

Supplementary Material

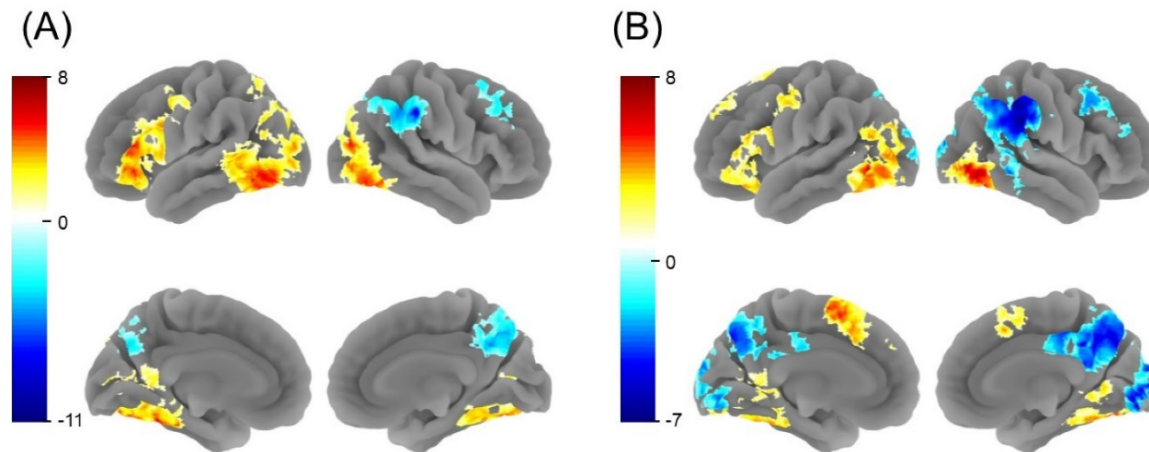


Figure S1. Whole brain activation from permutation tests with 10,000 simulations at a cluster-defining uncorrected threshold ($p < 0.01$) and F.W.E. cluster-corrected threshold ($p < 0.05$), for (A) controls (k_{crit} cluster extent = 263 voxels) and (B) patients (k_{crit} cluster extent = 274 voxels).

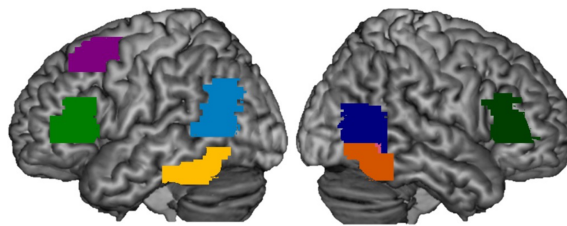


Figure S2. ROI masks created to localize individual activation peaks.

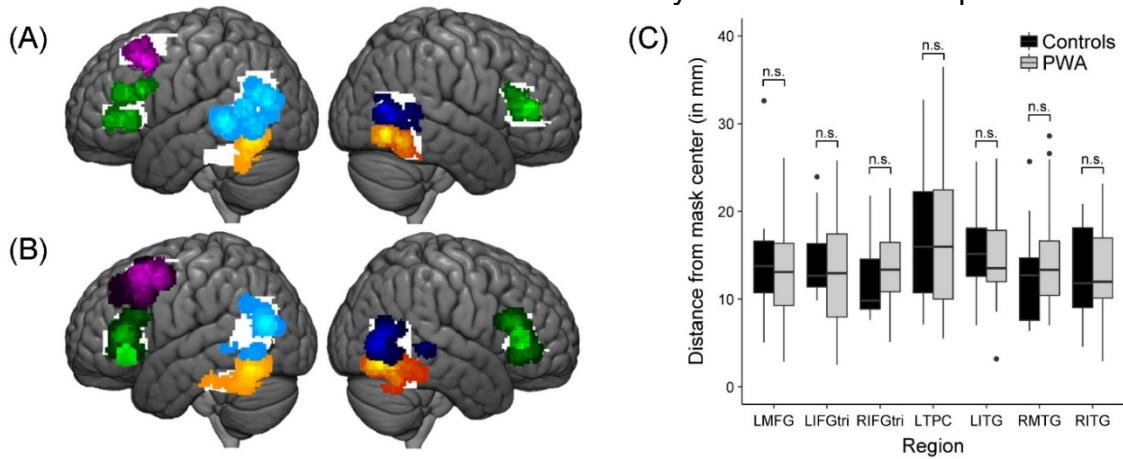


Figure S3. Overlays and distance calculations for volumes of interest (VOIs). The overlays of individual VOIs in each region in the (A) controls and (B) patient groups reveal that peaks were extracted from similar anatomical locations. (C) Results of the t-tests between patients and controls indicate that the distance between individual peaks and the center of each ROI mask did not differ between groups (n.s. = not significant). Regional masks shown in white.

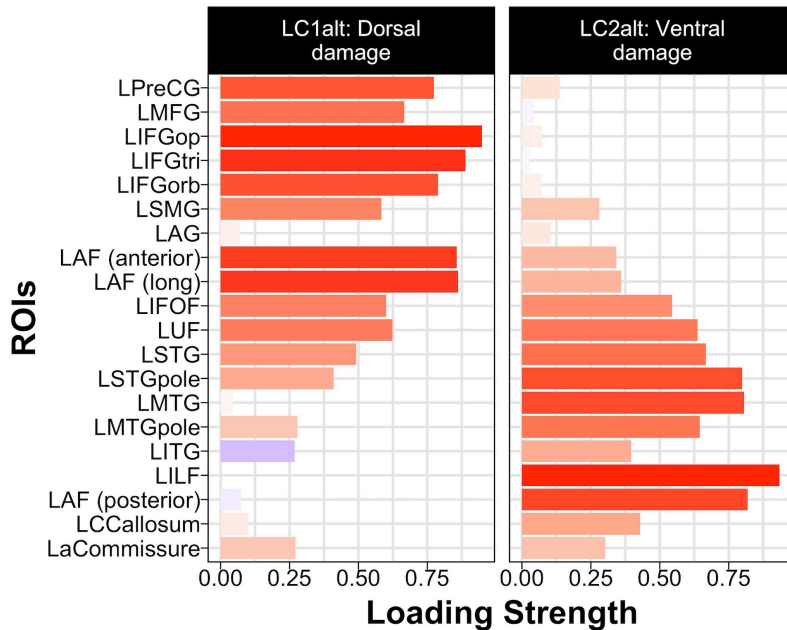


Figure S4. Variable loadings of percent damage to regions of interest (ROIs) onto alternative lesion components (LCs). Positive and negative loadings are shaded in red and blue, respectively.

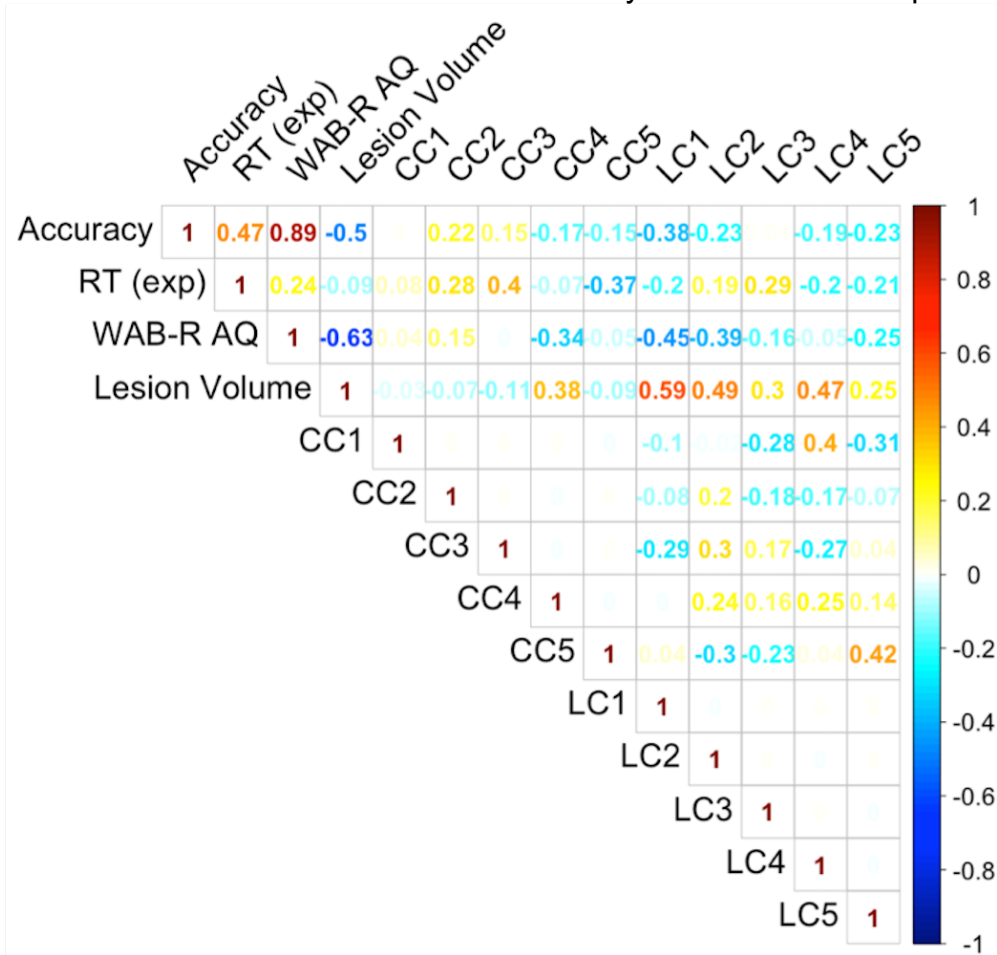


Figure S5. Relationship between DCM connectivity components (CCs), lesion components (LCs), total lesion volume, and language measures (fMRI task accuracy, fMRI task exponentiated reaction time [RT exp] and WAB-R Aphasia Quotient [AQ]). Pearson correlation coefficients are provided within each cell.

Table S1. Summary of backward stepwise regressions predicting five DCM connection components from alternative lesion components (see Figure S4) and total lesion volume

DCM Variable	Overall model			R^2	Lesion Predictors	p -value
	(df)	F -stat	p -value			
CC1: RH connectivity	(3,26)	1.27	0.306	0.128	LC1alt: $\beta = -0.622$, $t = -1.679$ LC2alt: $\beta = -0.625$, $t = -1.893$ Vol.: $\beta = 9.828^{-06}$, $t = 1.692$	0.105 0.070 [^] 0.103
CC2: Target bilateral frontal ROIs	--	--	--	--	--	--
CC3: IntraLH, target frontal ROIs	(2,27)	4.23	0.025*	0.239	LC2alt: $\beta = 0.591$, $t = 2.829$ Vol.: $\beta = -5.880^{-06}$, $t = -2.231$	0.009** 0.034*
CC4: IntraLH, target LITG	(2,27)	3.66	0.039*	0.213	LC1alt: $\beta = -0.368$, $t = -1.545$ Vol.: $\beta = 8.019^{-06}$, $t = 2.669$	0.134 0.013*
CC5: Target bilateral posterior ROIs	(2,27)	1.71	0.200	0.113	LC1alt: $\beta = 0.450$, $t = 1.777$ Vol.: $\beta = -5.136^{-06}$, $t = -1.610$	0.087 0.119

Notes: Dashes indicate intercept-only model for CC2 predicted by lesion variables. CC = connectivity component, LC = lesion component, RH = Right hemisphere, ROIs = regions of interest, IntraLH = left intrahemispheric connections, Vol. = total lesion volume, alt = alternative components from retention of only two lesion PCs. Variance inflation factors (VIFs) for all models were < 3.0. Significance for p -values: [^] 0.08 <> 0.05, * < 0.05, ** < 0.01, *** < 0.001

Table S2. Summary of backward stepwise regressions predicting language abilities from DCM connection and alternative lesion components (see Figure S4)

Variable	Overall model			DCM & Lesion Predictors	p -value	
	(df)	F -stat	p -value			
fMRI task %acc	(2,27)	5.09	0.013*	0.274	LC1alt: $\beta = -0.069$, $t = -2.625$ LC2alt: $\beta = -0.048$, $t = -1.814$	0.014* 0.081
fMRI task RT ^{exp}	(3,26)	5.17	0.006**	0.374	CC2: $\beta = 0.660$, $t = 1.829$ CC3: $\beta = 0.930$, $t = 2.576$ CC5: $\beta = -0.850$, $t = -2.354$	0.079 [^] 0.016* 0.026*
WAB-R AQ	(2,27)	10.34	<0.001***	0.434	LC1alt: $\beta = -10.994$, $t = -3.200$ LC2alt: $\beta = -11.100$, $t = -3.231$	0.004** 0.003**

Notes: %acc = percent accuracy on the fMRI task, RT^{exp} = fMRI task RT in milliseconds, exponentiated (exp) to improve distribution of the residuals. CC = connectivity component, LC = lesion component, alt = alternative components from retention of only two lesion PCs. Variance inflation factors (VIFs) for all models were < 3.0. Significance for p -values: [^] 0.08 <> 0.05, * < 0.05, ** < 0.01, *** < 0.001

Table S3. Spearman correlations between DCM components and noisy volumes of interest (VOIs)

DCM Variable	Noisy LMFG	Noisy LIFGtri	Noisy LTFC	Noisy RIFGtri
CC1: RH connectivity	r = 0.071, p = 0.711	r = -0.105, p = 0.582	r = 0.252, p = 0.178	r = -0.014, p = 0.943
CC2: Target bilateral frontal ROIs	r = 0.160, p = 0.397	r = -0.035, p = 0.855	r = 0.192, p = 0.311	r = -0.032, p = 0.867
CC3: IntraLH, target frontal ROIs	r = -0.071, p = 0.711	r = -0.357, p = 0.053 [^]	r = 0.348, p = 0.059 [^]	r = -0.196, p = 0.300
CC4: IntraLH, target LITG	r = 0.455, p = 0.011*	r = -0.070, p = 0.715	r = 0.078, p = 0.681	r = -0.260, p = 0.166
CC5: Target bilateral posterior ROIs	r = -0.096, p = 0.613	r = 0.044, p = 0.819	r = -0.575, p < 0.001***	r = -0.205, p = 0.278

Notes: CC = connectivity component, RH = Right hemisphere, ROIs = regions of interest, IntraLH = left intrahemispheric connections. Correction for multiple tests not applied.

Significance for p-values: [^] 0.08 <> 0.05, * < 0.05, ** < 0.01, *** < 0.001

Table S4. Summary of regression models predicting DCM connection components from lesion variables, controlling for noisy volumes of interest (VOIs)

DCM Variable	Overall model			Lesion Predictors	p-value
	(df) F-stat	p-value	R ²		
CC1: RH connectivity	--	--	--	--	--
CC2: Target bilateral frontal ROIs	--	--	--	--	--
CC3: IntraLH, target frontal ROIs	--	--	--	--	--
CC4: IntraLH, target LITG	(3,26) 3.26	0.037*	0.274	LC1: $\beta = -0.365$, t = -1.759 Vol.: $\beta = 6.636^{-06}$, t = 2.475 Noisy LMFG = $\beta = 0.379$, t = 1.321	0.090 0.020* 0.198
CC5: Target bilateral posterior ROIs	(5,24) 3.54	0.015*	0.424	LC1: $\beta = 0.147$, t = 0.537 LC4: $\beta = 0.142$, t = 0.614 LC5: $\beta = 0.313$, t = 1.362 Vol.: $\beta = -3.474^{-06}$, t = -0.808 Noisy LTFC: $\beta = -0.461$, t = -1.794	0.596 0.545 0.186 0.427 0.086

Notes: CC = connectivity component, LC = lesion component, RH = Right hemisphere, ROIs = regions of interest, IntraLH = left intrahemispheric connections, Vol. = total lesion volume.

Dashes indicate that the DCM connectivity component was not significantly related to the presence of noisy VOIs and thus, the regression model was not re-run. Variance inflation factors (VIFs) for all models were < 3.0. Significance for p-values: [^] 0.08 <> 0.05, * < 0.05, ** < 0.01, *** < 0.001