

Supplementary Materials for: Relating Global and Local Connectome Changes to Dementia and Targeted Gene Expressions in Alzheimer's Disease

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Figure S1. The top figure shows the distribution of local efficiency along the 90 AAL brain regions in the baseline (purple) vs in the follow-up (green). The bottom figure shows the distribution of the differences between the baseline and follow-up measures of local efficiency of the AD (blue) vs controls (yellow), along the 90 AAL brain regions.



Figure S2. The top figure shows the distribution of clustering coefficient along the 90 AAL brain regions in the baseline (purple) vs in the follow-up (green). The bottom figure shows the distribution of the differences between the baseline and follow-up measures of clustering coefficient of the AD (blue) vs controls (yellow), along the 90 AAL brain regions.

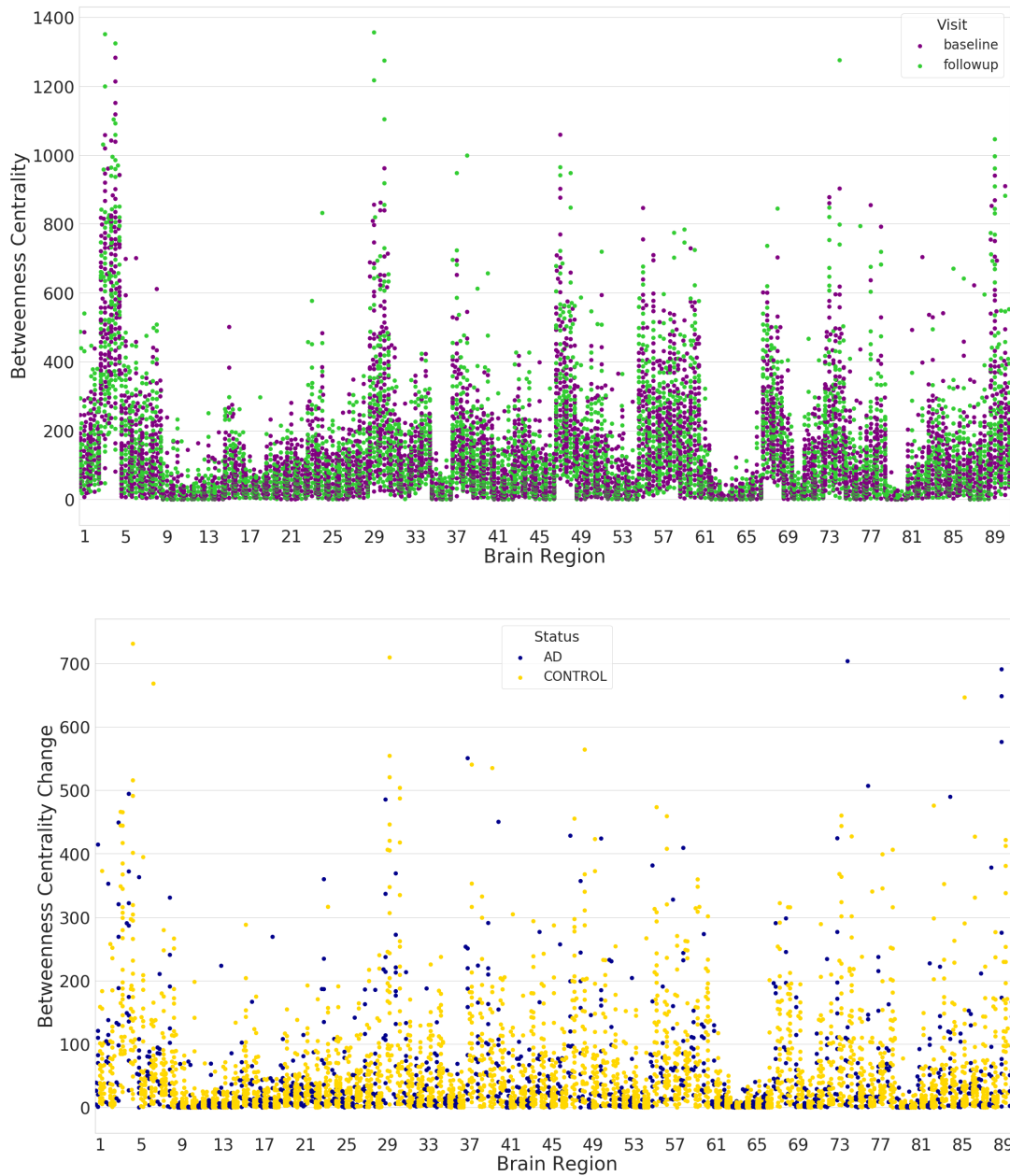


Figure S3. The top figure shows the distribution of betweenness centrality along the 90 AAL brain regions in the baseline (purple) vs in the follow-up (green). The bottom figure shows the distribution of the differences between the baseline and follow-up measures of betweenness centrality of the AD (blue) vs controls (yellow), along the 90 AAL brain regions.

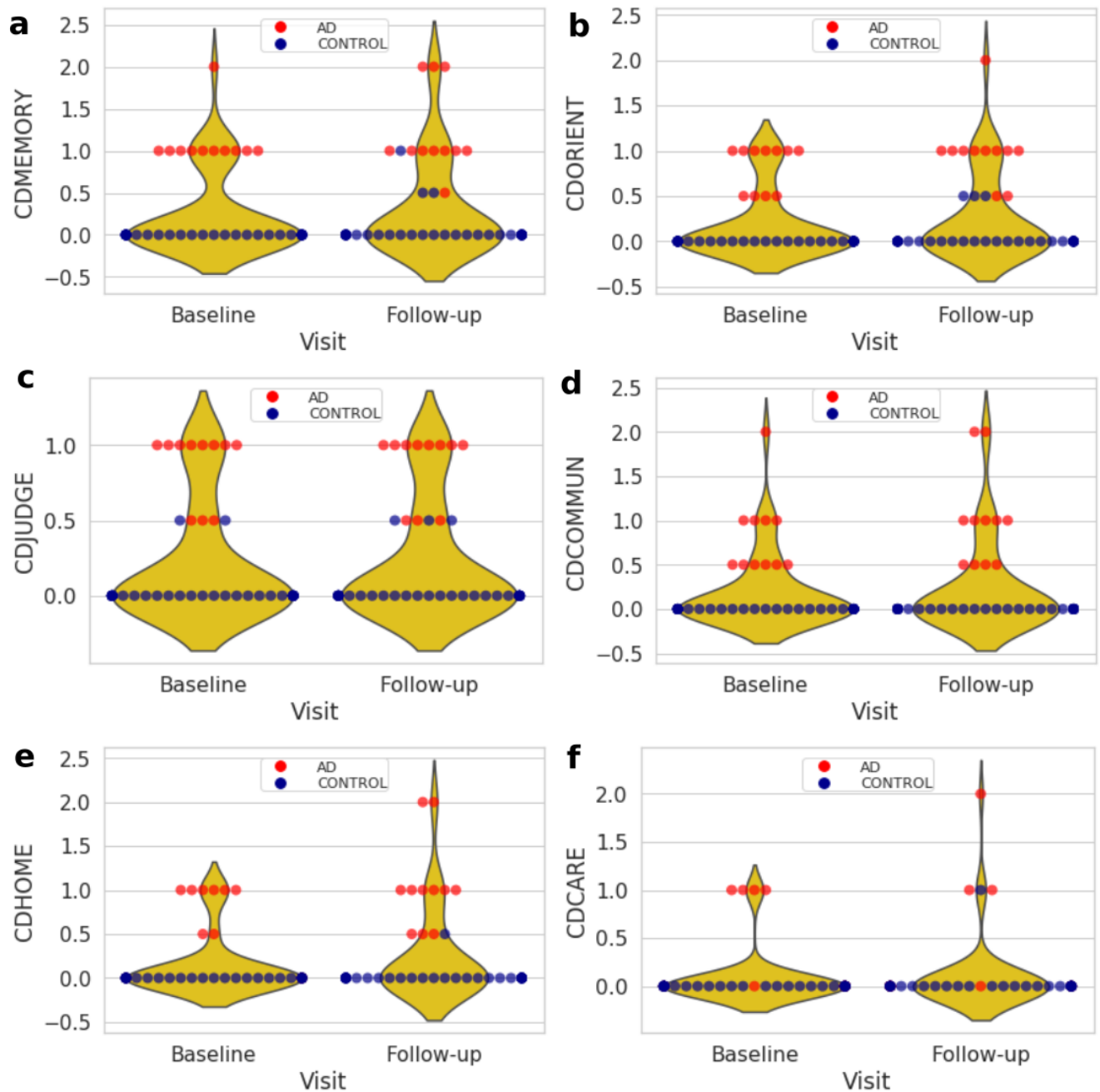


Figure S4. Violin plots to illustrate the CDR scores (either 0: None, 0.5: very mild, 1: mild, 2: moderate or 3: severe) in the baseline (left violin plot) and follow-up (right violin plot) visits, for AD (red dots) and controls (blue dots). The memory (CDMEMORY; a) and orientation (CDORIENT; b) scores are represented by the top sub-figures, judgment and problem solving (CDJUDGE; c) and community affairs (CDCOMMUN; d) are the middle sub-figures, while home and hobbies (CDHOME; e) and personal care (CDCARE; f) are at the bottom. It is visible that generally some AD subjects worsen their score, except for the CDCARE score where few improved as a result to finding strategies after the diagnosis at baseline.

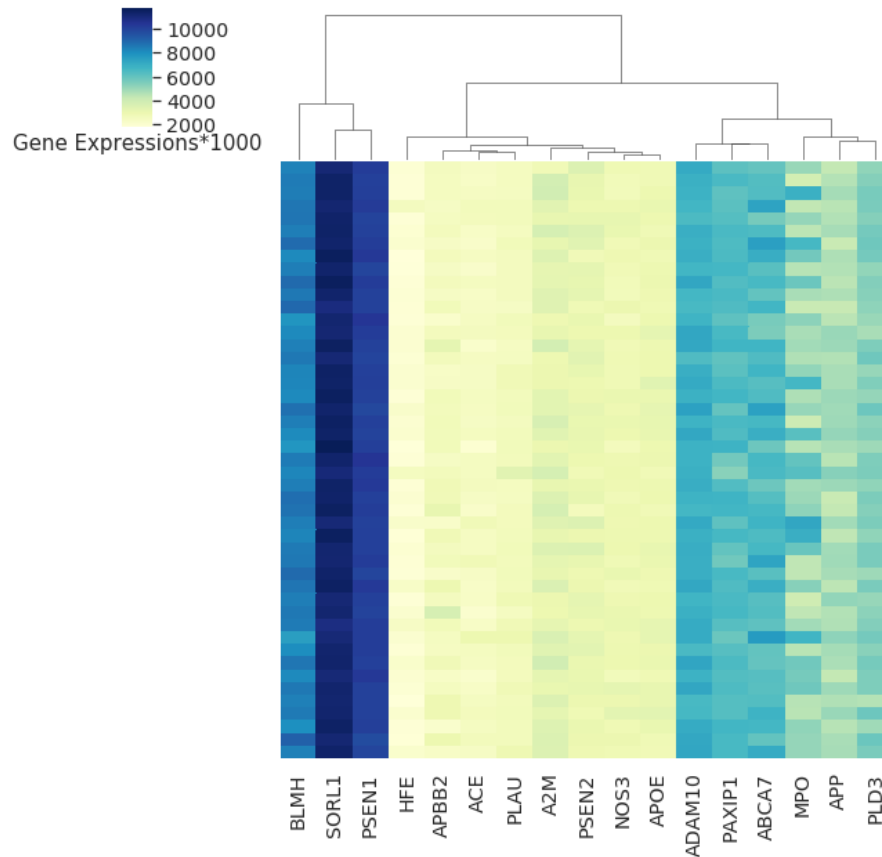


Figure S5. A heatmap of the estimated 17 gene expression profiles (values multiplied by 1000, each line represents a participant) out of the 65 probe sets as explained in the Materials and Methods section. The dark blue represents a high expression values, while the yellow represents low expression. The SORL1 has the highest expression among the genes and HFE expression was the lowest among other genes.

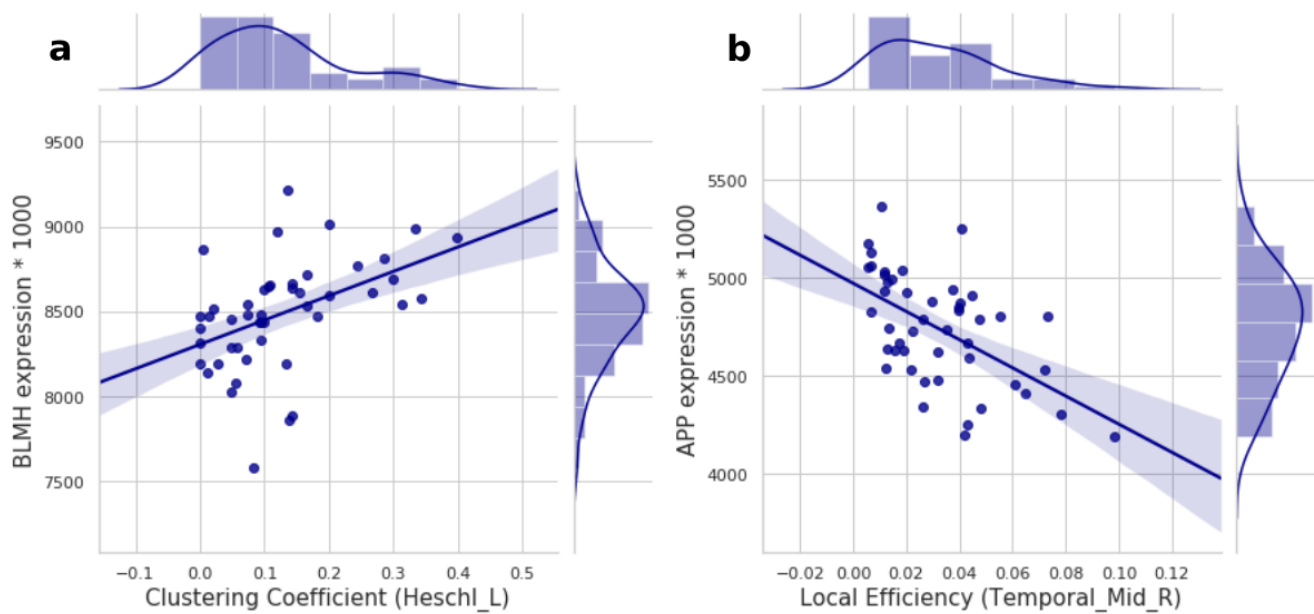


Figure S6. A scatter plot of all the significant association results. The plots shows the associations between; (a) BLMH expression and clustering coefficient in AAL region 79 (Heschl_L), (b) APP expression and local efficiency in brain region 86 (Temporal_Mid_R).

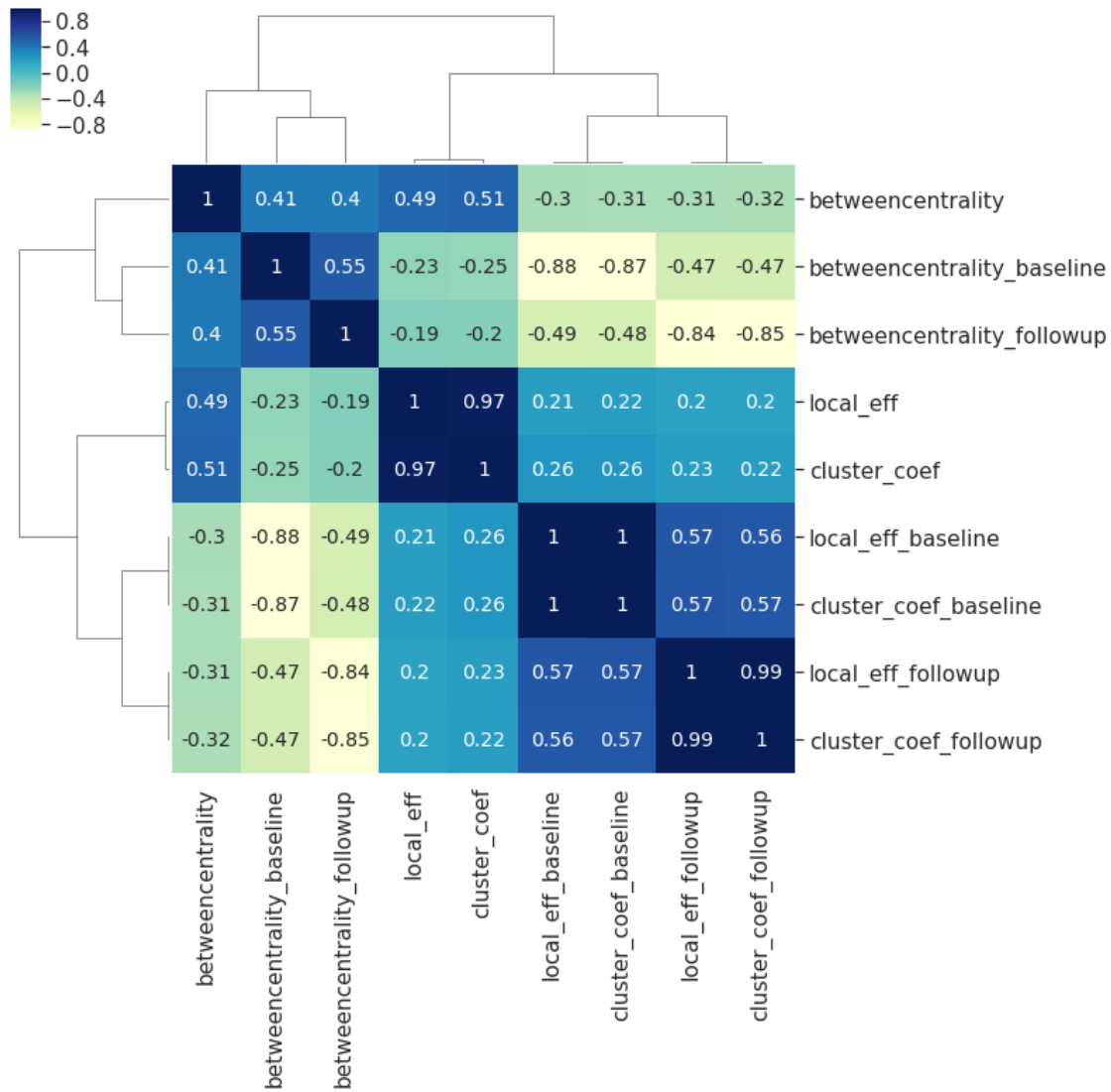


Figure S7. Spearman correlations between the three local connectivity metrics; local efficiency, clustering coefficient and betweenness centrality, at baseline (suffix: _baseline), follow-up (suffix: _followup) and the absolute difference between them (no suffix). The calculation of Spearman's coefficient combines all 90 brain regions. The plot illustrates the very strong relationship between the clustering coefficient and local efficiency at baseline, follow-up and the absolute difference between the two visits.

Table S1. Full names of brain AAL atlas regions.

Regions	Regions	abbr.	regionLabels
Precentral_L	Precentral gyrus	PreCG.L	region1
Precentral_R	Precentral gyrus	PreCG.R	region2
Frontal_Sup_L	Superior frontal gyrus;dorsolateral	SFGdor.L	region3
Frontal_Sup_R	Superior frontal gyrus;dorsolateral	SFGdor.R	region4
Frontal_Sup_Orb_L	Superior frontal gyrus; orbital part	ORBsup.L	region5
Frontal_Sup_Orb_R	Superior frontal gyrus; orbital part	ORBsup.R	region6
Frontal_Mid_L	Middle frontal gyrus	MFG.L	region7
Frontal_Mid_R	Middle frontal gyrus	MFG.R	region8
Frontal_Mid_Orb_L	Middle frontal gyrus; orbital part	ORBmid.L	region9
Frontal_Mid_Orb_R	Middle frontal gyrus; orbital part	ORBmid.R	region10
Frontal_Inf_Oper_L	Inferior frontal gyrus;opercular part	IFGoperc.L	region11
Frontal_Inf_Oper_R	Inferior frontal gyrus;opercular part	IFGoperc.R	region12
Frontal_Inf_Tri_L	Inferior frontal gyrus;triangular part	IFGtriang.L	region13
Frontal_Inf_Tri_R	Inferior frontal gyrus;triangular part	IFGtriang.R	region14
Frontal_Inf_Orb_L	Inferior frontal gyrus; orbitalpart	ORBinf.L	region15
Frontal_Inf_Orb_R	Inferior frontal gyrus; orbitalpart	ORBinf.R	region16
Rolandic_Oper_L	Rolandic operculum	ROL.L	region17
Rolandic_Oper_R	Rolandic operculum	ROL.R	region18
Supp_Motor_Area_L	Supplementary motor area	SMA.L	region19
Supp_Motor_Area_R	Supplementary motor area	SMA.R	region20
Olfactory_L	Olfactory cortex	OLF.L	region21
Olfactory_R	Olfactory cortex	OLF.R	region22
Frontal_Sup_Medial_L	Superior frontal gyrus; medial	SFGmed.L	region23
Frontal_Sup_Medial_R	Superior frontal gyrus; medial	SFGmed.R	region24
Frontal_Mid_Orb_L	Superior frontal gyrus; medial orbital	ORBsupmed.L	region25
Frontal_Mid_Orb_R	Superior frontal gyrus; medial orbital	ORBsupmed.R	region26
Rectus_L	Gyrus rectus	REC.L	region27
Rectus_R	Gyrus rectus	REC.R	region28
Insula_L	Insula	INS.L	region29
Insula_R	Insula	INS.R	region30
Cingulum_Ant_L	Anterior cingulate and paracingulate gyri	ACG.L	region31
Cingulum_Ant_R	Anterior cingulate and paracingulate gyri	ACG.R	region32
Cingulum_Mid_L	Median cingulate and paracingulate gyri	DCG.L	region33
Cingulum_Mid_R	Median cingulate and paracingulate gyri	DCG.R	region34
Cingulum_Post_L	Posterior cingulate gyrus	PCG.L	region35
Cingulum_Post_R	Posterior cingulate gyrus	PCG.R	region36
Hippocampus_L	Hippocampus	HIP.L	region37
Hippocampus_R	Hippocampus	HIP.R	region38
ParaHippocampal_L	Parahippocampal gyrus	PHG.L	region39
ParaHippocampal_R	Parahippocampal gyrus	PHG.R	region40
Amygdala_L	Amygdala	AMYG.L	region41
Amygdala_R	Amygdala	AMYG.R	region42
Calcarine_L	Calcarine fissure and surrounding cortex	CAL.L	region43
Calcarine_R	Calcarine fissure and surrounding cortex	CAL.R	region44
Cuneus_L	Cuneus	CUN.L	region45
Cuneus_R	Cuneus	CUN.R	region46
Lingual_L	Lingual gyrus	LING.L	region47
Lingual_R	Lingual gyrus	LING.R	region48
Occipital_Sup_L	Superior occipital gyrus	SOG.L	region49
Occipital_Sup_R	Superior occipital gyrus	SOG.R	region50

Table S1. Full names of brain AAL atlas regions (continued).

Regions	Regions	abbr.	regionLabels
Occipital_Mid_L	Middle occipital gyrus	MOG.L	region51
Occipital_Mid_R	Middle occipital gyrus	MOG.R	region52
Occipital_Inf_L	Inferior occipital gyrus	IOG.L	region53
Occipital_Inf_R	Inferior occipital gyrus	IOG.R	region54
Fusiform_L	Fusiform gyrus	FFG.L	region55
Fusiform_R	Fusiform gyrus	FFG.R	region56
Postcentral_L	Postcentral gyrus	PoCG.L	region57
Postcentral_R	Postcentral gyrus	PoCG.R	region58
Parietal_Sup_L	Superior parietal gyrus	SPG.L	region59
Parietal_Sup_R	Superior parietal gyrus	SPG.R	region60
Parietal_Inf_L	Inferior parietal; but supramarginal and angular gyri	IPL.L	region61
Parietal_Inf_R	Inferior parietal; but supramarginal and angular gyri	IPL.R	region62
SupraMarginal_L	Supramarginal gyrus	SMG.L	region63
SupraMarginal_R	Supramarginal gyrus	SMG.R	region64
Angular_L	Angular gyrus	ANG.L	region65
Angular_R	Angular gyrus	ANG.R	region66
Precuneus_L	Precuneus	PCUN.L	region67
Precuneus_R	Precuneus	PCUN.R	region68
Paracentral_Lobule_L	Paracentral lobule	PCL.L	region69
Paracentral_Lobule_R	Paracentral lobule	PCL.R	region70
Caudate_L	Caudate nucleus	CAU.L	region71
Caudate_R	Caudate nucleus	CAU.R	region72
Putamen_L	Lenticular nucleus; putamen	PUT.L	region73
Putamen_R	Lenticular nucleus; putamen	PUT.R	region74
Pallidum_L	Lenticular nucleus; pallidum	PAL.L	region75
Pallidum_R	Lenticular nucleus; pallidum	PAL.R	region76
Thalamus_L	Thalamus	THA.L	region77
Thalamus_R	Thalamus	THA.R	region78
Heschl_L	Heschl gyrus	HES.L	region79
Heschl_R	Heschl gyrus	HES.R	region80
Temporal_Sup_L	Superior temporal gyrus	STG.L	region81
Temporal_Sup_R	Superior temporal gyrus	STG.R	region82
Temporal_Pole_Sup_L	Temporal pole: superior temporal gyrus	TPOsup.L	region83
Temporal_Pole_Sup_R	Temporal pole: superior temporal gyrus	TPOsup.R	region84
Temporal_Mid_L	Middle temporal gyrus	MTG.L	region85
Temporal_Mid_R	Middle temporal gyrus	MTG.R	region86
Temporal_Pole_Mid_L	Temporal pole: middle temporal gyrus	TPOmid.L	region87
Temporal_Pole_Mid_R	Temporal pole: middle temporal gyrus	TPOmid.R	region88
Temporal_Inf_L	Inferior temporal gyrus	ITG.L	region89
Temporal_Inf_R	Inferior temporal gyrus	ITG.R	region90

Table S2. Top 20 Spearman association results of the change in global network metrics with targeted Alzheimer’s Disease gene expressions. Threshold= $\frac{0.5}{17} = 0.0029$

Gene	Results are sorted according to p-value		
	ρ	P-value	Global Feature
PAXIP1	0.3889	0.0069	transitivity
PLAU	-0.3824	0.008	global_eff
ACE	-0.3696	0.0106	transitivity
PLAU	-0.3523	0.0151	char_path_len
ABCA7	-0.3492	0.0161	char_path_len
PSEN1	-0.299	0.0412	transitivity
APP	-0.2602	0.0774	char_path_len
PLAU	-0.2542	0.0847	louvain
APOE	-0.2506	0.0893	char_path_len
ADAM10	-0.2365	0.1095	louvain
ACE	0.2291	0.1213	louvain
NOS3	-0.2207	0.1359	char_path_len
NOS3	-0.2202	0.1369	global_eff
ABCA7	-0.2164	0.1441	global_eff
HFE	-0.2012	0.1752	char_path_len

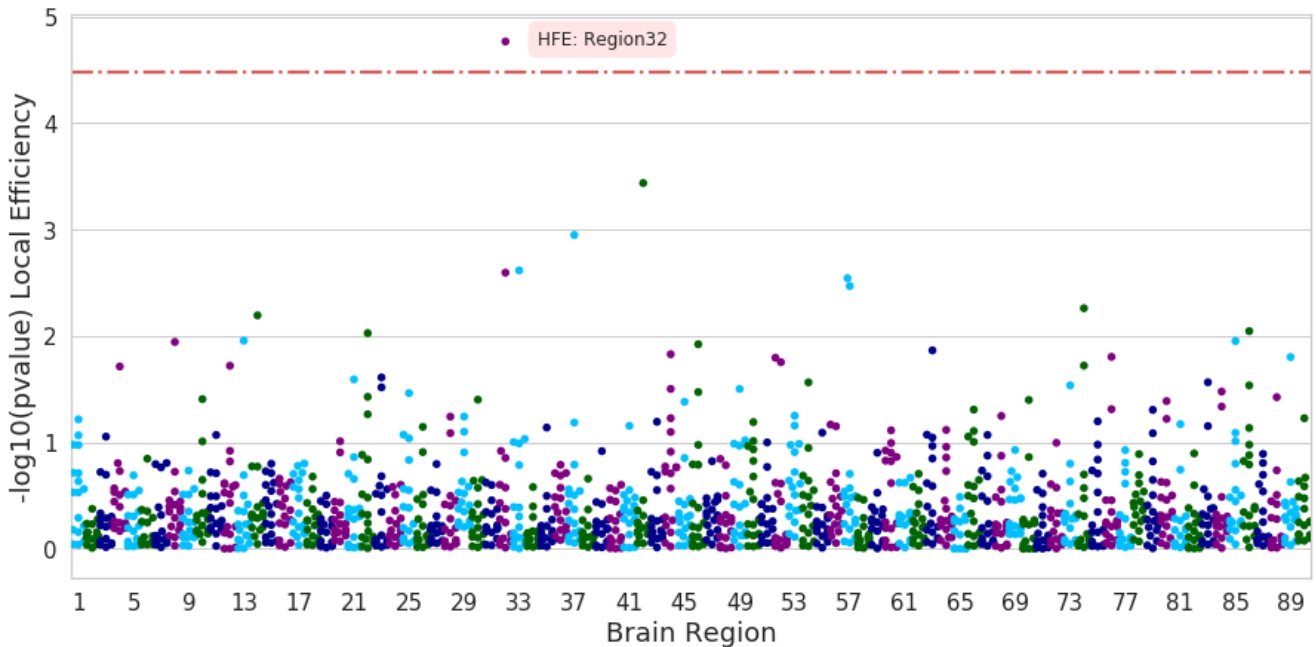


Figure S8. The figure shows the quantile regression model coefficient $-\log_{10}$ p-values. The model regresses the change in the local coefficient (dependant variable) on a single gene at a time (independent variable), at each of the 90 brain regions as in the AAL atlas (x axis).

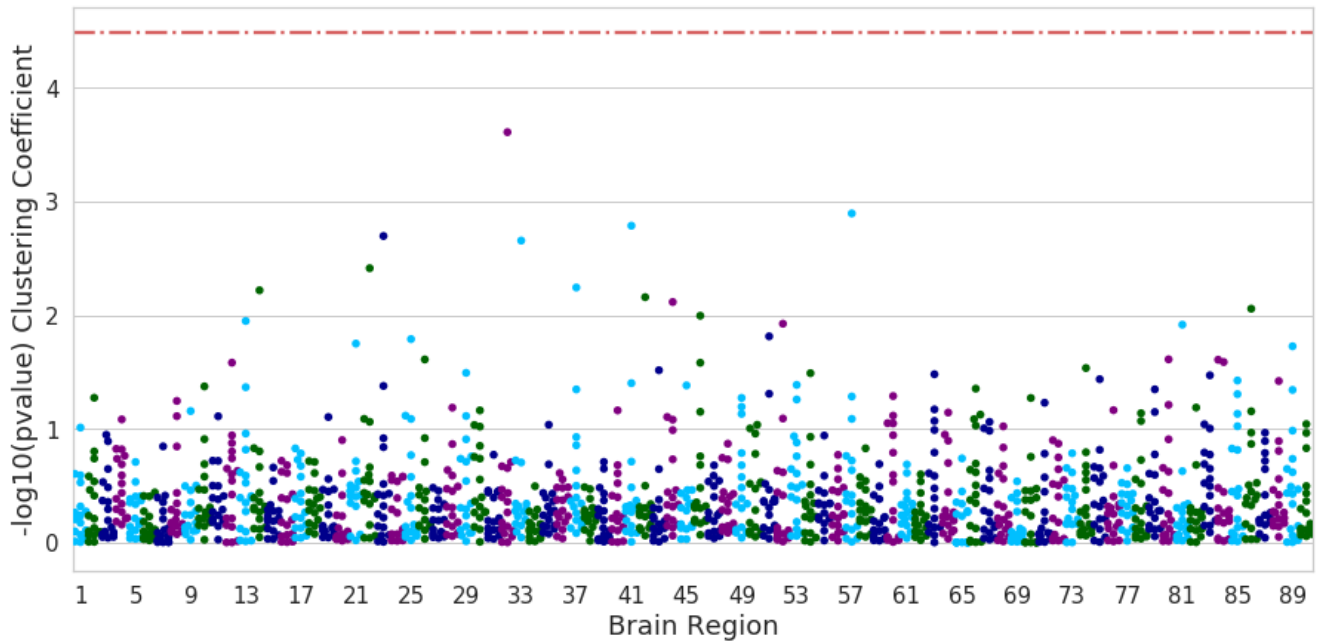


Figure S9. The figure shows the quantile regression model coefficient $-\log_{10}$ p-values. The model regresses the change in the betweenness centrality (dependant variable) on a single gene at a time (independent variable), at each of the 90 brain regions as in the AAL atlas (x axis).

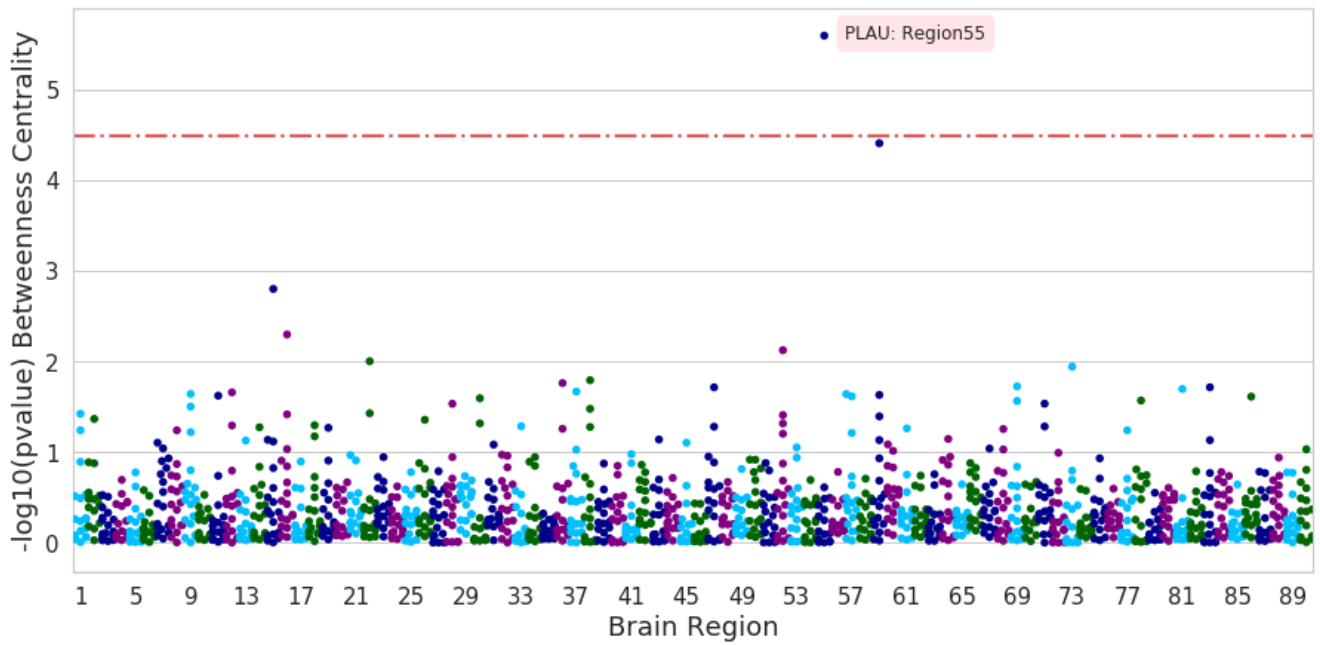


Figure S10. The figure shows the quantile regression model coefficient $-\log_{10}$ p-values. The model regresses the change in the local coefficient (dependant variable) on a single gene at a time (independent variable), at each of the 90 brain regions as in the AAL atlas (x axis).

Table S3. Top quantile regression results of the change in global network metrics and targeted Alzheimer’s Disease gene expressions. Threshold= $\frac{0.5}{17} = 0.0029$.

Gene	Results are sorted according to p-value			
	Beta	Statistic	P-value	Metric
PAXIP1	0.0155	2.1179	0.039738	transitivity
PSEN1	-0.0366	-2.0821	0.04305	transitivity
A2M	0.0178	1.9728	0.054679	louvain
PLAU	-0.0157	-1.9288	0.06008	global_eff
APBB2	0.0166	1.7579	0.085573	louvain
ABCA7	0.0077	1.5185	0.135881	transitivity
BLMH	0.0101	1.3476	0.184529	transitivity
ACE	-0.0162	-1.2618	0.213524	transitivity
ADAM10	-0.0147	-1.2538	0.21638	louvain
APOE	-0.0555	-1.1673	0.249246	char_path_len
PLD3	-0.0096	-1.1433	0.258978	transitivity
ABCA7	-0.0156	-1.1367	0.261684	char_path_len
SORL1	0.0147	1.1278	0.265372	transitivity
APOE	-0.0099	-1.1048	0.275101	global_eff
HFE	-0.0161	-1.0436	0.302239	louvain

Table S4. Quantile regression results of the difference in CDR (y) with the difference in global connectivity (x)

Global Metric	Threshold = $\frac{0.05}{6} = 0.00833$. * represents significant p-value.						
	CDMEMORY	CDORIENT	CDJUDGE	CDCOMMUN	CDHOME	CD CARE	
Q. Regression: β (p-value)							
transitivity	-6.14e-06 (0.0034*)	-1.8e-06 (nan)	-3.2e-07 (nan)	8.4e-07 (0.9249)	4.13e-06 (0.7324)	-3.1e-07 (nan)	
global_eff	1.3e-06 (0.8572)	3.36e-06 (0.9944)	3.5e-07 (0.9826)	3.09e-06 (0.3131)	9.5e-06 (0.1613)	-2.5e-07 (nan)	
louvain	-2.64e-06 (0.1683)	-6.84e-06 (0.0352)	1.21e-06 (0.0012*)	-1.01e-06 (0.8125)	-2.16e-06 (0.9424)	-6.3e-07 (0.1787)	
char_path_len	-5.8e-07 (0.8562)	-8.3e-07 (0.8791)	-8e-08 (0.8637)	-8.3e-07 (0.0361)	-2.14e-06 (0.0442)	-2e-08 (nan)	
Spearman: ρ (p-value)							
transitivity	-0.3395 (0.021)	-0.0763 (0.6142)	-0.0618 (0.6835)	0.0661 (0.6623)	0.161 (0.2851)	-0.0081 (0.9574)	
global_eff	0.0483 (0.7497)	0.0056 (0.9707)	0.0505 (0.7388)	0.2685 (0.0712)	0.4145 (0.0042*)	-0.0263 (0.8625)	
louvain	-0.1955 (0.1928)	-0.3119 (0.0349)	0.2077 (0.166)	-0.0968 (0.522)	-0.11 (0.4666)	-0.0628 (0.6784)	
char_path_len	-0.1183 (0.4337)	-0.0516 (0.7333)	-0.0281 (0.8531)	-0.2909 (0.0498)	-0.3811 (0.009)	-0.0065 (0.9658)	

Table S5. Quantile regression top results of regressing CDR scores on the local connectivity metrics.

CDR	Results are sorted according to p-value. Threshold = $\frac{0.05}{6 \times 90} = 9.26e - 05$				
	Metric	Region	Region id	β	P-value
CDJUDGE	betweencentrality	Frontal_Inf_Oper_L	region11	-1.06e-08	1.3246e-17
CDCOMMUN	betweencentrality	Frontal_Inf_Tri_L	region13	1.162e-07	1.0377e-16
CDCOMMUN	betweencentrality	Pallidum_R	region76	6.79e-08	1.5932e-16
CDCARE	betweencentrality	Pallidum_R	region76	1.21e-08	2.5409e-15
CDCARE	betweencentrality	Frontal_Inf_Tri_L	region13	-2.35e-08	4.3817e-15
CDCARE	betweencentrality	Rolandic_Oper_R	region18	-5e-09	5.5180e-14
CDCARE	betweencentrality	Frontal_Mid_Orb_L	region9	8.35e-08	6.8455e-14
CDCARE	betweencentrality	Frontal_Inf_Tri_R	region14	1.538e-07	4.6868e-13
CDMEMORY	betweencentrality	Pallidum_R	region76	9.8e-09	1.8588e-12
CDMEMORY	betweencentrality	Heschl_R	region80	-1.431e-07	7.9135e-12
CDHOME	betweencentrality	Pallidum_R	region76	2.34e-08	1.0339e-10
CDORIENT	betweencentrality	Rolandic_Oper_R	region18	3.566e-07	2.8690e-10
CDCOMMUN	betweencentrality	Frontal_Sup_Medial_L	region23	1.2e-08	2.2249e-09
CDMEMORY	betweencentrality	Frontal_Mid_Orb_L	region9	1.53e-08	2.7792e-09
CDHOME	betweencentrality	Frontal_Inf_Tri_L	region13	7.55e-08	2.8144e-09
CDCARE	local_eff	Parietal_Sup_L	region59	-2.8362e-06	4.5150e-09
CDCARE	betweencentrality	Caudate_R	region72	-2.7e-09	5.9383e-08
CDCARE	betweencentrality	Frontal_Sup_Medial_L	region23	1.81e-08	8.4091e-08
CDCOMMUN	betweencentrality	Precentral_L	region1	5.6e-09	8.8635e-08
CDCARE	betweencentrality	Frontal_Sup_Orb_L	region5	-6.8e-09	9.1463e-08
CDCARE	betweencentrality	Occipital_Inf_L	region53	3.2e-09	1.0397e-07
CDJUDGE	betweencentrality	Insula_R	region30	-1.9e-09	1.0927e-07
CDORIENT	betweencentrality	Angular_R	region66	-2.58e-08	1.3192e-07
CDHOME	betweencentrality	Frontal_Sup_Medial_L	region23	7.28e-08	1.4609e-07
CDMEMORY	betweencentrality	Angular_L	region65	9.69e-08	1.5599e-07
CDCOMMUN	betweencentrality	Occipital_Inf_L	region53	8e-09	1.6902e-07
CDCOMMUN	betweencentrality	Occipital_Sup_R	region50	8.8e-09	1.8204e-07
CDCARE	betweencentrality	Cingulum_Post_R	region36	3.55e-08	2.6603e-07
CDCARE	betweencentrality	Angular_L	region65	5.9e-09	3.2401e-07
CDCARE	betweencentrality	Frontal_Inf_Oper_R	region12	-4.9e-09	3.9313e-07
CDMEMORY	betweencentrality	Frontal_Inf_Oper_R	region12	1.72e-08	4.2464e-07
CDJUDGE	betweencentrality	Precentral_R	region2	2.4e-09	4.2576e-07
CDJUDGE	betweencentrality	Paracentral_Lobule_R	region70	5.1e-09	4.5211e-07
CDCARE	local_eff	Caudate_L	region71	7.203e-07	6.0570e-07
CDMEMORY	betweencentrality	Occipital_Mid_R	region52	-1.45e-08	7.3061e-07
CDJUDGE	betweencentrality	SupraMarginal_R	region64	-1.35e-08	7.3933e-07
CDJUDGE	betweencentrality	Calcarine_L	region43	1.2e-09	8.0399e-07
CDCARE	betweencentrality	Precentral_L	region1	3.9e-09	1.0015e-06
CDCARE	local_eff	Thalamus_R	region78	-1.6719e-06	1.1912e-06
CDCARE	betweencentrality	ParaHippocampal_L	region39	8.1e-09	1.2821e-06
CDMEMORY	betweencentrality	Precentral_L	region1	4.9e-09	1.4549e-06
CDJUDGE	betweencentrality	Cingulum_Mid_L	region33	5e-10	1.8206e-06
CDORIENT	betweencentrality	Amygdala_R	region42	2.7e-08	2.0376e-06
CDCARE	betweencentrality	Cuneus_R	region46	2.6e-09	2.1374e-06
CDJUDGE	local_eff	Occipital_Mid_L	region51	-1.3593e-06	2.5568e-06
CDCARE	betweencentrality	Occipital_Sup_R	region50	2.4e-09	2.7811e-06
CDCARE	betweencentrality	SupraMarginal_R	region64	2.35e-08	2.8475e-06
CDCARE	cluster_coef	Parietal_Sup_L	region59	-1.5812e-06	3.0162e-06
CDCARE	betweencentrality	Precentral_R	region2	6.4e-09	3.0711e-06
CDJUDGE	betweencentrality	Cuneus_R	region46	8e-10	3.1560e-06

Table S5. Quantile regression top results of regressing CDR scores on the local connectivity metrics (continued).

CDR	Results are sorted according to p-value. Threshold = $\frac{0.05}{6 \times 90} = 9.26e - 05$				
	Metric	Region	Region id	β	P-value
CDMEMORY	betweencentrality	Precentral_R	region2	1.21e-08	4.0628e-06
CDCARE	betweencentrality	Occipital_Mid_L	region51	-2e-09	4.7259e-06
CDCARE	betweencentrality	Temporal_Inf_R	region90	-8e-10	5.1879e-06
CDCOMMUN	betweencentrality	Temporal_Pole_Sup_R	region84	1.7e-09	5.2490e-06
CDCARE	local_eff	Paracentral_Lobule_R	region70	4.028e-07	5.3093e-06
CDCARE	betweencentrality	Olfactory_R	region22	2.5e-09	6.1963e-06
CDCARE	betweencentrality	Pallidum_L	region75	2.8e-09	6.6154e-06
CDJUDGE	betweencentrality	Postcentral_L	region57	-4e-10	6.6330e-06
CDCARE	betweencentrality	Frontal_Med_Orb_L	region25	-5.5e-09	6.7257e-06
CDCARE	betweencentrality	Parietal_Inf_L	region61	-7.6e-09	6.8700e-06
CDCARE	local_eff	Calcarine_L	region43	-1.3701e-06	6.9599e-06
CDCARE	betweencentrality	Cingulum_Mid_L	region33	9e-10	7.0795e-06
CDHOME	betweencentrality	Precentral_L	region1	6.5e-09	7.2322e-06
CDJUDGE	cluster_coef	Occipital_Mid_L	region51	-7.789e-07	7.5340e-06
CDCARE	betweencentrality	Olfactory_L	region21	1.2e-09	1.0177e-05
CDCARE	betweencentrality	Paracentral_Lobule_L	region69	2.9e-09	1.0179e-05
CDORIENT	betweencentrality	Frontal_Sup_Medial_L	region23	4.18e-08	1.1987e-05
CDCARE	cluster_coef	Thalamus_R	region78	-9.55e-07	1.2007e-05
CDMEMORY	betweencentrality	Frontal_Sup_Orb_L	region5	-2.3e-09	1.3418e-05
CDCARE	betweencentrality	Frontal_Sup_Medial_R	region24	-2.2e-09	1.3753e-05
CDMEMORY	betweencentrality	Thalamus_L	region77	4.6e-09	1.4079e-05
CDCARE	betweencentrality	Putamen_R	region74	-6.6e-09	1.4768e-05
CDCOMMUN	betweencentrality	Putamen_R	region74	-1.1e-09	1.7248e-05
CDCARE	local_eff	Amygdala_R	region42	-1.2503e-06	1.7740e-05
CDCARE	betweencentrality	Thalamus_L	region77	-7e-10	1.7820e-05
CDJUDGE	betweencentrality	Frontal_Inf_Orb_R	region16	6e-10	1.7857e-05
CDJUDGE	cluster_coef	Temporal_Mid_L	region85	6.814e-07	1.7954e-05
CDJUDGE	betweencentrality	Pallidum_L	region75	6e-10	1.9036e-05
CDCARE	local_eff	Lingual_L	region47	-1.3648e-06	1.9534e-05
CDCARE	betweencentrality	Putamen_L	region73	-9e-10	2.0543e-05
CDCARE	local_eff	Frontal_Mid_Orb_L	region9	-9.801e-07	2.0693e-05
CDJUDGE	local_eff	Temporal_Mid_L	region85	1.1769e-06	2.4200e-05
CDJUDGE	cluster_coef	Frontal_Sup_Orb_L	region5	5.54e-07	2.5902e-05
CDCARE	betweencentrality	Temporal_Pole_Sup_L	region83	-2.4e-09	2.7526e-05
CDJUDGE	local_eff	Calcarine_L	region43	-5.122e-07	2.7953e-05
CDJUDGE	cluster_coef	Cuneus_R	region46	-6.206e-07	2.8360e-05
CDCARE	betweencentrality	Frontal_Med_Orb_R	region26	1.1e-09	2.9931e-05
CDCARE	betweencentrality	Rectus_L	region27	1.7e-09	3.1086e-05
CDCARE	betweencentrality	Temporal_Pole_Sup_R	region84	4e-10	3.2473e-05
CDCARE	local_eff	Precentral_R	region2	-1.7287e-06	3.3132e-05
CDJUDGE	local_eff	Frontal_Sup_Orb_L	region5	7.069e-07	3.3295e-05
CDCARE	cluster_coef	Precuneus_L	region67	-1.3847e-06	3.3801e-05
CDJUDGE	cluster_coef	Olfactory_L	region21	3.541e-07	3.5295e-05
CDCARE	cluster_coef	Occipital_Sup_L	region49	-1.2676e-06	3.5428e-05
CDJUDGE	cluster_coef	Calcarine_L	region43	-4.54e-07	3.7033e-05
CDJUDGE	local_eff	Cuneus_R	region46	-1.0686e-06	3.7315e-05
CDCARE	local_eff	Occipital_Sup_L	region49	-2.3923e-06	3.9588e-05
CDCOMMUN	betweencentrality	Frontal_Sup_Orb_R	region6	1e-09	4.0230e-05
CDCARE	betweencentrality	Rolandic_Oper_L	region17	6.2e-08	4.0397e-05

Table S5. Quantile regression top results of regressing CDR scores on the local connectivity metrics (continued).

CDR	Results are sorted according to p-value. Threshold = $\frac{0.05}{6 \times 90} = 9.26e - 05$				
	Metric	Region	Region id	β	P-value
CDJUDGE	betweencentrality	Insula_L	region29	2e-10	4.3809e-05
CDR_diff	betweencentrality	Frontal_Sup_Medial_L	region23	0.0037021312	4.5916e-05
CDCOMMUN	cluster_coef	Precuneus_L	region67	-1.9329e-06	4.9971e-05
CDCARE	local_eff	Occipital_Mid_L	region51	-1.4926e-06	5.3963e-05
CDCARE	betweencentrality	Temporal_Inf_L	region89	2e-10	5.5267e-05
CDCARE	betweencentrality	Amygdala_L	region41	-1.1e-09	5.6693e-05
CDCARE	betweencentrality	Frontal_Inf_Orb_L	region15	-8e-10	5.6717e-05
CDJUDGE	betweencentrality	Putamen_R	region74	3e-10	5.8176e-05
CDCARE	local_eff	Parietal_Inf_L	region61	1.8772e-06	5.9063e-05
CDORIENT	local_eff	Caudate_L	region71	2.6838e-06	5.9186e-05
CDCARE	local_eff	ParaHippocampal_L	region39	-6.989e-07	6.0628e-05
CDCARE	cluster_coef	Paracentral_Lobule_L	region69	-3.682e-07	6.0769e-05
CDHOME	betweencentrality	Cingulum_Mid_L	region33	1.12e-08	6.2336e-05
CDCARE	local_eff	Temporal_Pole_Sup_R	region84	-2.5008e-06	6.4671e-05
CDCARE	betweencentrality	Calcarine_R	region44	-2.3e-09	7.4457e-05
CDCARE	betweencentrality	ParaHippocampal_R	region40	-1.2e-09	7.5724e-05
CDMEMORY	local_eff	Temporal_Mid_L	region85	4.7978e-06	7.5984e-05
CDORIENT	betweencentrality	Thalamus_L	region77	3.7e-09	8.3093e-05
CDCARE	cluster_coef	Parietal_Inf_L	region61	9.696e-07	8.3094e-05
CDCARE	betweencentrality	Precuneus_L	region67	1.3e-09	8.9269e-05
CDJUDGE	local_eff	Precentral_R	region2	-1.0795e-06	8.9400e-05
CDCOMMUN	betweencentrality	Cingulum_Mid_L	region33	1.8e-09	8.9822e-05

Table S6. Ridge regression results of the change CDR scores on the global connectivity changes and Alzheimer's Disease gene expressions.

CDR		Metric	Alpha score	Metric	APBB2MPO	APP	ACE	PLAU	PAXIP1HFE	SORL1 A2M	NOS3	BLMH	ADAMI0PLD3	APOE	PSENI	PSENI2	ABCA7				
CDMEMORY	transitivity	0.1	-0.0747	-0.6704	0.122	0.0823	0.0248	-0.0392	-0.0556	0.0497	-0.0926	0.0138	-0.3465	0.3276	-0.1321	-0.1347	-0.0774	-0.2426	0.161	-0.1369	0.1903
CDMEMORY	global_eff	0.1	-0.0753	-0.0304	0.1114	0.0802	0.0332	-0.0311	-0.0575	0.06	-0.0765	0.0086	-0.3486	0.3226	-0.1364	-0.1318	-0.0628	-0.267	0.1585	-0.1392	0.1919
CDMEMORY	louvain	0.1	-0.0754	-0.259	0.1052	0.0823	0.0353	-0.0259	-0.0676	0.0647	-0.0634	0.0098	-0.3483	0.3178	-0.1388	-0.1296	-0.0616	-0.2694	0.1563	-0.1373	0.1884
CDMEMORY	char_path_len	0.1	-0.0752	-0.1203	0.1004	0.0804	0.0351	-0.0335	-0.0617	0.0619	-0.0769	0.0074	-0.3507	0.3187	-0.1365	-0.1287	-0.0475	-0.2827	0.1621	-0.1398	0.1869
CDORIENT	transitivity	0.1	-0.0677	-0.3061	0.1731	0.0679	0.2135	0.0287	0.0046	-0.0399	-0.472	0.0156	-0.192	0.0553	-0.0138	-0.0342	-0.0135	-0.1967	0.1309	-0.232	-0.0035
CDORIENT	global_eff	0.1	-0.0677	-0.0517	0.169	0.067	0.2172	0.0324	0.0042	-0.0354	-0.4648	0.0133	-0.1928	0.0532	-0.0157	-0.0332	-0.0078	-0.2068	0.1297	-0.2331	-0.0025
CDORIENT	louvain	0.1	-0.0673	-0.403	0.1592	0.0702	0.2203	0.0406	-0.0117	-0.0281	-0.4445	0.0151	-0.1923	0.0457	-0.0195	-0.0298	-0.0058	-0.2107	0.1261	-0.23	-0.0079
CDORIENT	char_path_len	0.1	-0.0677	0.009	0.1688	0.067	0.2173	0.0325	0.0039	-0.0352	-0.4645	0.0132	-0.1929	0.0532	-0.0158	-0.033	-0.0076	-0.2071	0.1295	-0.2331	-0.0025
CDJUDGE	transitivity	149	-0.0056	-0.0	-0.0002	0.0023	-0.0007	-0.0012	0.0	0.0019	0.0003	0.0002	0.0004	0.0002	-0.0005	-0.0002	-0.0007	-0.0003	-0.0005	-0.0001	-0.0027
CDJUDGE	global_eff	149	-0.0056	0.0	-0.0002	0.0023	-0.0007	-0.0012	0.0	0.0019	0.0003	0.0002	0.0004	0.0002	-0.0005	-0.0002	-0.0007	-0.0003	-0.0005	-0.0001	-0.0027
CDJUDGE	louvain	149	-0.0056	0.0001	-0.0002	0.0023	-0.0007	-0.0012	0.0	0.0019	0.0003	0.0002	0.0004	0.0002	-0.0005	-0.0002	-0.0007	-0.0003	-0.0005	-0.0001	-0.0027
CDJUDGE	char_path_len	149	-0.0056	-0.0001	-0.0002	0.0023	-0.0007	-0.0012	0.0	0.0019	0.0003	0.0002	0.0004	0.0002	-0.0005	-0.0002	-0.0007	-0.0003	-0.0005	-0.0001	-0.0027
CDCOMMUN	transitivity	0.3	-0.0325	-0.0526	0.1227	-0.0205	-0.178	0.1151	0.1812	-0.0161	-0.0366	-0.0375	-0.1628	0.1476	-0.0795	0.1688	-0.0516	0.0563	0.0078	-0.1135	0.0637
CDCOMMUN	global_eff	0.3	-0.0325	0.0071	0.1218	-0.0207	-0.1775	0.1154	0.1811	-0.0155	-0.0356	-0.0378	-0.1629	0.1473	-0.0798	0.1692	-0.0503	0.0547	0.0076	-0.1137	0.0637
CDCOMMUN	louvain	0.3	-0.0325	0.0174	0.1223	-0.0208	-0.1776	0.1152	0.1817	-0.0158	-0.0363	-0.0379	-0.1629	0.1476	-0.0797	0.169	-0.0505	0.0548	0.0077	-0.1138	0.064
CDCOMMUN	char_path_len	0.5	-0.0324	-0.0703	0.1038	-0.0164	-0.1436	0.0941	0.1423	-0.0117	-0.0184	-0.0381	-0.1579	0.1242	-0.0666	0.1484	-0.0458	0.0447	0.0139	-0.1111	0.0613
CDHOME	transitivity	0.4	-0.0893	0.0428	0.1908	-0.0343	-0.09	0.0756	0.0009	-0.0142	0.0578	-0.1228	-0.1029	-0.0044	-0.1787	0.3326	-0.095	0.1188	0.1113	-0.3091	0.1076
CDHOME	global_eff	0.3	-0.0891	0.0872	0.1961	-0.0363	-0.0987	0.0821	-0.0017	-0.0156	0.0521	-0.132	-0.1063	-0.0057	-0.1846	0.3515	-0.0929	0.1258	0.1227	-0.3232	0.1079
CDHOME	louvain	0.3	-0.0892	-0.0191	0.1972	-0.0361	-0.0989	0.0826	-0.0017	-0.0157	0.0525	-0.1318	-0.1059	-0.0054	-0.1847	0.3511	-0.0949	0.1275	0.1225	-0.3231	0.1082
CDHOME	char_path_len	0.6	-0.0891	-0.1843	0.1674	-0.0302	-0.0767	0.0607	0.0025	-0.0114	0.0616	-0.1083	-0.0978	-0.0083	-0.167	0.3047	-0.0782	0.0932	0.1009	-0.2832	0.0988
CD CARE	transitivity	149	-0.1093	-0.0	-0.0008	0.0027	-0.0014	-0.0002	0.0007	0.0001	-0.0037	0.0013	-0.0066	-0.001	-0.0037	-0.0018	-0.0031	0.0	0.0013	-0.0045	0.0078
CD CARE	global_eff	149	-0.1093	-0.0	-0.0008	0.0027	-0.0014	-0.0002	0.0007	0.0001	-0.0037	0.0013	-0.0066	-0.001	-0.0037	-0.0018	-0.0031	0.0	0.0013	-0.0045	0.0078
CD CARE	louvain	149	-0.1093	-0.0001	-0.0008	0.0027	-0.0014	-0.0002	0.0007	0.0001	-0.0037	0.0013	-0.0066	-0.001	-0.0037	-0.0018	-0.0031	0.0	0.0013	-0.0045	0.0078
CD CARE	char_path_len	149	-0.1093	0.0	-0.0008	0.0027	-0.0014	-0.0002	0.0007	0.0001	-0.0037	0.0013	-0.0066	-0.001	-0.0037	-0.0018	-0.0031	0.0	0.0013	-0.0045	0.0078
CDR_diff	transitivity	0.1	-1.2761	-1.5541	0.7401	0.1734	-0.2195	0.1158	0.197	0.0516	-0.8229	-0.0517	-1.2177	0.8435	-0.6461	0.3132	-0.3519	-0.337	0.6769	-1.3473	0.6318
CDR_diff	global_eff	0.1	-1.2782	0.1652	0.7112	0.1687	-0.1988	0.134	0.1901	0.0768	-0.7842	-0.0645	-1.2239	0.8302	-0.6564	0.3216	-0.3117	-0.3999	0.6719	-1.353	0.634
CDR_diff	louvain	0.1	-1.28	-0.4664	0.7041	0.1724	-0.1962	0.1439	0.1741	0.084	-0.762	-0.0618	-1.2221	0.823	-0.6605	0.3239	-0.3153	-0.3984	0.6672	-1.3492	0.6292
CDR_diff	char_path_len	0.1	-1.2776	-1.0277	0.6252	0.1706	-0.1849	0.1144	0.1581	0.0904	-0.7903	-0.0733	-1.2397	0.8002	-0.6563	0.3454	-0.1921	-0.5225	0.7013	-1.3571	0.5943