**Supplementary Materials**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Initials | BY | DA | JG | JHM | NP | STR | SW | WL |
| **General information** |  |  |  |  |  |  |  |  |
| Age | 59 | 71 | 73 | 52 | 73 | 81 | 82 | 64 |
| Gender | M | M | F | F | M | F | F | M |
| Ischaemic or haemorrhagic CVA | H\* | na | I | I | I | I | H | I |
| Years post CVA | 37 | 11 | 6 | 10 | 13 | 13 | 4 | 2 |
| **Neuropsychological Test Scores** |  |  |  |  |  |  |  |  |
| Object and Action Naming test: |  |  |  |  |  |  |  |  |
| *Nouns (N=50)* | 45 | 50 | 43 | 48 | 48 | 47 | 42 | 46 |
| *Verbs (N=50)* | 43 | 45 | 38 | 46 | 44 | 48 | 30 | 43 |
| PCB Sentence Comprehension test: |  |  |  |  |  |  |  |  |
| *Lexical distracters (N=30)* | 30 | 29 | 30 | 29 | 30 | 29 | 27 | 30 |
| *Reverse role distracters (N=30)* | 29 | 21 | 25 | 26 | 30 | 21 | 12 | 18 |
| PPVT Standard Score | 90 | 99 | 90 | 91 | 81 | 96 | < 40 | 102 |
| Pyramids and Palm Trees test: |  |  |  |  |  |  |  |  |
| *Three-picture subtest (N=52)* | 52 | 48 | 48 | 51 | 48 | 52 | 43 | 50 |
| Letter fluency: sum of F, A, S | 7 | 16 | 5 | 6 | 27 | 22 | 10 | 15 |
| Category fluency: *Animals* | 11 | 15 | 11 | 9 | 14 | 17 | 4 | 9 |
| Category fluency: *Fruits* | 6 | 5 | 9 | 8 | 9 | 7 | 5 | 7 |

H= haemorrhagic; I = Ischaemic; SH = subarachnoid haemorrhage; na = data not available

The Object and Action Naming test is from Druks and Masterton (2000)

PCB = Philadelphia Comprehension Battery (Saffran, Schwartz, Linebarger, Martin & Bochetto, 1988)

PPVT = Peabody Picture Vocabulary test (Dunn & Dunn, 1997).

PALPA = Psycholinguistic Assessment of Language Processing in Aphasia (Kay, Lesser, & Coltheart, 1992).

**Table S1**

Background information for each participant and scores on key tests and measures.



**Figure S1**

Lesion mapsfor participants with aphasia showing axial slices of the brain on a standard template (Rorden et al., 2012). For patients who met the criteria for nonfluent aphasia, lesions are marked in blue, and for those meeting the criteria for fluent aphasia, lesions are marked in red. Slices were selected according to representative display of individual lesions (MNI coordinates are reported above each slice).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Harvard-Oxford Cortical Atlas | Number of voxels | % of region | HCP-1065 white matter atlas  (association tracts) | Number of voxels | % of region |
|  |  |  |  |  |  |
| Temporal Pole | 2849 | 46.0 | Arcuate fasciculus | 10824 | 98.0 |
| STG, anterior | 2062 | 25.7 | Frontal aslant tract | 5015 | 42.4 |
| STG, posterior | 5111 | 29.6 | Inferior fronto-occipital fasc. | 6028 | 48.0 |
| MTG, anterior | 886 | 7.9 | Inferior longitudinal fasc. | 5623 | 33.4 |
| MTG, posterior | 6979 | 20.3 | Middle longitudinal fasc. | 9689 | 88.6 |
| MTG, temporooccipital part | 5344 | 21.3 | Superior longitudinal fasc. 1 | 4449 | 23.9 |
| ITG, posterior | 1298 | 4.0 | Superior longitudinal fasc. 2 | 13021 | 59.7 |
| ITG, temporooccipital part | 963 | 4.8 | Superior longitudinal fasc. 3 | 12743 | 74.0 |
| Planum temporale | 6526 | 53.5 | Uncinate fasciculus | 2679 | 30.0 |
| Temporal FFG, posterior | 937 | 4.1 | Vertical occipital fasciculus | 2414 | 19.9 |
| Planum polare | 3903 | 43.3 |  |  |  |
| Heschl's gyrus | 3114 | 51.2 |  |  |  |
|  |  |  |  |  |  |
| Insular cortex | 15302 | 48.7 |  |  |  |
|  |  |  |  |  |  |
| Postcentral gyrus | 10605 | 13.0 |  |  |  |
| Superior parietal lobule | 2935 | 8.4 |  |  |  |
| SMG, anterior | 5448 | 24.6 |  |  |  |
| SMG, posterior | 8958 | 27.9 |  |  |  |
| Angular gyrus | 9094 | 31.0 |  |  |  |
| Parietal operculum cortex | 6444 | 50.4 |  |  |  |
| Precuneous cortex | 2809 | 4.5 |  |  |  |
| LOC, superior | 13873 | 12.2 |  |  |  |
| LOC, inferior | 6234 | 10.8 |  |  |  |
| Intracalcarine cortex | 1778 | 10.2 |  |  |  |
| Occipital FFG | 1510 | 5.4 |  |  |  |
|  |  |  |  |  |  |
| Superior frontal gyrus | 1120 | 1.5 |  |  |  |
| Middle frontal gyrus | 5047 | 7.5 |  |  |  |
| IFG, pars triangularis | 1395 | 7.4 |  |  |  |
| IFG, pars opercularis | 5274 | 28.5 |  |  |  |
| Frontal operculum cortex | 3999 | 51.6 |  |  |  |
| Central opercular cortex | 10203 | 51.8 |  |  |  |
| Frontal orbital cortex | 3787 | 9.6 |  |  |  |
| Precentral gyrus | 23035 | 21.3 |  |  |  |
|  |  |  |  |  |  |

FFG = fusiform gyrus; IFG = inferior frontal gyrus; LOC = lateral occipital gyrus; MTG = middle temporal gyrus; SMG = supramarginal gyrus; STG = superior temporal gyrus.

**Table S2**

Localisation of voxels submitted to analyses, based on the Harvard-Oxford cortical atlas and the Natbrainlab white matter atlas. The table lists regions with at least 800 voxels of coverage. Note that these atlases contain overlap, so localisation in one atlas does not exclude the possibility of localisation in the other. All voxels were located within the left hemisphere. Note that the Harvard-Oxford cortical atlas does not discriminate between left and right hemisphere structures, so percentages shown in the table are as a function of the combined area for the left and right. To arrive at a rough estimate of the percentage coverage in the left hemisphere only, these figures should be halved.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | BY | |  | DA | |  | JG | |  | JHM | |  | RP | |  | NP | |  | STR | |  | SW | |  | WL | |
|  | Rel | UR |  | Rel | UR |  | Rel | UR |  | Rel | UR |  | Rel | UR |  | Rel | UR |  | Rel | UR |  | Rel | UR |  | Rel | UR |
| **Percent correct** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Cycle 1 | 90.3 | 93.1 |  | 92.5 | 96.2 |  | 81.9 | 75.0 |  | 94.4 | 97.2 |  | 76.4 | 88.9 |  | 77.8 | 80.6 |  | 90.3 | 83.3 |  | 63.9 | 61.1 |  | 81.9 | 81.9 |
| Cycle 2 | 86.1 | 97.2 |  | 94.1 | 84.3 |  | 81.9 | 87.5 |  | 83.3 | 91.7 |  | 76.4 | 87.5 |  | 79.2 | 83.3 |  | 88.9 | 88.9 |  | 68.1 | 75.0 |  | 73.6 | 86.1 |
| Cycle 3 | 86.1 | 95.8 |  | 98.2 | 92.6 |  | 77.8 | 91.7 |  | 83.3 | 91.7 |  | 65.3 | 84.5 |  | 84.7 | 90.3 |  | 94.4 | 87.5 |  | 76.4 | 72.2 |  | 70.8 | 86.1 |
| Cycle 4 | 80.6 | 84.7 |  | 91.5 | 89.8 |  | 79.2 | 94.4 |  | 76.4 | 94.4 |  | 72.2 | 87.5 |  | 81.9 | 88.9 |  | 91.7 | 93.1 |  | 73.6 | 76.4 |  | 90.3 | 84.7 |
| **Mean naming latencies** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Cycle 1 | 1409 | 1609 |  | 1591 | 1679 |  | 1310 | 1521 |  | 1048 | 1010 |  | 1178 | 1314 |  | 1543 | 1688 |  | 1575 | 1719 |  | 1579 | 1731 |  | 1543 | 1753 |
| Cycle 2 | 1819 | 1698 |  | 1703 | 1734 |  | 1227 | 1263 |  | 1173 | 1062 |  | 1115 | 1298 |  | 1910 | 1274 |  | 1290 | 1292 |  | 1254 | 1251 |  | 1236 | 1169 |
| Cycle 3 | 2152 | 1802 |  | 1524 | 1592 |  | 1370 | 1059 |  | 1186 | 1013 |  | 1240 | 1179 |  | 1691 | 1632 |  | 1156 | 1192 |  | 1207 | 1271 |  | 1277 | 1251 |
| Cycle 4 | 2099 | 1844 |  | 1522 | 1579 |  | 1308 | 1067 |  | 1267 | 1035 |  | 1233 | 1079 |  | 1936 | 1326 |  | 1152 | 1132 |  | 1055 | 1201 |  | 1362 | 1111 |
| **Repetition priming index (see text for details)** | | | | | | | | | | | | | | | | | | | | | | | | | | |
|  | -9.2 | |  | 2.6 | |  | 5.7 | |  | -2.9 | |  | -0.30 | |  | 2.3 | |  | 11.9 | |  | 11.7 | |  | 8.2 | |

**Table S3**

Naming accuracy and naming latencies in the Blocked cyclic naming task. Mean naming latencies were calculated from logged values, but means have been unlogged for presentation purposes. The table also provides scores for the two behavioural indices extracted from the blocked cyclic naming task: the Relatedness by Cycle interaction and the Repetition priming score.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Sentence relatedness effect: facilitation** | | | **BCNT repetition priming effect (v=10)** |
| Total significant voxels | 3060 | | | 2295 |
| Overlap with Harvard-Oxford cortical atlas |  | | |  |
| MTG, temporooccipital part | 2355 (44.1) | | | - |
| ITG, temporooccipital part | 281 (29.2) | | | - |
| LOC, inferior division | 276 (4.4) | | | - |
| ITG, posterior division | - | | | 473 (36.4) |
| Temporal Fusiform Cortex, anterior division | - | | | 237 (na) |
| Temporal Fusiform Cortex, posterior division | - | | | 348 (37.1) |
| Overlap with HCP-1065 association pathways |  | | |  |
| Inferior longitudinal fasciculus | 202 (3.6) | | | 937 (16.7) |
| Inferior fronto-occipital fasciculus | | - | 722 (12.0) | |
| Arcuate fasciculus | 586 (5.4) | | | - |
| Middle longitudinal fasciculus | - | | | 215 (2.2) |

IFG = inferior frontal gyrus; ITG = inferior temporal gyrus; LOC = lateral occipital gyrus; MTG = middle temporal gyrus; SMG = supramarginal gyrus.

**Table S4**

VLSM results for indices associated with posterior language regions. Localisation of voxels reaching the threshold for statistical significance in each analysis, based on the Harvard-Oxford cortical atlas, and the HCP-1065 tractography atlas (association tracts). Regions where fewer than 200 voxels reached threshold are not shown. All voxels were located within the left hemisphere. The value of v used in the CFWER correction method was 5 unless otherwise stated.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Insular Cortex | Middle Frontal Gyrus | IFG, pars triangularis | IFG, pars opercularis | Precentral Gyrus | Postcentral Gyrus | SMG, anterior division | Frontal Operculum | Central Operculum |
| Insular Cortex | — | 0.535 | 0.644 | 0.723\* | 0.224 | 0.257 | 0.134 | 0.956\*\*\* | 0.858\*\* |
| Middle Frontal Gyrus | 0.535 | — | 0.622 | 0.910\*\* | 0.780\* | 0.731\* | 0.329 | 0.475 | 0.664 |
| IFG, pars triangularis | 0.644 | 0.622 | — | 0.862\*\* | 0.066 | -0.041 | -0.287 | 0.778\* | 0.504 |
| IFG, pars opercularis | 0.723\* | 0.910\*\* | 0.862\*\* | — | 0.492 | 0.428 | 0.047 | 0.742\* | 0.713\* |
| Precentral Gyrus | 0.224 | 0.780\* | 0.066 | 0.492 | — | 0.966\*\*\* | 0.789\* | 0.036 | 0.549 |
| Postcentral Gyrus | 0.257 | 0.731\* | -0.041 | 0.428 | 0.966\*\*\* | — | 0.806\* | 0.031 | 0.574 |
| SMG, anterior division | 0.134 | 0.329 | -0.287 | 0.047 | 0.789\* | 0.806\* | — | -0.128 | 0.526 |
| Frontal Operculum | 0.956\*\*\* | 0.475 | 0.778\* | 0.742\* | 0.036 | 0.031 | -0.128 | — | 0.711\* |
| Central Operculum | 0.858\*\* | 0.664 | 0.504 | 0.713\* | 0.549 | 0.574 | 0.526 | 0.711\* | — |

**Table S5**

Correlation matrix describing the pairwise correlations between damage to various Harvard-Oxford regions that were heavily implicated in the measures used here.