SUPPLEMENTARY MATERIAL

Intelligence is associated with the modular structure of intrinsic brain networks

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Supplementary Table S1. Descriptive statistics for global graph metrics at different graph thresholds.

	Thr	*M*	*SD*	*Min*	*Max*
Global modularity Q					
	10 %	.464	. 037	.258	.578
	15 %	.408	.034	.208	.532
	20 %	.365	.034	.207	.497
	25 %	.330	.035	.201	.462
	30 %	.300	.034	.212	.441
Number of modules					
	10 %	4.20	.595	3	6
	15 %	3.74	.556	3	5
	20 %	3.41	.512	2	5
	25 %	3.21	.434	2	5
	30 %	3.14	.353	2	4
Module size					
	10 %	1314.41	192.82	897.67	1803.67
	15 %	1478.55	229.27	1075.00	1803.67
	20 %	1620.88	232.83	1077.29	2704.00
	25 %	1709.22	204.54	1078.60	2704.00
	30 %	1742.16	165.25	1332.00	2672.50
Variability in module size					
	10 %	376.96	183.08	34.00	932.69
	15 %	368.27	183.06	27.64	1031.39
	20 %	368.27	182.86	15.06	1138.56
	25 %	360.02	223.71	13.82	1222.94
	30 %	397.72	276.54	11.05	1300.46

Thr, proportional threshold applied on the binarised adjacency matrix; *M*, mean, *SD*, standard deviation; *Min*, minimum; *Max*, maximum.

Supplementary Table S2. Associations between intelligence (WASI FSIQ) and whole-brain aspects of modular organization across thresholds.

	Thr	$r_{part.}$	$p_{part.}$	**BF_{01}-Reg.**
Global Modularity Q				
	10 %	.042	.470	2.884
	15 %	.004	.952	3.665
	20 %	.025	.669	3.369
	25 %	.057	.327	2.369
	30 %	.046	.432	2.772
Number of modules				
	10 %	.085	.144	1.384
	15 %	.095	.099	1.060
	20 %	-.045	.441	2.803
	25 %	.041	.480	2.914
	30 %	-.099	.088	0.970
Module size				
	10 %	-.089	.122	1.226
	15 %	-.088	.127	1.311
	20 %	.029	.610	3.251
	25 %	-.063	.277	2.113
	30 %	.099	.088	0.971
Variability in module size				
	10 %	.035	.550	3.128
	15 %	.098	.091	0.985
	20 %	-.014	.813	3.592
	25 %	.005	.926	3.635
	30 %	-.033	.569	3.130

Thr, proportional threshold applied on the binarised adjacency matrix; $r_{part.}$, Pearson's correlation coefficient for the partial correlation controlling for effects of age, sex, and handedness; $p_{part.}$, *p*-value of significance for the partial-correlation; BF_{01}-Reg., Bayes Factor in favour of the null hypothesis (i.e., absence of correlation) for Bayes linear regression models predicting FSIQ values by the respective whole-brain measure of modular network organization while controlling for effects of age, sex, and handedness.

Supplementary Table S3. Associations between intelligence (WASI FSIQ) and whole-brain node type proportions at different graph thresholds.

	Thr	$r_{part.}$	$p_{part.}$	**BF_{01}-Reg.**
Ultra-peripheral nodes				
	10 %	.030	.610	3.238
	15 %	.015	.801	3.557
	20 %	-.057	.327	2.379
	25 %	-.028	.632	3.275
	30 %	.021	.723	3.499
Peripheral nodes				
	10 %	.062	.287	2.184
	15 %	.070	.226	1.883
	20 %	-.050	.390	2.621
	25 %	.062	.284	2.177
	30 %	.102	.078	0.890
Non-hub connector nodes				
	10 %	-.020	.728	3.491
	15 %	-.045	.439	2.805
	20 %	-.013	.819	3.613
	25 %	-.031	.594	3.241
	30 %	-.027	.642	3.342
Non-hub kinless nodes				
	10 %	.023	.694	3.438
	15 %	.062	.280	2.161
	20 %	.104	.071	0.832
	25 %	.009	.882	3.647
	30 %	-.135	.020*	0.305
Provincial hubs				
	10 %	.010	.860	3.637
	15 %	.024	.675	3.369

	20 %	-.046	.421	2.745
	25 %	.045	.433	2.783
	30 %	.027	.640	3.028
Connector hubs				
	10 %	.011	.852	3.631
	15 %	-.031	.596	3.244
	20 %	-.040	.489	2.963
	25 %	-.040	.493	2.977
	30 %	-.015	.796	3.578
Kinless hubs				
	10 %	.001	.991	3.672
	15 %	.058	.322	2.342
	20 %	.068	.239	1.956
	25 %	.032	.578	3.186
	30 %	-.033	.568	3.380

Thr, proportional threshold applied on the binarised adjacency matrix; $r_{part.}$, Pearson's correlation coefficient for the partial correlation controlling for effects of age, sex, and handedness; $p_{part.}$, *p*-value of significance for the partial-correlation; BF_{01}-Reg., Bayes Factor in favour of the null hypothesis (i.e., absence of correlation) for Bayes linear regression models predicting FSIQ values by the respective node-type proportion while controlling for effects of age, sex, and handedness.

Supplementary Table S4. Associations between intelligence (WASI FSIQ) and whole-brain aspects of modular organization based on weighted graphs.

	$r_{part.}$	$p_{part.}$	BF_{01}-Reg.
Whole-brain measures			
global modularity	.03	.632	3.31
number of modules	.10	.094	1.02
average module size	-.10	.094	1.19
variability in module size	.08	.170	1.55
Whole-brain proportions of node types			
ultra-peripheral nodes	.09	.145	1.34
peripheral nodes	.05	.420	2.74
non-hub connector nodes	-.03	.616	3.29
non-hub kinless nodes	.04	.521	3.06
provincial hubs	.04	.518	3.05
connector hubs	-.03	.616	3.29
kinless hubs	.03	.672	3.40

$r_{part.}$, Pearson's correlation coefficient for the partial correlation controlling for effects of age, sex, and handedness; $p_{part.}$, *p*-value of significance for the partial-correlation; BF_{01}-Reg., Bayes Factor in favour of the null hypothesis (i.e., absence of correlation) for Bayes linear regression models predicting FSIQ values by the respective whole-brain measure of modular network organization or whole-brain proportions of node types while controlling for effects of age, sex, and handedness.

Supplementary Table S5. Intelligence-related effects in weighted within-module and between-module connectivity.

Brain Region	BA	Hem	x	y	z	t_{max}	*k*
A: Weighted *participation coefficient* p_{iw} (between-module connectivity)							
positive association							
anterior insula*	47, 13	R	36	33	-6	4.03	58
cuneus	30, 23	L	-9	-72	6	3.36	32
middle occipital gyrus	17, 18	L	-18	-93	-3	3.65	130
negative association							
superior frontal gyrus*	10	R/L	3	63	12	-2.62	61
inferior parietal lobule	40	L	-42	-39	39	-2.60	28
temporo-parietal junction*	39, 40	L	-48	-66	30	-2.60	136
B: Weighted *within-module degree* z_{iw} (within-module connectivity)							
positive association							
superior frontal gyrus*	10, 9	R/L	-15	54	36	3.97	300
superior frontal gyrus	8	L	-12	33	51	3.23	31
middle frontal gyrus	9, 8	L	-45	21	42	3.94	61
inferior precentral gyrus / superior temporal gyrus	22, 44	L	-54	0	6	3.49	34
inferior frontal gyrus / inferior precentral gyrus	44, 13	R	45	3	21	3.43	40
superior parietal lobule	5, 7	L	-27	-48	69	3.04	35
temporo-parietal junction*	39	L	-51	-66	27	4.35	217
temporo-parietal junction	39	R	57	-63	33	4.28	67
negative association							
anterior insula*	47, 13	R	36	30	-3	-2.56	75
superior precentral gyrus	4, 3	L	-15	-18	63	-2.59	80
superior precentral gyrus / supplementary motor area	6, 4	R	39	-18	54	-2.61	139

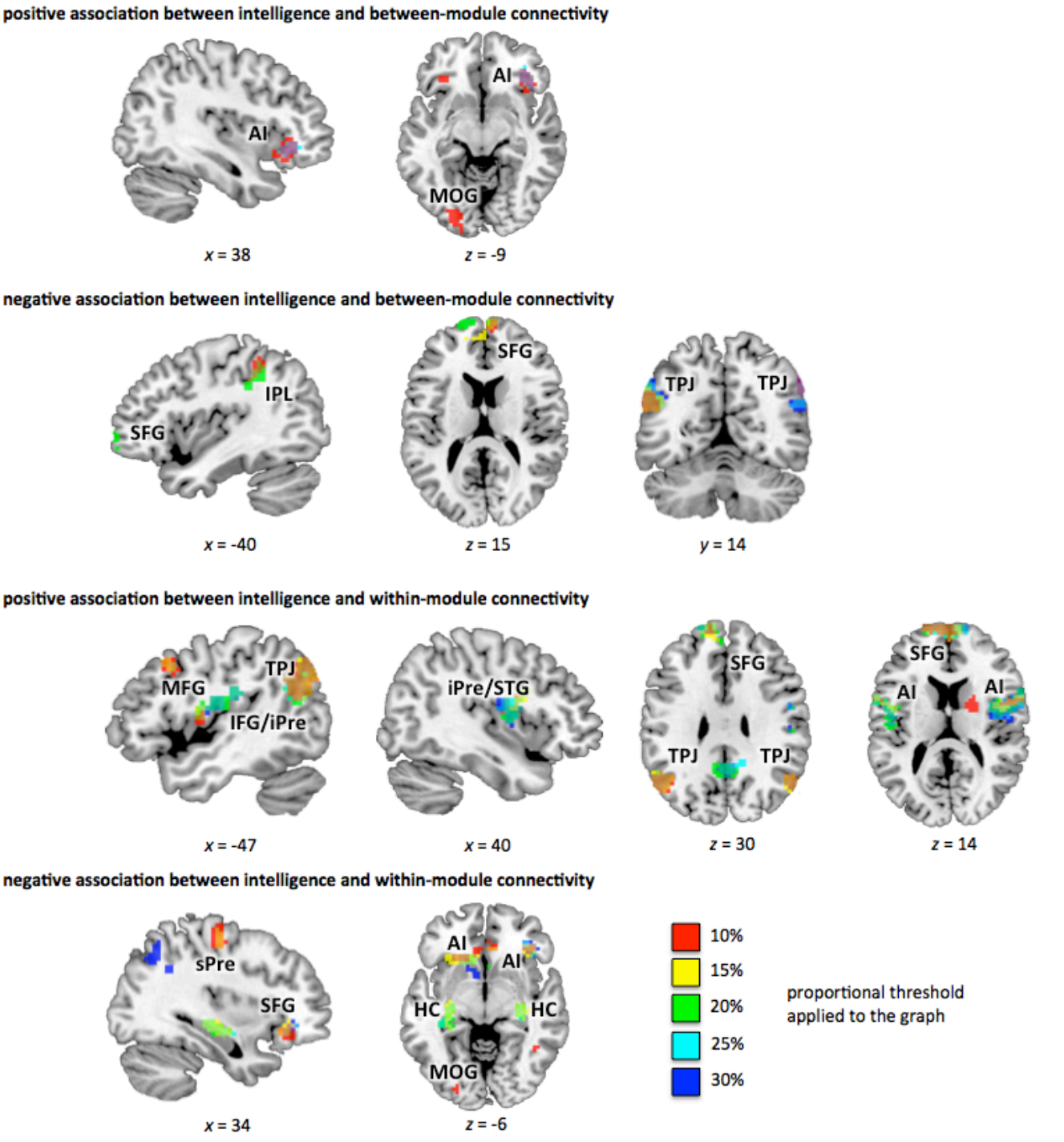
hippocampus		L	-33	-27	-12	-2.60	73
hippocampus		R	27	-15	-9	-2.60	36
caudate nucleus		L	-9	27	0	-2.65	52

C: Conjunction between weighted *participation coefficient* p_{iw} and *weighted within-module degree* z_{iw}

superior frontal gyrus	10	R/L	3	63	12		61
anterior insula	47, 13	R	33	27	-9		41
temporo-parietal junction	39, 40	L	-57	-69	21		98

BA, approximate Brodmann's area; Hem, hemisphere; L, left; R, right; regions with intelligence-related effects in both measures (between-module and within-module connectivity) are marked with an asterisk and separately listed in (C); coordinates refer to the Montreal Neurological Institute template brain (MNI); t_{max}, maximum t statistic in the cluster; k, cluster size in voxels of size 3x3x3mm.

Supplementary Figure 1. Clusters of nodes where intelligence (WASI FSIQ) was significantly associated with between-module or within-module connectivity for each of 5 different graph threshold.



Between-module connectivity was operationalized by *participation coefficient* p_i , within-module connectivity by *within-module degree* z_i (see Methods for details). Statistic parametric maps for both measures are shown at a voxel-level threshold of $p < .005$, uncorrected, and a cluster-level threshold of $k > 26$ voxels, corresponding to an overall threshold of $p < .05$, family-wise corrected for multiple comparisons (see Methods). SFG, superior frontal gyrus; AI, anterior insula; MFG, middle frontal gyrus; IFG, inferior frontal gyrus; HC, Hippocampus; iPre, inferior precentral gyrus; sPre, superior precentral gyrus; STG, superior temporal gyrus; TPJ, temporo-parietal junction; SPL, superior parietal lobule; IPL, inferior parietal lobule; MOG, middle occipital gyrus. The *x*-, *y*- and *z*-coordinates represent coordinates of the Montreal Neurological Institute template brain (MNI152).