

INTRODUCTION

- **Spatial neglect** is a multicomponent syndrome characterized by an inability to orient or to respond to stimuli arising in the hemispace contralateral to a brain lesion.
- Spatial working memory deficits might exacerbate neglect, as reflected in the patients' tendency to repeatedly search through items located on the right, as if they did not realize that they had previously examined the rightward locations favored by their lateral bias. This spatial re-exploration behavior is particularly evident in cancellation tasks in which no marks are left on the processed targets .
- The aim of this study was to assess (1) the re-cancellation behaviors in a visual search task without visible response marks, and (2) the potential impact of location and lesion volume on re-cancellation behaviors, by using a neuropsychological approach.

METHOD

PARTICIPANTS

- 14 right brain-damaged patients suffering from spatial neglect
- Control group: 14 adults matched for age and profession

PROCEDURE

- Participants performed a cancellation task without visual feedback. Percentage of re-cancellations [(number of targets with one additional delayed mark/number of targets cancelled) X 100] was determined for each participant. Neglect patients were divided in two subgroups according to the frequency of re-cancellation behaviors.
- The volume and location of brain lesions was assessed on the basis of CT or MRI scan of the patient's brain and normalized to the MNI space using the *Clinical toolbox* in SPM8 (Rorden et al., 2012).
- Two kinds of maps were computed: lesion overlap maps identified structures that were commonly damaged in each patients' subgroup (Figure A and B), and contrast maps – obtained by subtracting the superimposed lesions of one subgroup from those of the other subgroup – reveals the areas of damage most distinctive of each subgroup (Figure C).

RESULTS

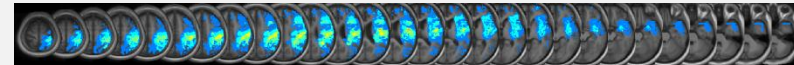
BEHAVIORAL DATA

Compared to the control group, neglect patients cancelled fewer targets, $U = 19$, $Z = 3.69$, $p < .001$, and made more re-cancellations, $U = 17$, $Z = 3.9$, $p < .001$, both on the left side, $U = 48$, $Z = 2.65$, $p = .007$, and the right side, $U = 30$, $Z = 3.52$, $p < .001$.

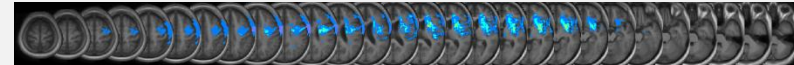
ANATOMICAL ANALYSES

- The proportion of lesioned tissue was larger in patients with high re-cancellation, $U = 4$, $Z = 2.36$, $p = .02$.
- Contrast maps (C) revealed that the right insula was commonly damaged in 5 out of 6 patients with the highest-re-cancellation percentage (A), but was spared in the subgroup of patients with the lowest re-cancellation percentage (B).

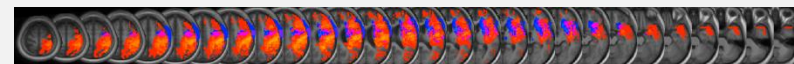
A. High re-cancellation



B. Low re-cancellation



C. Contrast (High - Low re-cancellation)



DISCUSSION

- The right insula, damaged in the high re-cancellation subgroup, belongs to a ventral frontoparietal network that supports the reorientation of attention, detection and arousal. A lesion of this part of the ventral frontoparietal network may contribute to spatial neglect by reducing interaction between the ventral and dorsal networks, the latter being more directly involved in spatial processes (Corbetta & Shulman, 2002).
- A recent model proposed the involvement of the insula (mainly the anterior part) in the detection of salient events, particularly to mark such events in time and space for additional processing (Menon & Uddin, 2010). Damage to this region could contribute to pathological search and particularly to re-cancellation behaviors observed in some neglect patients.
- Given the inherent problems with using the lesion overlapping method to infer the critical locus of lesion in cognitive deficits (Bartolomeo, 2011), further studies will be necessary to confirm our results.