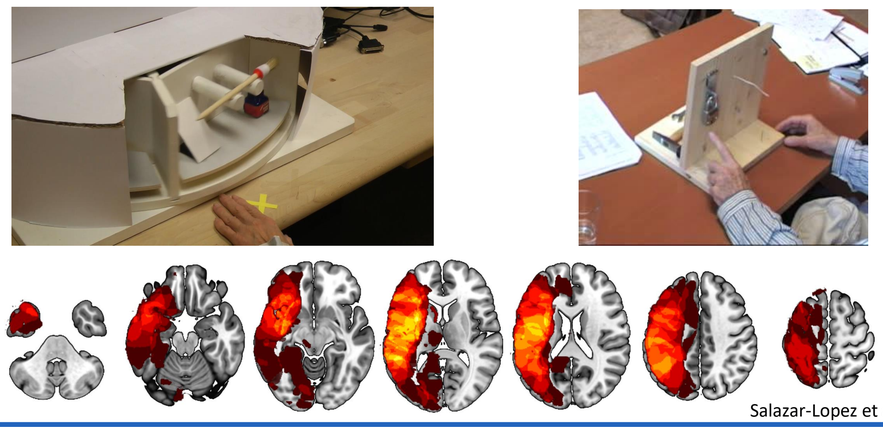
METHODS

How is the human praxis representation network subjected to age-related changes?

- Event-related fMRI study, including **16 young** (M_{age} = 25.4 y) and **16 older** (M_{age} = 67.6 y) healthy individuals
- Brain activation in response to the **planning** and **execution** phase of **real tool use**

How is the location and size of a lesion related to impaired tool use performance?

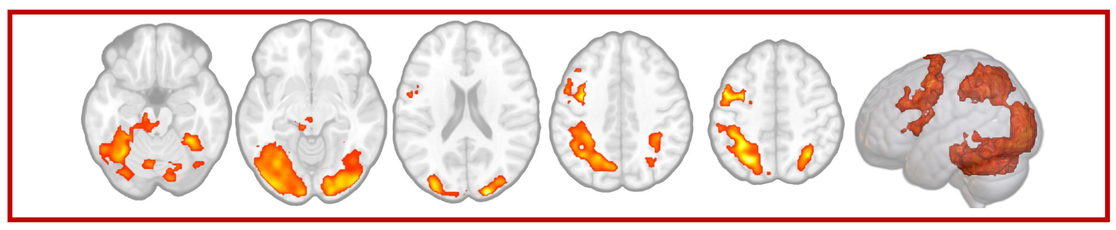
- Voxel Lesion Symptom Mapping, including patients with left brain damage
- Correlation of lesion size and location to performance rates in tool use tasks



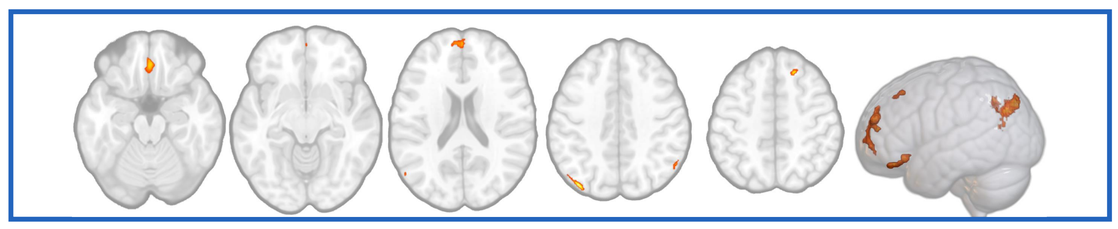
Salazar-Lopez et al., 2016

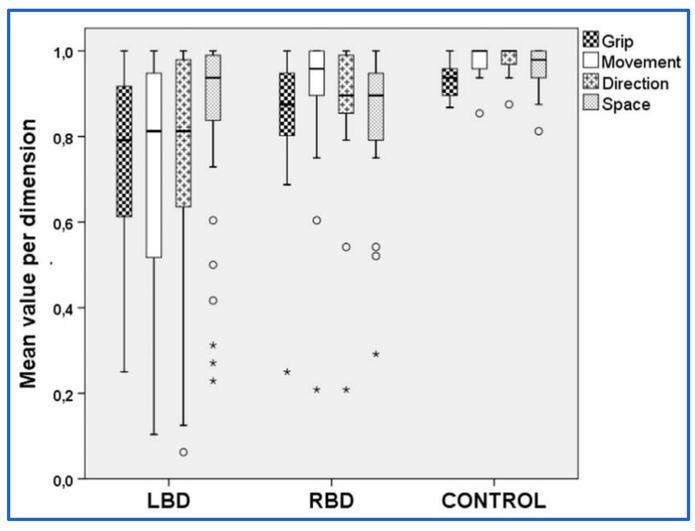
RESULTS

Older people > Patients



Patients > Older people





Salazar-Lopez et al., 2016

DISCUSSION

*Overlap: older people **and** patients*

Left inferior parietal lobe

Core region of the praxis representation network; activated in response to tool-related tasks by older individuals and related to tool use deficts when it is damaged

***Older people** minus patients*

Left superior parietal lobe, left precentral gyrus, left superior temporal lobe

Regions form part of the praxis representation network in older people, but are **not causally** relevant performing tool-related tasks accurately

***Patients** minus older people*

Left angular gyrus

Linked to deficits in tool use performance, but not activated in healthy older participants;

processes of **neuroplasticity**

REFERENCES

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Funded by DFG Deutsche Forschungsgemeinschaft German Research Foundation

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