

Supplementary materials:

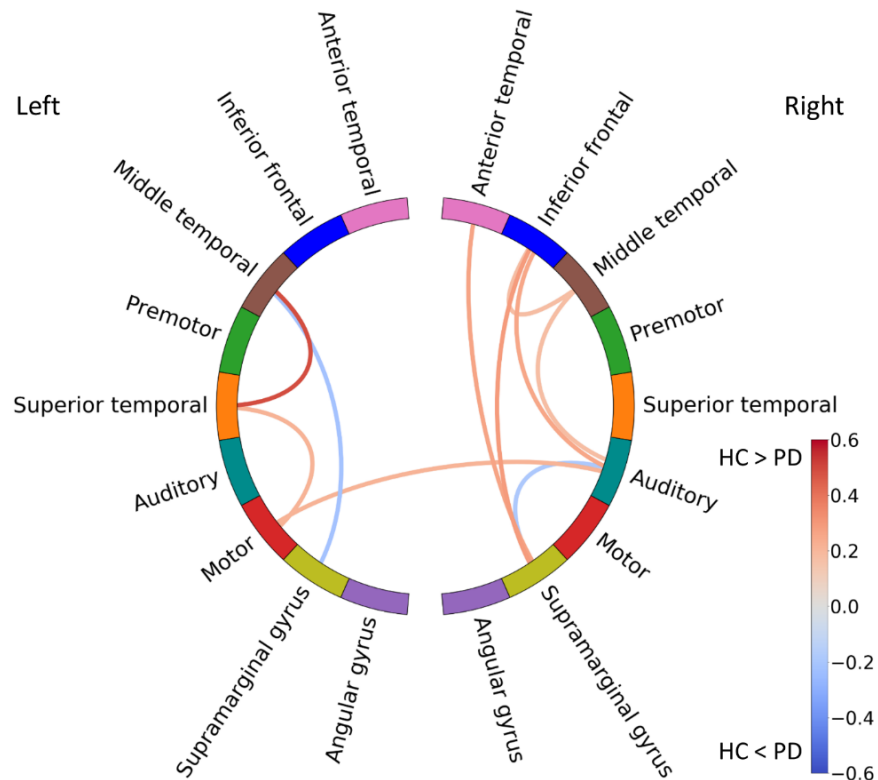


Figure S1: Differences in correlation scores between PD patients and controls for the action verb condition. Red connections indicate lower correlation values for PD patients relative to controls (PD < HC) and blue connections indicate higher correlation values for PD patients relative to controls (PD > HC).

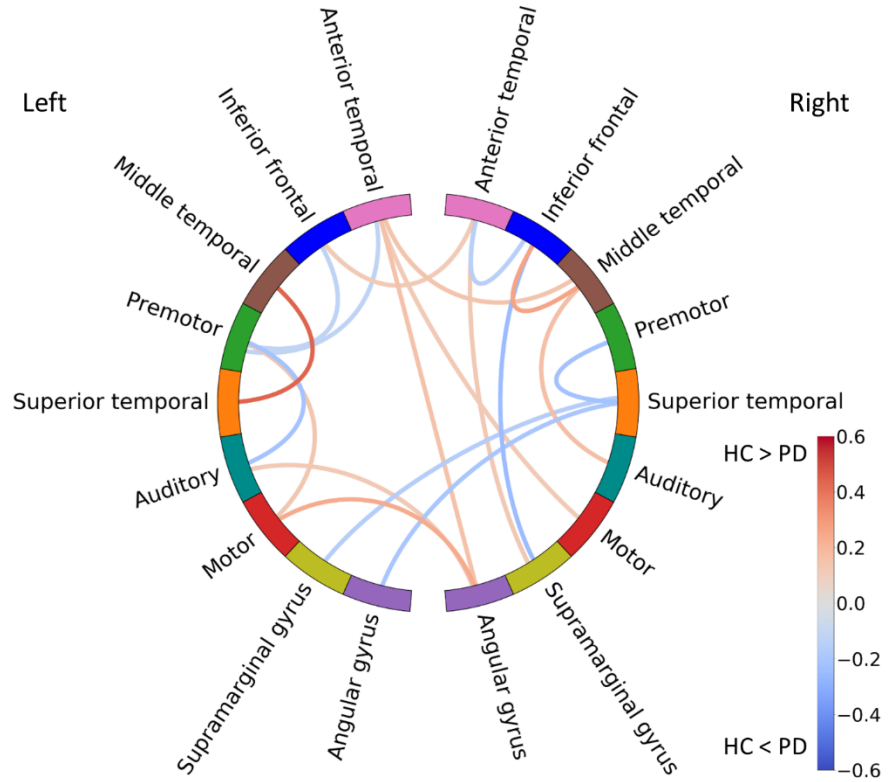


Figure S2: Differences in correlation scores between PD patients and controls for the abstract verb condition. Red connections indicate lower correlation values for PD patients relative to controls (PD < HC) and blue connections indicate higher correlation values for PD patients relative to controls (PD > HC).

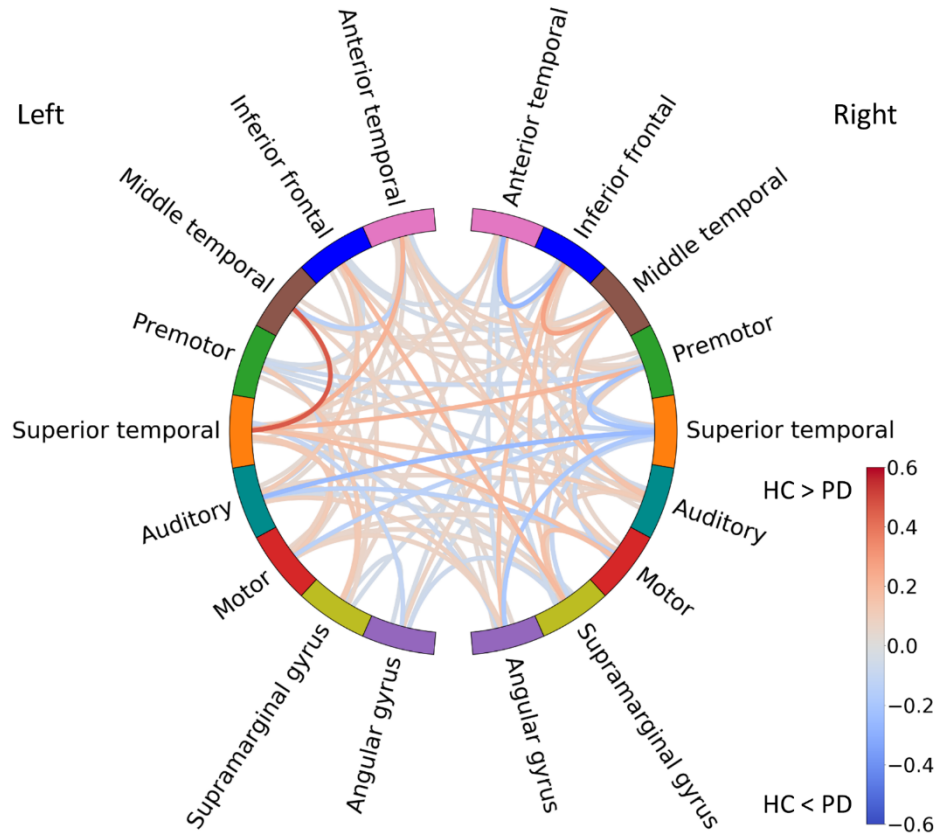


Figure S3: Differences in correlation scores between PD patients and controls for the incorrect morphosyntactic form condition. Red connections indicate lower correlation values for PD patients relative to controls (PD < HC) and blue connections indicate higher correlation values for PD patients relative to controls (PD > HC).

Table S1: Classification coefficients and the mean of correlation scores of PD patients and controls for all the selected features.

Labels	Classifier's coefficients	Controls' correlation Mean (SD)	PD patients' correlation Mean (SD)
Action verbs			
Left middle temporal cortex (BA 21) - Left superior temporal cortex (BA 22)	0.866	0.403 (0.468)	-0.088 (0.590)
Left middle temporal cortex (BA 21) - Left supramarginal gyrus (BA 40)	-0.826	0.042 (0.270)	0.259 (0.279)

Right middle temporal cortex (BA 21) - Right auditory cortex (BA 41-42)	0.681	0.313 (0.207)	0.139 (0.270)
Right middle temporal cortex (BA 21) - Right inferior frontal gyrus (BA 44-45-47)	0.048	0.352 (0.260)	0.175 (0.269)
Left superior temporal cortex (BA 22) - Left motor cortex (BA 4)	0.228	0.357 (0.276)	0.145 (0.321)
Right anterior temporal cortex (BA 38) - Right supramarginal gyrus (BA 40)	0.289	0.221 (0.345)	-0.042 (0.364)
Left motor cortex (BA 4) - Right auditory cortex (BA 41-42)	0.252	0.237 (0.223)	0.023 (0.271)
Right supramarginal gyrus (BA 40) - Right auditory cortex (BA 41-42)	-1.242	-0.015 (0.226)	0.171 (0.198)
Right supramarginal gyrus (BA 40) - Right inferior frontal gyrus (BA 44-45-47)	-0.043	0.609 (0.187)	0.316 (0.433)
Right auditory cortex (BA 41-42) - Right inferior frontal gyrus (BA 44-45-47)	0.785	0.258 (0.223)	0.002 (0.277)
Abstract verbs			
Left middle temporal cortex (BA 21) - Left superior temporal cortex (BA 22)	0.431	0.335 (0.498)	-0.103 (0.588)
Right middle temporal cortex (BA 21) - Left anterior temporal cortex (BA 38)	0.700	0.175 (0.221)	0.026 (0.228)
Right middle temporal cortex (BA 21) - Right auditory cortex (BA 41-42)	0.359	0.335 (0.242)	0.167 (0.319)
Right middle temporal cortex (BA 21) - Right inferior frontal gyrus (BA 44-45-47)	0.636	0.321 (0.262)	0.058 (0.363)
Right superior temporal cortex (BA 22) - Left angular gyrus (BA 39)	-1.153	-0.122 (0.257)	0.075 (0.239)
Right superior temporal cortex (BA 22) - Left supramarginal gyrus (BA 40)	-0.431	-0.021 (0.263)	0.137 (0.208)
Right superior temporal cortex (BA 22) - Right premotor cortex (BA 6)	-0.914	-0.013 (0.330)	0.205 (0.324)
Left anterior temporal cortex (BA 38) - Right angular gyrus (BA 39)	0.297	0.126 (0.248)	-0.031 (0.266)
Left anterior temporal cortex (BA 38) - Right motor cortex (BA 4)	0.507	0.145 (0.177)	0.028 (0.259)
Left anterior temporal cortex (BA 38) - Left premotor cortex (BA 6)	0.250	0.052 (0.245)	0.171 (0.224)
Right anterior temporal cortex (BA 38) - Right supramarginal gyrus (BA 40)	0.041	0.240 (0.223)	0.110 (0.232)
Right anterior temporal cortex (BA 38) - Left inferior frontal gyrus (BA 44-45-47)	0.663	0.294 (0.236)	0.173 (0.251)
Right anterior temporal cortex (BA 38) - Right inferior frontal gyrus (BA 44-45-47)	-0.323	-0.038 (0.250)	0.112 (0.205)
Right angular gyrus (BA 39) - Left motor cortex (BA 4)	0.369	0.392 (0.270)	0.149 (0.379)
Right angular gyrus (BA 39) - Left auditory cortex (BA 41-42)	0.768	0.086 (0.214)	-0.036 (0.182)

Left motor cortex (BA 4) - Left premotor cortex (BA 6)	0.403	0.107 (0.263)	-0.030 (0.222)
Right supramarginal gyrus (BA 40) - Right inferior frontal gyrus (BA 44-45-47)	-0.181	0.318 (0.601)	0.566 (0.171)
Left auditory cortex (BA 41-42) - Left premotor cortex (BA 6)	-0.581	0.162 (0.502)	0.374 (0.289)
Left inferior frontal gyrus (BA 44-45-47) - Left premotor cortex (BA 6)	-0.667	-0.022 (0.214)	0.098 (0.194)
Incorrect morphosyntactic forms			
Left middle temporal cortex (BA 21) - Right middle temporal cortex (BA 21)	-0.219	0.110 (0.223)	0.057 (0.254)
Left middle temporal cortex (BA 21) - Left superior temporal cortex (BA 22)	1.023	0.369 (0.526)	-0.094 (0.587)
Left middle temporal cortex (BA 21) - Left anterior temporal cortex (BA 38)	-0.781	0.433 (0.515)	0.572 (0.418)
Left middle temporal cortex (BA 21) - Left supramarginal gyrus (BA 40)	0.941	0.100 (0.238)	0.041 (0.212)
Left middle temporal cortex (BA 21) - Right supramarginal gyrus (BA 40)	0.372	0.300 (0.354)	0.213 (0.345)
Left middle temporal cortex (BA 21) - Left auditory cortex (BA 41-42)	0.115	0.083 (0.244)	0.047 (0.226)
Left middle temporal cortex (BA 21) - Right inferior frontal gyrus (BA 44-45-47)	0.329	0.068 (0.263)	0.027 (0.228)
Left middle temporal cortex (BA 21) - Right premotor cortex (BA 6)	0.665	0.089 (0.224)	0.047 (0.220)
Right middle temporal cortex (BA 21) - Left superior temporal cortex (BA 22)	-0.128	0.061 (0.257)	-0.007 (0.262)
Right middle temporal cortex (BA 21) - Right superior temporal cortex (BA 22)	-0.191	0.150 (0.533)	0.281 (0.472)
Right middle temporal cortex (BA 21) - Left anterior temporal cortex (BA 38)	0.109	0.156 (0.180)	0.075 (0.240)
Right middle temporal cortex (BA 21) - Right anterior temporal cortex (BA 38)	0.055	0.620 (0.234)	0.509 (0.441)
Right middle temporal cortex (BA 21) - Left angular gyrus (BA 39)	-0.016	0.186 (0.205)	0.108 (0.240)
Right middle temporal cortex (BA 21) - Right motor cortex (BA 4)	-0.295	0.122 (0.210)	0.091 (0.244)
Right middle temporal cortex (BA 21) - Right auditory cortex (BA 41-42)	0.723	0.287 (0.217)	0.128 (0.336)
Right middle temporal cortex (BA 21) - Left inferior frontal gyrus (BA 44-45-47)	-0.209	0.040 (0.241)	0.090 (0.212)
Right middle temporal cortex (BA 21) - Right inferior frontal gyrus (BA 44-45-47)	0.906	0.330 (0.238)	0.058 (0.345)
Right middle temporal cortex (BA 21) - Right premotor cortex (BA 6)	0.202	0.148 (0.241)	0.071 (0.254)
Left superior temporal cortex (BA 22) - Left anterior temporal cortex (BA 38)	0.328	0.195 (0.453)	-0.025 (0.487)

Left superior temporal cortex (BA 22) - Right anterior temporal cortex (BA 38)	-0.087	0.037 (0.248)	-0.042 (0.289)
Left superior temporal cortex (BA 22) - Left angular gyrus (BA 39)	-1.017	-0.028 (0.477)	0.077 (0.415)
Left superior temporal cortex (BA 22) - Right angular gyrus (BA 39)	-0.521	-0.040 (0.332)	0.035 (0.221)
Left superior temporal cortex (BA 22) - Left motor cortex (BA 4)	0.049	0.163 (0.427)	0.044 (0.389)
Left superior temporal cortex (BA 22) - Right motor cortex (BA 4)	0.629	0.079 (0.278)	-0.087 (0.261)
Left superior temporal cortex (BA 22) - Left supramarginal gyrus (BA 40)	-0.136	0.117 (0.581)	-0.013 (0.485)
Left superior temporal cortex (BA 22) - Right supramarginal gyrus (BA 40)	0.126	0.037 (0.263)	-0.016 (0.213)
Left superior temporal cortex (BA 22) - Right auditory cortex (BA 41-42)	-0.526	0.266 (0.693)	0.150 (0.708)
Left superior temporal cortex (BA 22) - Left inferior frontal gyrus (BA 44-45-47)	-0.136	0.035 (0.264)	-0.015 (0.258)
Left superior temporal cortex (BA 22) - Right premotor cortex (BA 6)	0.717	0.193 (0.448)	-0.017 (0.390)
Right superior temporal cortex (BA 22) - Left anterior temporal cortex (BA 38)	0.173	0.036 (0.263)	-0.038 (0.242)
Right superior temporal cortex (BA 22) - Right anterior temporal cortex (BA 38)	-0.091	-0.001 (0.258)	0.088 (0.240)
Right superior temporal cortex (BA 22) - Right angular gyrus (BA 39)	-0.300	0.086 (0.435)	0.276 (0.334)
Right superior temporal cortex (BA 22) - Left motor cortex (BA 4)	-0.249	0.063 (0.380)	0.201 (0.297)
Right superior temporal cortex (BA 22) - Right motor cortex (BA 4)	-0.613	0.150 (0.486)	0.248 (0.463)
Right superior temporal cortex (BA 22) - Right supramarginal gyrus (BA 40)	-0.197	-0.001 (0.281)	0.096 (0.260)
Right superior temporal cortex (BA 22) - Left auditory cortex (BA 41-42)	-0.106	0.190 (0.691)	0.444 (0.500)
Right superior temporal cortex (BA 22) - Right auditory cortex (BA 41-42)	0.356	0.070 (0.397)	0.122 (0.328)
Right superior temporal cortex (BA 22) - Left premotor cortex (BA 6)	-0.638	0.022 (0.234)	0.078 (0.200)
Right superior temporal cortex (BA 22) - Right premotor cortex (BA 6)	-0.256	0.014 (0.367)	0.228 (0.274)
Left anterior temporal cortex (BA 38) - Right angular gyrus (BA 39)	-0.216	0.092 (0.238)	0.052 (0.218)
Left anterior temporal cortex (BA 38) - Left motor cortex (BA 4)	0.265	0.208 (0.209)	0.167 (0.237)
Left anterior temporal cortex (BA 38) - Right motor cortex (BA 4)	0.255	0.361 (0.217)	0.261 (0.300)
Left anterior temporal cortex (BA 38) - Left auditory cortex (BA 41-42)	-0.144	0.130 (0.224)	0.094 (0.241)
Left anterior temporal cortex (BA 38) - Right auditory cortex (BA 41-42)	-0.116	0.133 (0.211)	0.091 (0.250)

Left anterior temporal cortex (BA 38) - Right inferior frontal gyrus (BA 44-45-47)	-0.212	0.097 (0.258)	0.157 (0.246)
Left anterior temporal cortex (BA 38) - Left premotor cortex (BA 6)	0.217	0.122 (0.200)	0.076 (0.216)
Left anterior temporal cortex (BA 38) - Right premotor cortex (BA 6)	-0.145	0.090 (0.253)	0.034 (0.281)
Right anterior temporal cortex (BA 38) - Right angular gyrus (BA 39)	-0.057	0.063 (0.207)	0.124 (0.235)
Right anterior temporal cortex (BA 38) - Left supramarginal gyrus (BA 40)	-0.014	0.179 (0.207)	0.119 (0.280)
Right anterior temporal cortex (BA 38) - Right supramarginal gyrus (BA 40)	-0.585	0.042 (0.246)	0.104 (0.219)
Right anterior temporal cortex (BA 38) - Right auditory cortex (BA 41-42)	0.276	0.363 (0.243)	0.221 (0.337)
Right anterior temporal cortex (BA 38) - Left inferior frontal gyrus (BA 44-45-47)	0.138	0.052 (0.351)	0.093 (0.231)
Right anterior temporal cortex (BA 38) - Right inferior frontal gyrus (BA 44-45-47)	-0.664	0.093 (0.583)	0.359 (0.455)
Left angular gyrus (BA 39) - Left supramarginal gyrus (BA 40)	-0.018	0.050 (0.213)	0.095 (0.227)
Left angular gyrus (BA 39) - Right supramarginal gyrus (BA 40)	-0.559	0.144 (0.435)	0.210 (0.425)
Left angular gyrus (BA 39) - Right inferior frontal gyrus (BA 44-45-47)	-0.114	0.079 (0.232)	0.115 (0.224)
Left angular gyrus (BA 39) - Right premotor cortex (BA 6)	0.129	0.039 (0.318)	0.087 (0.228)
Right angular gyrus (BA 39) - Left motor cortex (BA 4)	0.614	0.144 (0.217)	0.066 (0.207)
Right angular gyrus (BA 39) - Left auditory cortex (BA 41-42)	0.109	0.140 (0.191)	0.050 (0.211)
Right angular gyrus (BA 39) - Left inferior frontal gyrus (BA 44-45-47)	-0.324	0.182 (0.276)	0.140 (0.284)
Right angular gyrus (BA 39) - Right inferior frontal gyrus (BA 44-45-47)	0.798	0.152 (0.263)	-0.002 (0.243)
Right angular gyrus (BA 39) - Left premotor cortex (BA 6)	0.297	0.053 (0.238)	0.012 (0.183)
Right angular gyrus (BA 39) - Right premotor cortex (BA 6)	0.222	0.085 (0.185)	0.016 (0.192)
Left motor cortex (BA 4) - Right motor cortex (BA 4)	0.260	0.114 (0.288)	0.058 (0.262)
Left motor cortex (BA 4) - Right supramarginal gyrus (BA 40)	0.230	0.181 (0.176)	0.127 (0.217)
Left motor cortex (BA 4) - Left auditory cortex (BA 41-42)	0.259	0.287 (0.362)	0.233 (0.218)
Left motor cortex (BA 4) - Left inferior frontal gyrus (BA 44-45-47)	0.246	0.091 (0.193)	0.065 (0.194)
Left motor cortex (BA 4) - Left premotor cortex (BA 6)	-0.323	0.416 (0.277)	0.331 (0.274)
Right motor cortex (BA 4) - Right supramarginal gyrus (BA 40)	0.807	0.324 (0.317)	0.165 (0.223)

Right motor cortex (BA 4) - Left auditory cortex (BA 41-42)	0.087	0.376 (0.570)	0.512 (0.329)
Right motor cortex (BA 4) - Right inferior frontal gyrus (BA 44-45-47)	-0.135	0.255 (0.222)	0.165 (0.302)
Right motor cortex (BA 4) - Right premotor cortex (BA 6)	-0.048	0.156 (0.241)	0.102 (0.232)
Left supramarginal gyrus (BA 40) - Left inferior frontal gyrus (BA 44-45-47)	0.170	0.198 (0.263)	0.132 (0.299)
Left supramarginal gyrus (BA 40) - Left premotor cortex (BA 6)	0.082	0.296 (0.266)	0.172 (0.228)
Left supramarginal gyrus (BA 40) - Right premotor cortex (BA 6)	0.033	0.011 (0.270)	0.061 (0.237)
Right supramarginal gyrus (BA 40) - Left auditory cortex (BA 41-42)	0.488	0.057 (0.253)	0.098 (0.209)
Right supramarginal gyrus (BA 40) - Right auditory cortex (BA 41-42)	0.132	0.116 (0.223)	0.023 (0.234)
Right supramarginal gyrus (BA 40) - Left inferior frontal gyrus (BA 44-45-47)	0.593	0.562 (0.207)	0.371 (0.444)
Right supramarginal gyrus (BA 40) - Right inferior frontal gyrus (BA 44-45-47)	0.266	0.151 (0.251)	0.025 (0.258)
Right supramarginal gyrus (BA 40) - Right premotor cortex (BA 6)	0.214	0.150 (0.256)	0.073 (0.299)
Left auditory cortex (BA 41-42) - Right auditory cortex (BA 41-42)	-0.596	0.123 (0.228)	0.071 (0.247)
Left auditory cortex (BA 41-42) - Left inferior frontal gyrus (BA 44-45-47)	-0.088	0.331 (0.328)	0.209 (0.267)
Left auditory cortex (BA 41-42) - Left premotor cortex (BA 6)	-0.861	0.206 (0.406)	0.291 (0.236)
Right auditory cortex (BA 41-42) - Left inferior frontal gyrus (BA 44-45-47)	0.401	0.088 (0.226)	0.010 (0.215)
Right auditory cortex (BA 41-42) - Right inferior frontal gyrus (BA 44-45-47)	-0.368	0.209 (0.274)	0.172 (0.271)
Right auditory cortex (BA 41-42) - Left premotor cortex (BA 6)	-0.754	0.004 (0.270)	0.061 (0.246)
Left inferior frontal gyrus (BA 44-45-47) - Left premotor cortex (BA 6)	0.046	0.005 (0.259)	0.048 (0.229)
Right inferior frontal gyrus (BA 44-45-47) - Right premotor cortex (BA 6)	0.415	0.256 (0.393)	0.180 (0.410)
Left premotor cortex (BA 6) - Right premotor cortex (BA 6)	-0.562	0.044 (0.226)	0.122 (0.205)