SUPPLEMENTARY MATERIALS

**Table S1.** Association analyses of MRI structural metrics with memory K scores for controls and PD patients .

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **a-1. Controls (N=22)** | | | | | | | | | | | | | |
| *Correlation coefficient R*  *(p-value)* | | | | | | | | | | | | | |
| Delayed Memory | | | | | | | |  | | Working Memory | | | |
|  | | Low-Load | | Low-Load with Distractor | | High-Load | | Memory Load  2 | | Memory Load  3 | Memory Load  4 | Memory Load  5 | Memory Load  6 |
| L. inferior Frontal-  Opercular | | 0.372  (0.107) | | -0.017  (0.944) | | -0.062  (0.794) | | **0.481**  **(0.032)** | | 0.208  (0.380) | 0.314  (0.178) | 0.022  (0.928) | 0.067  (0.780) |
| L. Inferior Frontal-  Triangular | | 0.222  (0.348) | | -0.177  (0.456) | | 0.122  (0.607) | | 0.440  (0.052) | | 0.362  (0.117) | 0.365  (0.114) | 0.025  (0.916) | 0.123  (0.606) |
| L. middle Frontal  Gyrus | | 0.254  (0.279) | | -0.34  (0.887) | | 0.-99  (0.679) | | 0.076  (0.752) | | -0.084  (0.725) | 0.052  (0.828) | -0.099  (0.677) | 0.190  (0.423) |
| L. Angular  Gyrus | | 0.190  (0.422) | | 0.068  (0.776) | | 0.258  (0.271) | | -0.072  (0.762) | | -0.049  (0.838) | -0.013  (0.955) | 0.110  (0.644) | 0.306  (0.190) |
| L. Supra-marginal  gyrus | | 0.149  (0.531) | | -0.094  (0.693) | | -0.011  (0.964) | | 0.064  (0.790) | | -0.119  (0.618) | 0.025  (0.918) | -0.094  (0.693) | -0.079  (0.740) |
| L. superior  Temporal  gyrus | | -0.144  (0.546) | | -0.299  (0.201) | | -0.311  (0.181) | | **-0.448**  **(0.048)** | | -0.359  (0.120) | -0.383  (0.095) | -0.121  (0.613) | -0.009  (0.969) |
| L. superior  Frontal  gyrus | | **0.466**  **(0.038)** | | 0.148  (0.532) | | 0.070  (0.770) | | 0.088  (0.711) | | 0.160  (0.499) | 0.221  (0.350) | 0.107  (0.653) | **0.460**  **(0.041)** |
| L. superior  Parietal  Gyrus | | 0.292  (0.212) | | 0.098  (0.680) | | 0.020  (0.935) | | -0.071  (0.765) | | 0.021  (0.930) | -0.008  (0.975) | -0.223  (0.346) | 0.050  (0.835) |
| L. Intra-parietal  Sulcus | | 0.346  (0.135) | | 0.133  (0.577) | | -0.052  (0.829) | | -0.214  (0.364) | | 0.004  (0.988) | -0.022  (0.926) | -0.101  0.673) | 0.092  (0.701) |
| L. Entorhinal  Cortex | | -0.021  (0.929) | | 0.155  (0.514) | | 0.246  (0.296) | | 0.315  (0.176) | | 0.429  (0.059) | 0.332  (0.152) | 0.265  (0.259) | 0.255  (0.278) |
| L. Para-hippocampal  Gyrus | | 0.027  (0.911) | | 0.034  (0.887) | | 0.057  (0.810) | | -0.045  (0.851) | | -0.138  (0.561) | -0.181  (0.44 | -0.253  (0.283) | -0.351  (0.129) |
| L. hippocampal  volume | | 0.118  (0.622) | | 0.275  (0.240) | | 0.166  (0.483) | | 0.366  (0.113) | | 0.155  (0.514) | 0.350  (0.131) | 0.183  (0.441) | 0.030  (0.900) |
|  | |  | |  | |  | |  | |  |  |  |  |
| **a-2. Controls (N=22)** | | | | | | | | | | | | | |
| *Correlation coefficient R*  *(p-value)* | | | | | | | | | | | | | |
| Delayed Memory | | | | | | | |  | | Working Memory | | | |
|  | | Low-Load | | Low-Load with Distractor | | High-Load | | Memory Load  2 | | Memory Load  3 | Memory Load  4 | Memory Load  5 | Memory Load  6 |
| R. inferior Frontal-  Opercular | | 0.224  (0.343) | | 0.109  (0.648) | | 0.104  (0.663) | | 0.198  (0.403) | | -0.088  (0.712) | 0.123  (0.605) | -0.140  (0.556) | -0.052  (0.829) |
| R. Inferior Frontal-  Triangular | | 0.327  (0.160) | | 0.054  (0.823) | | -0.042  (0.860) | | -0.218  (0.355) | | -0.098  (0.680) | -0.180  (0.448) | -0.249  (0.289) | -0.084  (0.726) |
| R. middle Frontal  Gyrus | | 0.397  (0.083) | | 0.239  (0.311) | | 0.242  (0.303) | | -0.045  (0.850) | | 0.054  (0.820) | 0.191  (0.421) | 0.085  (0.722) | 0.256  (0.277) |
| R. Angular  Gyrus | | 0.084  (0.725) | | -0.041  (0.864) | | -0.028  (0.906) | | -0.116  (0.627) | | 0.048  (0.840) | -0.070  (0.770) | 0.092  (0.701) | 0.190  (0.422) |
| R. Supra-marginal  gyrus | | 0.319  (0.171) | | 0.101  (0.672) | | -0.117  (0.623) | | -0.232  (0.325) | | -0.075  (0.755) | -0.264  (0.261) | -0.320  (0.169) | -0.105  (0.659) |
| R. superior  Temporal  gyrus | | 0.281  (0.231) | | 0.051  (0.831) | | -0.005  (0.982) | | -0.235  (0.319) | | -0.3005  (0.198) | -0.253  (0.2883) | -0.328  (0.158) | -0.155  (0.515) |
| R. superior  Frontal  gyrus | | 0.324  (0.164) | | 0.108  (0.649) | | 0.034  (0.886) | | 0.007  (0.975) | | 0.121  (0.613) | 0.109  (0.648) | 0.235  (0.318) | **0.512**  **(0.021)** |
| R. superior  Parietal  Gyrus | | 0.211  (0.371) | | 0.096  (0.688) | | 0.115  (0.628) | | -0.161  (0.498) | | 0.102  (0.669) | -0.080  (0.738) | 0.037  (0.876) | 0.276  (0.239) |
| R. Intra-parietal  Sulcus | | 0.151  (0.525) | | 0.024  (0.920) | | 0.010  (0.965) | | -0.232  (0.326) | | -0.055  (0.818) | -0.129  (0.587) | 0.087  (0.717) | 0.232  (0.325) |
| R. Entorhinal  Cortex | | 0.260  (0.268) | | 0.058  (0.809) | | 0.320  (0.170) | | 0.249  (0.290) | | 0.098  (0.683) | 0.261  (0.266) | 0.006  (0.982) | 0.238  (0.313) |
| R. Para-hippocampal  Gyrus | | 0.068  (0.775) | | 0.030  (0.899) | | 0.024  (0.922) | | -0.124  (0.601) | | -0.286  (0.221) | -0.145  (0.543) | -0.068  (0.774) | -0.265  (0.258) |
| R. hippocampal  volume | | 0.061  (0.798) | | 0.144  (0.544) | | 0.061  (0.798) | | 0.279  (0.234) | | -0.020  (0.934) | 0.255  (0.277) | 0.114  (0.632) | -0.063  (0.792) |
|  | |  | |  | |  | |  | |  |  |  |  |
| **b-1. PD Patients (N=19)** | | | | | | | | | | | | | |
| *Correlation coefficient R*  *(p-value)* | | | | | | | | | | | | | |
| Delayed Memory | | | | | | | Working Memory | | | | | | |
|  | Low-Load | | Low-Load with Distractor | | High-Load | | Memory Load  2 | | Memory Load  3 | | Memory Load  4 | Memory Load  5 | Memory Load  6 |
| L. inferior Frontal-  Opercular | | 0.237  (0.360) | 0.330  (0.196) | | 0.255  (0.322) | | **0.640\***  **(0.006)** | | **0.546**  **(0.024)** | | **0.505**  **(0.039)** | 0.293  (0.254) | **0.487**  **(0.047)** |
| L. Inferior Frontal-  Triangular | | 0.206  (0.427) | 0.195  (0.453) | | 0.019  (0.941) | | **0.582**  **(0.014)** | | **0.489**  **(0.046)** | | 0.429  (0.086) | 0.173  (0.506) | 0.212  (0.414) |
| L. middle Frontal  Gyrus | | -0.219  (0.398) | -0.259  (0.315) | | 0.133  (0.610) | | 0.125  (0.634) | | 0.170  (0.513) | | 0.162  (0.534) | -0.050  (0.848) | 0.475  (0.054) |
| L. Angular  Gyrus | | 0.046  (0.861) | 0.161  (0.538) | | 0.258  (0.318) | | 0.215  (0.408) | | 0.284  (0.269) | | 0.023  (0.930) | -0.025  (0.923) | 0.256  (0.322) |
| L. Supra-marginal  gyrus | | 0.263  (0.309) | 0.232  (0.370) | | 0.414  (0.099) | | 0.466  (0.060) | | 0.431  (0.084) | | 0.208  (0.423) | 0.162  (0.535) | **0.679\***  **(0.003)** |
| L. superior  Temporal  Gyrus | | **0.493**  **(0.044)** | **0.563**  **(0.019)** | | 0.359  (0.157) | | **0.604\***  **(0.010)** | | **0.575**  **(0.016)** | | **0.714\***  **(0.001)** | **0.594**  **(0.012)** | **0.595**  **(0.012)** |
| L. superior  Frontal  gyrus | | -0.112  (0.668) | -0.215  (0.407) | | 0.115  (0.660) | | 0.134  (0.607) | | 0.203  (0.434) | | 0.010  (0.969) | -0.086  (0.744) | -0.093  (0.724) |
| L. superior  Parietal  Gyrus | | 0.188  (0.469) | 0.037  (0.887) | | 0.165  (0.526) | | 0.417  (0.096) | | 0.464  (0.061) | | 0.271  (0.293) | 0.307  (0.231) | 0.355  (0.162) |
| L. Intra-parietal  Sulcus | | 0.359  (0.157) | 0.139  (0.596) | | 0.315  (0.219) | | 0.325  (0.203) | | **0.568**  **(0.017)** | | 0.211  (0.417) | 0.282  (0.274) | 0.346  (0.174) |
| L. Entorhinal  Cortex | | 0.012  (0.965) | 0.156  (0.550) | | -0.215  (0.408) | | 0.065  (0.804) | | -0.197  (0.448) | | -0.062  (0.812) | -0.038  (0.885) | -0.170  (0.515) |
| L. Para-hippocampal  Gyrus | | 0.156  (0.549) | 0.168  (0.520) | | 0.363  (0.152) | | -0.107  (0.683) | | 0.217  (0.403) | | 0.014  (0.958) | -0.112  (0.669) | 0.391  (0.121) |
| L. hippocampal  volume | | -0.099  (0.704) | -0.195  (0.453) | | -0.246  (0.342) | | 0.246  (0.342) | | 0.098  (0.708) | | -0.052  (0.842) | 0.021  (0.936) | -0.048  (0.856) |
| **b-2. PD Patients (N=19)** | | | | | | | | | | | | | |
| *Correlation coefficient R*  *(p-value)* | | | | | | | | | | | | | |
| Delayed Memory | | | | | | | Working Memory | | | | | | |
|  | Low-Load | | Low-Load with Distractor | | High-Load | | Memory Load  2 | | Memory Load  3 | | Memory Load  4 | Memory Load  5 | Memory Load  6 |
| R. inferior Frontal-  Opercular | | -0.243  (0.348) | -0.073  (0.779) | | 0.255  (0.323) | | 0.262  (0.309) | | 0.094  (0.719) | | 0.227  (0.381) | 0.009  (0.971) | **0.681\***  **(0.003)** |
| R. Inferior Frontal-  Triangular | | -0.118  (0.652) | -0.034  (0.896) | | -0.288  (0.262) | | -0.077  (0.768) | | -0.183  (0.482) | | -0.308  (0.229) | -0.421  (0.093) | 0.026  (0.920) |
| R. middle Frontal  Gyrus | | 0.082  (0.754) | 0.052  (0.842) | | 0.123  (0.637) | | 0.190  (0.465) | | 0.368  (0.147) | | 0.227  (0.381) | 0.005  (0.984) | 0.168  (0.520) |
| R. Angular  Gyrus | | 0.027  (0.917) | 0.217  (0.404) | | -0.038  (0.884) | | 0.203  (0.436) | | 0.148  (0.571) | | 0.086  (0.743) | -0.098  (0.709) | 0.238  (0.358) |
| R. Supra-marginal  gyrus | | -0.071  (0.786) | 0.149  (0.569) | | 0.227  (0.381) | | 0.365  (0.150) | | 0.217  (0.403) | | 0.240  (0.353) | 0.005  (0.984) | **0.0570**  **(0.017)** |
| R. superior  Temporal  Gyrus | | -0.002  (0.993) | 0.125  (0.634) | | 0.004  (0.988) | | **0.514**  **(0.035)** | | 0.279  (0.278) | | 0.369  (0.145) | 0.218  (0.402) | 0.104  (0.690) |
| R. superior  Frontal  gyrus | | 0.232  (0.370) | 0.253  (0.327) | | 0.134  (0.608) | | **0.550**  **(0.022)** | | **0.568\***  **(0.017)** | | 0.370  (0.144) | 0.217  (0.402) | 0.107  (0.684) |
| R. superior  Parietal  Gyrus | | 0.375  (0.138) | 0.417  (0.096) | | 0.295  (0.251) | | **0.568**  **(0.017)** | | **0.630\***  **(0.007)** | | 0.386  (0.126) | 0.239  (0.356) | 0.297  (0.248) |
| R. Intra-parietal  Sulcus | | **0.490**  **(0.046)** | 0.438  (0.079) | | 0.115  (0.659) | | 0.442  (0.076) | | **0.574\***  **(0.016)** | | 0.447  (0.072) | 0.395  (0.117) | **0.569**  **(0.017)** |
| R. Entorhinal  Cortex | | -0.202  (0.438) | -0.004  (0.989) | | -0.324  (0.204) | | 0.110  (0.673) | | -0.039  (0.882) | | 0.017  (0.948) | -0.032  (0.902) | -0.030  (0.908) |
| R. Para-hippocampal  Gyrus | | -0.202  (0.436) | -0.055  (0.834) | | 0.088  (0.737) | | 0.025  (0.924) | | 0.070  (0.788) | | 0.070  (0.790) | -0.130  (0.618) | 0.219  (0.398) |
| R. hippocampal  volume | | -0.086  (0.744) | -0.030  (0.910) | | -0.304  (0.235) | | 0.289  (0.261) | | 0.072  (0.784) | | -0.029  (0.913) | -0.031  (0.906) | -0.091  (0.729) |

Association analysis results showing Pearson correlation coefficient R (p-value). \* indicates significant result at *FWER*=0.05. Association analyses were conducted with adjustment for age and education.