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INTRODUCTION

The relationship between spared tissue and ipsi and contralesional activation within language areas of the brain in the process of post-stroke language recovery are not well understood.

- Some studies have underlined the role of LIFG in recovery mechanisms (Sebastian & Kiran, 2011; Saur et al., 2006; Fridriksson, 2010).
- Other studies have implicated the RIFG in compensatory functions (Abo et al., 2004; Fridriksson & Morrow, 2005).
- In a systematic review, Turkeltaub et al. (2011), found that participants recruit a normal network that includes LIFG, LMTG, and new regions such as MFG and anterior insula and regions in the right hemisphere such as RIFG.
- In patients with large left hemisphere lesions, however the engagement of the contralateral right hemisphere homologues, particularly the RIFG is crucial to successful recovery of language.

Research Questions: What is the relationship between % spared tissue and % signal change in ipsilesional and contralesional regions? We hypothesize that: (1) left hemisphere language regions, even if slightly spared, will be engaged in language recovery, and (2) right hemisphere homologues will be active depending on the degree of damage to the left hemisphere.

METHODS

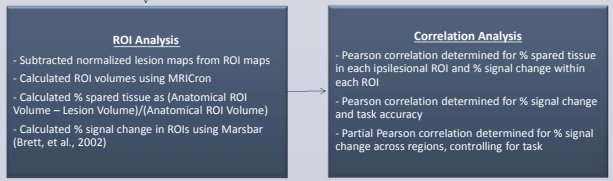
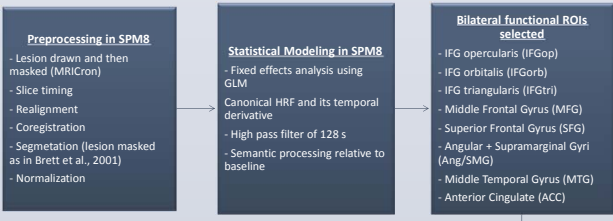
16 participations were scanned while performing a semantic processing language task in English. Data from two participants was dropped.

Participant Information

	Age	Gender	Months Post Stroke	Lesion Size (volume of cortex)
Averages	59.9 years	11 males	58 months	114.7 cc
Ranges	47 years to 74 years	3 females	6 months to 162 months	67 cc to 165 cc
Aphasia Types Present	Broca's (n=3), Wernicke's (n=1), Anomic (n=4), Conduction (n=2), Transcortical Motor (n=3), not categorized (n=1)			

Data Acquisition Parameters:

- T1: 140 sagittal slices, 1mm³ voxels, 240 x 240 matrix, FOV = 240 mm, flip angle = 8, fold-over direction = AP, TR = 8.2ms, TE = 3.8ms
- BOLD: 31 axial slices (3mm thick, 0.3 interslice gap), 3mm³ voxels, 80 x 78 matrix, FOV = 240, flip angle = 90, fold-over direction = AP, TR = 2000ms, TE = 35 ms

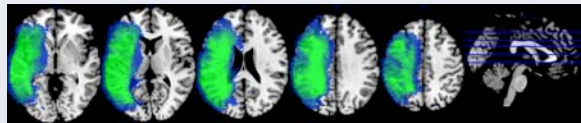


LESION INFORMATION

ROI %spared by subject

	Patients													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
LIFGop	21	3	46	51	6	94	4	18	6	100	74	21	56	38
LIFGorb	46	93	85	85	52	81	31	96	88	100	100	90	97	34
LIFGtri	28	10	85	73	15	99	13	48	48	100	72	42	70	68
LMFG	78	55	62	99	35	100	66	40	90	100	93	57	99	99
LSFG	99	98	99	100	72	100	105	83	100	100	95	57	100	100
LMTG	5	72	13	86	31	1	5	91	96	99	92	93	87	1
LAng/SMG	14	31	75	78	24	58	1	41	59	88	91	84	73	4
LAntCing	96	100	100	100	100	100	99	94	100	100	100	80	100	100

Lesion overlap in left hemisphere (n=14)

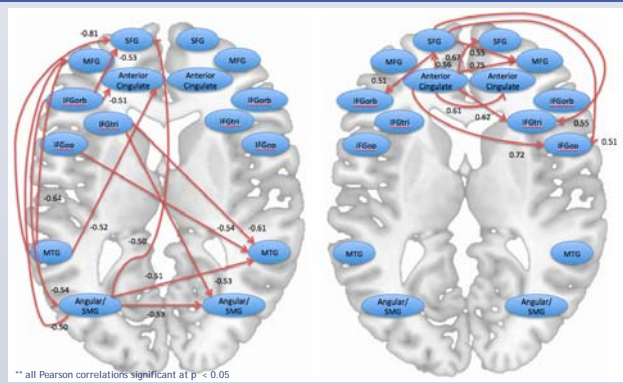


RESULTS

1. CORRELATIONS BETWEEN TASK ACCURACY AND PERCENT SIGNAL CHANGE

- Task accuracy is significantly correlated ($p < 0.05$) with signal in ipsi IFGop ($r=0.54$) and ipsi IFGtri ($r=0.54$), suggesting that the more accurate patients were on a task, the stronger the signal in LIFGop and LIFGtri.

2. CORRELATIONS BETWEEN PERCENT SPARED AND PERCENT SIGNAL CHANGE



** all Pearson correlations significant at $p < 0.05$

Negative Correlations

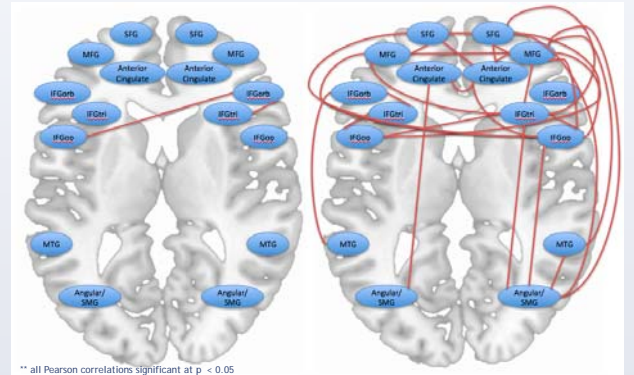
Greater % spared, less activation
More spared tissue in LIFGtri and LIFG op results in decreased % signal in RMTG and RAng/SMG
More spared tissue in LMTG and LAng/SMG is associated with less activation in LSFG and LMFG as well as RMTG and RAng/SMG

Positive Correlations

Greater % spared, more activation
More spared tissue in LSFG results in increased % signal in LIFGorb, RIFGtri, RIFGop, and RMFG; More spared tissue in the LACC has a positive correlation with bilateral SFG

RESULTS (cont)

3. CORRELATIONS BETWEEN PERCENT SIGNAL CHANGE ACROSS REGIONS



** all Pearson correlations significant at $p < 0.05$

Negative Correlations

- RIFG orb is its own; it displays no positive correlations with any other region, and displays negative correlations with RIFGtri and LIFGop

Positive Correlations

- LIFG and LMTG appear to work as one unit
- RSFG, RMFG, RIFG, RMTG and RAng/SMG appear to work as a unit
- RMFG is a hub of correlations

CONCLUSIONS

1. LIFGop is the most lesioned tissue (Lesion core; 12/14 patients show damage in LIFGop and 11/14 patients show damage in LIFGtri)
2. Increased accuracy is positively correlated with activation in LIFGop and LIFG tri
3. The more the spared tissue in LIFG (op, tri, orb), LMTG and LAng/SMG, the less activation in ipsilesional regions (LMFG, LSFG) and contralesional regions (RMTG, RAng/SMG)
4. The more the spared tissue in LSFG and LACC, the more the activation in R frontal regions (RIFG) - these regions appear to work in tandem
5. RH regions show positive correlations with each other, and a general upregulation of RH homologous regions
6. RIFGorb does not appear to have any relationship with percent spared tissue, and it has a negative correlation with other regions in terms of BOLD signal activation

ACKNOWLEDGMENTS

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