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Image acquisition

Diffusion weighted MRI (DW-MRI) images were acquired using a Philips Achieva 3T whole-body MRI scanner with a SENSE head coil at the National Neuroscience Institute, Singapore. Single-shot echo-planar sequence (TR = 3.725s, TE = 56ms, flip angle = 90, field of view 230 x 230 mm^2, acquisition matrix 112 x 109, reconstruction matrix 256 x 256, 42 slices with 3.0 mm slice thickness parallel to AC-PC line) was used to acquire the DW-MRI image. 15 diffusion-weighted images (b = 800 sec/mm^2) of non-parallel directions and 1 baseline image (b = 0 sec/mm^2) were obtained. Three runs of such DW-MRI images were acquired in the same session and were concatenated for processing.

Image preprocessing

Preprocessing of the diffusion weighted MRI (DW-MRI) images were performed using an approach we have used previously.[1,2] Briefly, diffusion images were visually inspected for motion and other artifacts. Eddy-current correction and diffusion gradient rotation were performed on the concatenated 3 runs of DW-MRI images. Subjects with >3mm of motion displacement during the scan were excluded. Diffusion tensors were then fitted for each voxel to obtain the diffusion images for each subject using a FSL software toolbox for analysis of DTI images (FDT),[3] resulting in images of fractional anisotropy (FA), mean diffusivity (MD), axial diffusivity (AD) and radial diffusivity (RD).

Derivation of individual-specific diffusion metrices

Tract-based spatial statistics (TBSS) from the FMRIB Software Library (FSL) was used to produce individual-specific skeletonized indices.[3] First, the FA images of all the subjects were non-linearly aligned to a common space. Second, the aligned FA images were then averaged and "thinned" to create a group mean FA skeleton, representing the center of all WM major tracts common to our study subjects. Third, the aligned FA images of each subject were then projected to the group FA skeleton, and the measures of diffusivity extracted through a method that "searched" the local maxima along the perpendicular direction of the WM skeleton in the original images.[3] Subsequent voxelwise statistics for diffusion metrics across subjects were then carried out on the skeleton-space FA data. We performed similar voxelwise statistics on MD, AD, and RD measures.

Derivation of laterality indices

To generate diffusion-based laterality indices for each individual, the following steps were performed. For example, to generate the FA laterality index, we used a "tbss_sym" script from FSL[3] that 1) thickened the original (asymmetrical) skeleton by one voxel, 2) flipped the group skeleton left-right, averaged and thinned to create an initial symmetrical FA image, 3) masked the initial symmetrical image with the original thickened skeleton, 4) flipped the masked version back again, and 5) for the

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final "symmetrical skeleton" took the parts common to the masked (flipped) and initial symmetrical FA image (non-flipped).[4]. Each individual's FA images were then projected to the symmetrical skeleton to create an individual symmetrical skeleton. Each symmetrically skeletonized FA image was then flipped. We repeated the same steps for the other three diffusion metrics (MD/AD/RD). For each diffusion measure, the subject-level laterality index (LI) [5] was calculated based on the original asymmetric and flipped symmetric skeletonized images as:

LI = (original - flipped) / (original + flipped)

The value of left hemispheric voxel in the resulting LI image is represented by (L - R)/(L + R).[5] L denotes the left hemisphere FA/MD voxel value and R denotes the counterpart voxel value in the right hemisphere. Mathematically, the right hemispheric voxels in the LI images were of the same magnitude but of the opposite sign as those on the left. As such, we only analyzed the LI values in the left hemisphere and used the term "LI" to denote the LI values in the left hemisphere. Positive LI indicates higher FA/MD in the left hemisphere than the right (L > R, leftward), while negative LI indicates a reversed pattern, with lower FA/MD in the left hemisphere than the right (L < R, rightward).

Derivation of white matter asymmetry indices

Asymmetry index is calculated as (L minus R) for each voxel of the left hemisphere, where L denotes the value of the WM index voxel in the left hemisphere of the symmetrically skeletonized image, and R denotes the value of the counterpart voxel in the right hemisphere.

Asymmetry images were created by subtracting flipped skeleton projected data from the original data, and zeroing the right sides of the images.[6]

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SUPPLEMENTARY RESULTS

Comparison of white matter laterality indices

We calculated the percentage of voxels in the white matter regions showing group-based laterality index (LI) differences between BD and SZ. We defined reversed and attenuated laterality according to the directionality of LI in controls. For example, for voxels with negative LI in controls i.e. FA, 1) if patient groups had positive LI, it was categorized as reversed laterality; 2) if patient groups had negative LI with smaller magnitude, it was categorized as attenuated laterality. Vice versa, for voxels with positive LI in healthy controls, i.e. MD, 1) if patient groups had negative LI, it was categorized as reversed laterality; 2) if patient groups had positive LI with smaller magnitude, it was categorized as attenuated laterality.

Among the white matter regions examined in SZ, 44.1% (FA) and 76.2% (MD) of them presented patterns of attenuated laterality as compared with HC. No reversed laterality in SZ was found. In contrast, among the WM regions examined in BD, 16.4% (FA) and 24.9% (MD) of them were found to exhibit patterns of reversed laterality, while 22.7% (FA) and 55.6% (MD) of them exhibited patterns of attenuated laterality. The results suggested that more severe loss of WM lateralization in BD compared to SZ.

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SUPPLEMENTARY TABLE 1. Regions showing white matter microstructural differences between subjects with schizophrenia, bipolar disorder, and healthy controls

(A)	SZ - HC T-score	Size	BD - HC T-score	Size	BD - SZ T-score	Size
Fractional anisotropy						
Left						
CST	-2.84	141	-3.54	183		
CP	-3.41	343	-3.96	392		
aIC	-3.1	273	-3.64	406		
pIC			-4.63	428	-3.66	345
rIC	-3.92	325	-4.25	274		
aCR	-2.75	416	-3.76	1044	-3.38	657
sCR	-3.73	480	-4.46	810	-3.06	309
pCR	-3.46	482	-5.05	672		
PTR	-3.15	595	-2.97	549		
SS	-3.09	126	-2.26	142		
EC	-3.89	567	-4.81	1169	-4.16	826
Cingulum CG			-4.99	315		
Fx/ST	-2.18	148				
SLF	-2.99	453	-5.06	982		
Right						
CST	-3.54	187	-4.79	220		
ML	-3.5	107				
CP	-4.69	491	-5.31	537	-3.82	411
aIC	-3.03	623	-4.49	655	-3.08	182
pIC	-4.36	442	-4.72	742	-3.7	528
rIC	-2.64	102	-4.2	202		
aCR	-2.99	666	-3.78	1057	-2.2	281
sCR	-3.8	790	-4.75	1362	-3.42	1104
pCR	-4.05	497	-4.01	823	-3.25	493
PTR	-3.62	673	-3.4	728		
SS	-2.6	150	-3.92	236		
EC	-3.98	1017	-4.73	1417	-4.46	791
Cingulum CG			-4.66	327	-3.73	233
Fx/ST	-3.55	196	-4.09	216		
SLF			-4.91	1719	-4.21	1269
mCP	-3.19	326	-3.94	750	-3.19	159
PCT	-2.97	130	-3.28	142		

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(A)	SZ - HC T-score	Size	BD - HC T-score	Size	BD - SZ T-score	Size
gCC	-4.13	770	-4.96	1658	-3.69	1302
bCC	-4.66	3181	-5.11	3380	-3.85	1196
SCC	-4.47	1357	-5.01	2032	-3.16	527
Fx	-4.73	186	-4.1	194		
Mean Diffusivity						
Left						
aCR			3.79	228		
Right						
CP			3.88	319		
aIC			6.85	280	3.91	102
pIC	3.95	237	5.72	732	4.59	397
rIC			4.87	606	4.08	354
aCR			3.54	411		
sCR	5.12	772	6.98	1161	3.46	150
pCR	3.45	110	4.94	470		
SS			5.14	286		
EC	4.44	366	6.97	716	4.43	399
Fx/ST			4.37	278		
SLF	4.61	727	6.07	1578	5.63	218
gCC			4.87	742		
bCC			5.43	2277		
SCC			3.47	292		
Fx			5.23	152		

(B)	SZ - HC T-score	Size	BD - HC T-score	Size	BD - SZ T-score	Size
Axial Diffusivity						
Left						
CST			-4.74	264		
ML			-4.83	106		
iCP			-3.62	115		
sCP			-3.83	120		
CP	-4.77	312	-5.27	481		
aIC	-4.28	174				
pIC	-3.39	165	-4.18	705		
rIC	-4.08	343	-4.07	454		

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(B)	SZ - HC T-score	Size	BD - HC T-score	Size	BD - SZ T-score	Size
sCR			-5.48	608		
pCR			-3.67	559		
PTR			-4.57	361		
SS	-4.77	109	-4.05	316		
EC	-3.91	445	-4.05	560		
Cingulum CG			-4.6	232		
Cingulum HIP			-4.43	214		
Fx/ST	-3.97	104	-3.88	198		
SLF			-5.03	1283		
Right						
CST			-3.56	223		
ML			-5.61	129		
iCP			-4.66	152		
sCP			-3.82	152		
CP			-3.95	180		
pIC			4.07	164		
rIC			5.04	387		
sCR			4.08	127		
mCP			-4.37	1064		
bCC	-4.82	531	-4.24	445		
SCC	-3.86	120	-4.88	933		
Radial Diffusivity						
Left						
aCR			4.4	524	3.14	194
sCR			3.57	119		
Cingulum CG			5.01	269		
Right						
CP	4.59	324	4.8	497	3.94	288
aIC	3	224	6.2	416	3.64	139
pIC	4.24	274	5.4	769	4.43	501
rIC	3.02	126	4.92	435	3.97	364
aCR	3.9	220	4.04	890	2.79	221
sCR	4.37	1121	6.35	1384	3.56	817
pCR	3.55	327	4.04	761	3.33	372
PTR	4.03	573	3.19	444		
SS	3.46	183	4.67	263	3.21	135
EC	4.41	686	6.74	1237	4.92	736

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(B)	SZ - HC T-score	Size	BD - HC T-score	Size	BD - SZ T-score	Size
Cingulum CG			4.35	264		
Fx/ST			4.65	289	3.63	105
SLF	3.74	833	5.55	1819	5.13	1363
gCC	3.91	540	5.21	1387	3.25	621
bCC	4.7	2332	5.6	3212	3.98	1009
SCC	3.8	482	4.96	818	3.32	303
Fx			5.13	185		

The table summarizes the difference in **(A)** fractional anisotropy and mean diffusivity in the left and right white matter regions between the three groups (schizophrenia, SZ; bipolar disorder, BD; and healthy controls, HC) (also see main text **Figure 1**). The peak *t* statistics and cluster size of each white matter region with reference to the JHU ICBM-DTI-81 white matter template are presented. Results were thresholded with $p < 0.05$ (threshold-free cluster enhancement, FWE corrected) with a minimum cluster size of 100 voxels. **(B)** To understand the group differences in fractional anisotropy measures of the white matter regions, both the axial diffusivity (AD) and radial diffusivity (RD) of the affected white matter regions were measured.

In SZ, the decreased FA in the internal capsule, IC, corresponded to both a decrease in AD and increase in RD. In contrast, the decreased FA in the right corpus callosum corresponded to decreases in AD only while the decreased FA in the right corona radiata corresponded to increases in RD.

In BD, the decreased FA found throughout the white matter regions corresponded to both decreases in AD and increases in RD.

Compared with SZ, the BD subjects showed a greater magnitude of RD increase in all the regions of FA abnormalities, but no difference in AD.

Abbreviations: CST, corticospinal tract; CP, cerebral peduncle; aIC, anterior limb of internal capsule; pIC, posterier limb of internal capsule; rIC retrolenticular limb of internal capsule; aCR, anterior corona radiata; sCR, superior corona radiata; pCR, posterior corona radiata; PTR, posterior thalamic radiation; SS, sagittal stratum; EC, external capsule; Cingulum CG, cingulum (cingulate gyrus); Fx/ST, fornix (cres)/stria terminalis; SLF, superior longitudinal fasciculus; mCP, middle cerebellar peduncle; PCT, pontine crossing tract; gCC, genu of corpus callosum; bCC, body of corpus callosum; SCC, splenium of corpus callosum; FX, fornix.

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SUPPLEMENTARY TABLE 2. Shared white matter microstructural abnormalities in the schizophrenia and bipolar disorder cohort.

	Cluster size	
Regions	**FA**	**MD**
Left		
bCC	2163	1685
Fx	153	119
CST	109	-
CP	264	-
aIC	200	-
rIC	197	-
aCR	310	313
sCR	480	-
pCR	332	-
PTR	335	-
EC	534	-
SLF	266	-
Right		
mCP	160	-
gCC	759	812
SCC	568	220
CST	135	-
CP	445	276
aIC	478	308
pIC	418	815
rLIC	-	594
aCR	621	446
sCR	797	1004
pCR	479	227
PTR	625	-
SS	-	254
EC	878	713
Fx/ST	150	216
SLF	-	1014

The table summarizes the regions of shared abnormalities in fractional anisotropy (FA), and mean diffusivity (MD) in the schizophrenia and bipolar disorder subjects,

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which were obtained from conjunction analysis of group comparisons of schizophrenia versus healthy controls, and bipolar versus healthy control groups.
Abbreviations: bCC, body of corpus callosum; FX, fornix; CST, corticospinal tract; CP, cerebral peduncle; aIC, anterior limb of internal capsule; pIC, posterier limb of internal capsule; rIC retrolenticular limb of internal capsule; aCR, anterior corona radiata; sCR, superior corona radiata; pCR, posterior corona radiata; PTR, posterior thalamic radiation; SS, sagittal stratum; EC, external capsule; Fx, fornix, Fx/ST, fornix (cres)/stria terminalis; SLF, superior longitudinal fasciculus; mCP, middle cerebellar peduncle; gCC, genu of corpus callosum; SCC, splenium of corpus callosum.

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SUPPLEMENTARY TABLE 3. Group differences in white matter laterality index (LI). (A) The complete sample of patients with schizophrenia (n=150), bipolar disorder (n=35) and healthy controls (n=77); (**B)** The complete sample cohort after accounting for lithium medication; (**C**) The subset of right-handed Chinese patients with schizophrenia (n=122), bipolar disorder (n=30), and healthy controls (n=60).

A	**SZ - HC**		**BD - HC**		**BD - SZ**	
	T-score	**Size**	**T-score**	**Size**	**T-score**	**Size**
Fractional anisotropy LI						
CP	3.36	101	5.41	457	4.3	274
aIC			3.28	177		
pIC	3.15	152	5.26	601	3.91	334
rIC			4.45	216	3.22	163
sCR			3.96	749	3.4	268
pCR			2.21	106		
EC			4.91	325		
Fx/ST			4.59	186		
SLF			4.5	1020	3.78	866
mCP			3.01	168		
bCC			2.96	415		
Mean diffusivity LI						
CST			-2.92	117		
CP	-4.37	383	-4.89	460	-3.31	182
aIC	-3.68	219	-5.64	222		
pIC	-4.51	670	-7.58	795	-5.09	638
rIC	-4.27	579	-5.65	725	-3.79	487
aCR	-3.5	536	-3.46	603		
sCR	-5.18	1149	-7.49	1107	-4.12	673
pCR	-5.22	618	-5.66	637	-3.73	255
PTR	-2.95	282	-3.31	149		
SS	-4.22	368	-5.86	397	-3.77	146
EC	-4.01	974	-6.79	775	-3.84	487
Cingulum CG	-4.4	182	-3.15	122		
Fx/ST	-4.56	270	-5.69	337	-2.94	100
SLF	-5.51	1344	-7.74	1629	-4.76	1176
gCC	-4.66	313	-4.82	275		
bCC	-4.57	814	-4.8	766		
sCC	-3.68	430	-3.43	421		

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Table 3A summarizes the differences in fractional anisotropy laterality index (LI) and mean diffusivity LI between the three groups (schizophrenia, SZ; bipolar disorder, BD; and healthy controls, HC) (also see main text **Figure 2 a-c**). The peak t statistics and cluster size of each white matter region with reference to the JHU ICBM-DTI-81 white matter template are presented. Results were thresholded with $p < 0.05$ (threshold-free cluster enhancement, FWE corrected) with minimum cluster size of 10 voxels.

B	**SZ - HC**		**BD - HC**		**BD - SZ**	
	T-score	**Size**	**T-score**	**Size**	**T-score**	**Size**
Fractional anisotropy LI						
CP	3.37	111	5.05	369		
aIC			3.35	186		
pIC	3.53	221	4.59	403		
rIC			4.61	176		
sCR			3.47	391		
EC			3.83	142		
Fx/ST			3.36	109		
SLF			3.83	520	3.23	246
mCP			2.89	171		
CP	3.37	111	5.05	369		
aIC			3.35	186		
Mean diffusivity LI						
CST			-3.01	106		
CP	-4.25	327	-5.93	408	-3.88	201
aIC	-3.95	233	-6.04	202	-3.11	114
pIC	-4.55	620	-7.24	749	-5.09	575
rIC	-4.26	424	-4.66	521	-3.79	327
aCR	-4.12	537				
sCR	-5.28	920	-7.39	943	-4.09	578
pCR	-5.17	359	-5.91	403	-3.68	102
PTR	-3.10	366	-3.25	233		
SS	-3.45	224	-4.94	260		
EC	-5.03	748	-6.54	638	-3.84	483
Cingulum CG	-4.22	131				
Cingulum Hippocampus			-4.18	112		
Fx/ST	-3.72	164	-5.19	222		
SLF	-5.48	771	-7.22	867	-4.76	673
gCC	-4.66	232				
bCC	-4.66	713	-4.16	538		
sCC	-3.66	284	-3.35	181		

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Table 3B summarizes the group differences in fractional anisotropy LI and mean diffusivity LI after adjusting for lithium medication, which is taken by some SZ and BD patients.

C	SZ - HC		BD - HC		BD - SZ	
	T-score	Size	T-score	Size	T-score	Size
Fractional anisotropy LI						
CP	3.88	235	5.15	461	4.18	164
aIC			3.22	373		
pIC	2.92	277	4.32	615	3.91	240
rIC			3.48	235		
sCR			4.19	869	3.02	445
SS			3.59	172		
EC	3.93	218	4.05	516		
Fx/ST			3.39	181		
SLF			4.51	738		
mCP			2.20	343		
bCC					3.13	228
Mean diffusivity LI						
CP	-4.02	210	-3.97	160		
aIC	-5.77	195	-3.80	188	-3.13	107
pIC	-7.63	748	-4.38	630	-4.65	603
rIC	-5.37	514	-4.62	442	-3.40	280
aCR	-2.74	366	-3.40	302		
sCR	-7.38	948	-5.20	891	-4.07	511
pCR	-5.11	377	-4.85	346		
PTR	-4.94	246	-3.88	230		
EC	-7.41	629	-4.74	671	-4.31	448
Cingulum CR	-4.22	249	-3.89	205		
Fx/ST	-4.63	443	-4.63	352	-4.19	215
SLF	-7.605	873	-5.88	733	-4.30	642
bCC	-4.39	692	-4.04	656		
sCC	-3.50	170	-4.13	111		

Table 3C summarizes the differences in fractional anisotropy LI and mean diffusivity LI between the subset of right-handed Chinese participants with schizophrenia, SZ (n=122), bipolar disorder, BD (n=30) and healthy controls, HC (n=60).

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The regions of group-based differences in WM lateralization abnormalities in Tables 3A, 3B and 3C are largely similar.
Abbreviations: CST, corticospinal tract; CP, cerebral peduncle; aIC, anterior limb of internal capsule; pIC, posterier limb of internal capsule; rIC retrolenticular limb of internal capsule; aCR, anterior corona radiata; sCR, superior corona radiata; pCR, posterior corona radiata; SS, sagittal stratum; EC, external capsule; Cingulum CG, cingulum (cingulate gyrus); Fx/ST, fornix (cres)/stria terminalis; SLF, superior longitudinal fasciculus; mCP, middle cerebellar peduncle; gCC, genu of corpus callosum; bCC, body of corpus callosum; SCC, splenium of corpus callosum.

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SUPPLEMENTARY TABLE 4. Shared white matter lateralization abnormalities in (A) The complete sample of patients with schizophrenia (n=150), bipolar disorder (n=35) and healthy controls (n=77); (**B)** The complete sample cohort after accounting for lithium medication; (**C**) The subset of right-handed Chinese patients with schizophrenia (n=122), bipolar disorder (n=30), and healthy controls (n=60).

A)	Cluster size	
Regions	**FA LI**	**MD LI**
bCC	-	478
gCC	-	176
sCC	-	116
CP	109	326
aIC	-	212
pIC	157	753
rLIC	-	531
aCR	-	415
sCR	-	988
pCR	-	262
SS	-	342
EC	-	673
Fx/ST	-	201
SLF	-	910

Table 4A) summarizes the regions of shared lateralization abnormalities in fractional anisotropy (FA) and mean diffusivities (MD) in the schizophrenia and bipolar disorder subjects. The regions of shared lateralization abnormalities were obtained using conjunction analysis of schizophrenia versus healthy control, and bipolar versus healthy control groups.

Common FA lateralization abnormalities of schizophrenia and bipolar disorder were found in the cerebral peduncle and posterior limb of the internal capsule. Common MD lateralization abnormalities were found in the frontal, subcortical, frontal-occipital/parietal, fornix and corpus callosal tracts.

B)	Cluster size	
Regions	**FA LI**	**MD LI**
bCC	-	384
SCC	-	113
CP	103	267
aIC	-	164

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B)	Cluster size	
pIC	150	614
rLIC	-	416
aCR	-	872
sCR	-	264
pCR	-	161
SS	-	198
EC	-	572
Fx/ST	-	147
SLF	-	738

Table 4B) summarizes the regions of shared lateralization abnormalities, after adjusting for lithium medication.

C)	Cluster size	
Regions	**FA LI**	**MD LI**
bCC	-	429
CP	224	304
aIC	-	120
pIC	208	626
rLIC	-	434
aCR	-	140
sCR	-	851
pCR	-	239
SS	-	206
EC	-	566
Fx/ST	-	190
SLF	-	715

Table 4C summarizes the regions of shared lateralization abnormalities in the subset of right-handed Chinese subjects with schizophrenia and bipolar disorder.

The regions of shared WM lateralization abnormalities in Tables 4A, 4B and 4C are largely similar.

Abbreviations: bCC, body of corpus callosum; gCC, genu of corpus callosum; sCC, splenium of corpus callosum; CP, cerebral peduncle; aIC, anterior limb of internal capsule; pIC, posterior limb of internal capsule; rIC retrolenticular limb of internal capsule; aCR, anterior corona radiata; sCR, superior corona radiata; pCR, posterior corona radiata; PTR, posterior thalamic radiation; SS, sagittal stratum; EC, external capsule; Fx/ST, fornix (cres)/stria terminalis; SLF, superior longitudinal fasciculus

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Supplementary Table 5. White matter lateralization in schizophrenia is correlated with certain clinical scores in schizophrenia.

Clinical Measures	**QOL physical**		**QOL psychological**		**GAF**	
Laterality	**FA LI**		**FA LI**		**FA LI**	
	T-score	Size	T-score	Size	T-score	Size
CP			-3.43	197	-3.66	156
aIC			-3.13	206		
pIC	-4.03	207	-3.83	534	-4.03	347
sCR	-3.6	109	-2.93	251	-4.19	262
EC			-2.71	171		
SLF			-2.8	146	-3.23	115

The table summarizes the relationship between fractional anisotropy (FA) laterality index (LI) and clinical measures in the schizophrenia group (also see main text **Figure 3**). The peak t statistics and cluster size of each white matter region with reference to the JHU ICBM-DTI-81 white matter template are presented. Results were thresholded with $p < 0.05$ (threshold-free cluster enhancement, familywise error corrected) with minimum cluster size of 100 voxels. The clinical measures shown here are quality of life (QOL) in the physical health and psychological domains, and global assessment of functioning scale (GAF).

Abbreviations: CP, cerebral peduncle; aIC, anterior limb of internal capsule; pIC, posterior limb of internal capsules; CR, superior corona radiata; pCR, posterior corona radiata; EC, external capsule; SLF, superior longitudinal fasciculus.

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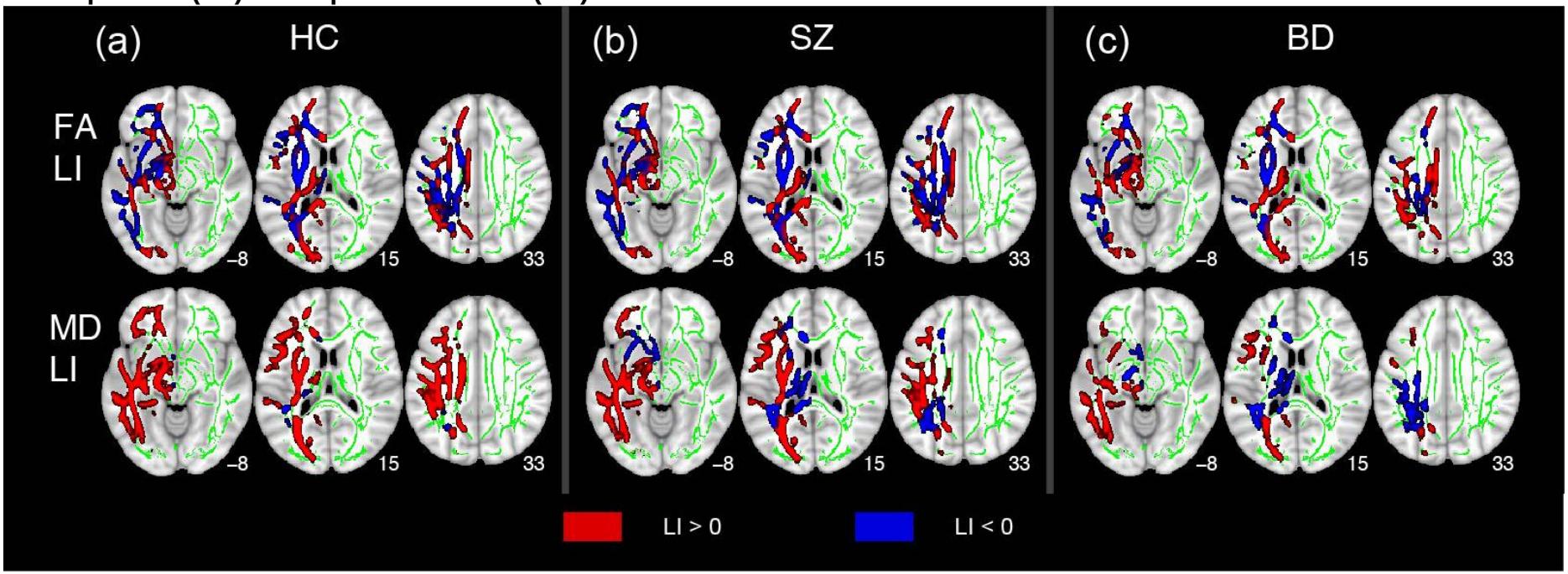
SUPPLEMENTARY FIGURE 1. Voxel-wise white matter laterality index (LI) of healthy controls (HC), patients with schizophrenia (SZ) and bipolar disorders (BD).



Laterality index (LI) is calculated as (L - R)/(L + R) for each voxel of the left hemisphere, where L denotes the value of the voxel in the left hemisphere of the symmetrically skeletonized image and R denotes the value of the counterpart voxel in the right hemisphere. As the LI is symmetrical (left and right have equal values), we present images of one hemisphere here, i.e. the left hemisphere. Leftward laterality is denoted by LI > 0 (red) and rightward laterality is denoted by LI < 0 (blue). Group-level laterality index maps of fractional anisotropy (FA) and mean diffusivity (MD) based on one-sample t-test are shown for: (a) HC, (b) SZ, and

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(c) BD. Results were thresholded with $p \leq 0.05$ (threshold-free cluster enhancement, FWE corrected) and thickened with the "tbss_fill" command (FSL) for better visibility.

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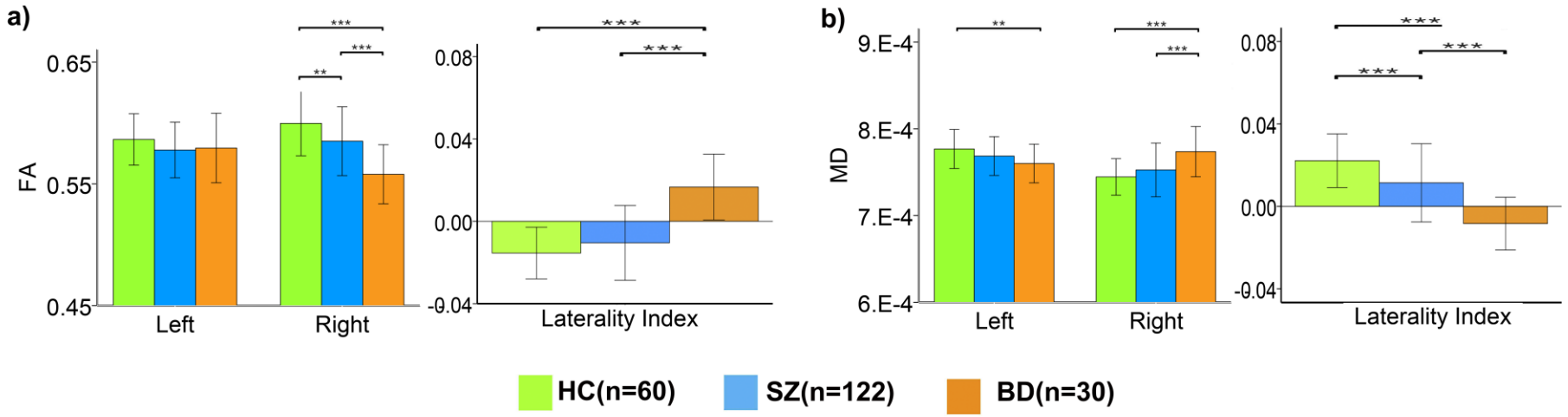
SUPPLEMENTARY FIGURE 2. Group comparisons of white matter lateralization in the subset of right-handed Chinese healthy controls (HC), patients with schizophrenia (SZ) and patients with bipolar disorder (BD).



White matter regions of abnormal lateralization between SZ and BD were parsed as a post-hoc analysis. **a)** Within-group average of FA values in each of the left and right hemisphere were measured for HC (green), SZ (blue) and BD (orange) groups. BD subjects demonstrated decreased FA in the right hemisphere compared with HC and SZ. Comparisons of mean FA laterality indices revealed reversed lateralization in BD compared with HC and SZ. **b)** The within-group averaged MD values in the left and right hemisphere of the different groups are shown. BD subjects showed decreased MD in the left hemisphere, and increased MD in the right hemisphere compared with HC and SZ. Overall, SZ subjects showed attenuated mean MD LI compared with controls.

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Conversely, BD subjects showed reversed MD LI. The mean and standard deviation of each group are presented by the bar charts. ** and *** denotes $p<0.01$ and $p<.005$.

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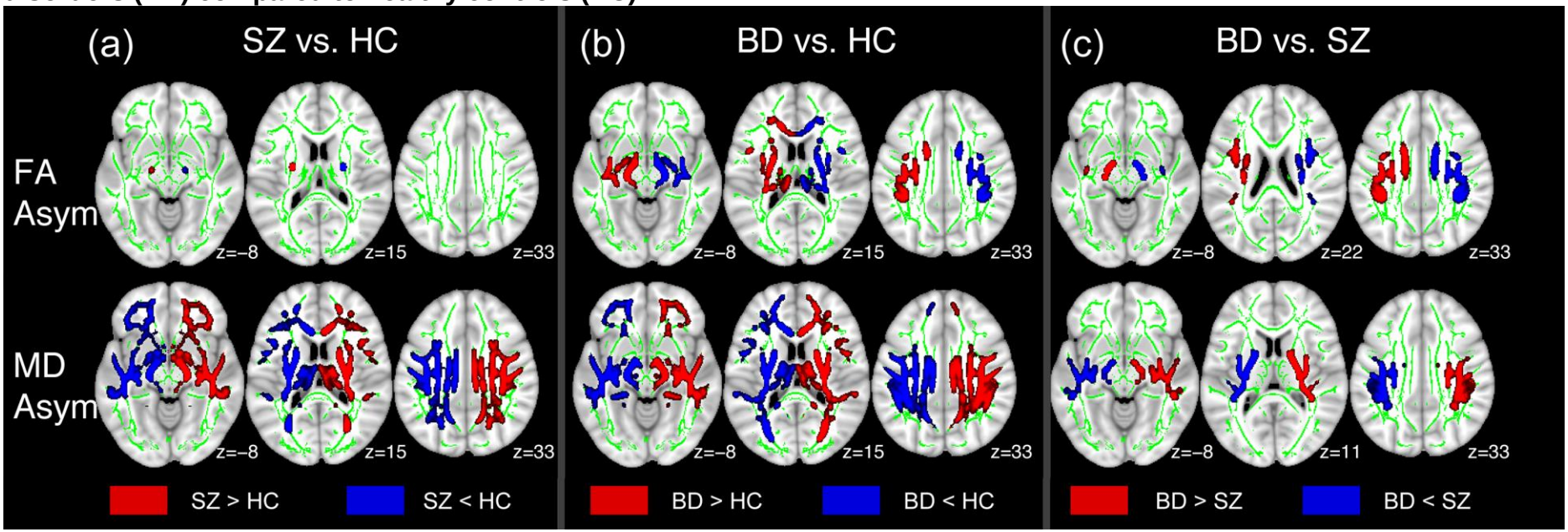
SUPPLEMENTARY FIGURE 3. White matter asymmetry abnormalities in subjects with schizophrenia (SZ) and bipolar disorders (BD) compared to healthy controls (HC).



Between-group comparisons revealed: (a) increased fractional anisotropy (FA) asymmetry (row 1, in red), reduced axial diffusivity (AD), mean diffusivity (MD) and radial diffusivity (RD) asymmetry (row 2, 3 and 4, in blue) in SZ compared to HC; (b) increased FA asymmetry (row 1, in red), reduced AD, MD and RD asymmetry (row 2, 3 and 4, in blue) in BD compared to HC; (c) greater FA asymmetry (row 1, in red), smaller AD, MD and RD asymmetry (row 2, 3 and 4, in blue) in BD compared with SZ. Results were thresholded with $p < 0.05$ (threshold-free cluster enhancement, FWE corrected) and thickened with the "tbss_fill" command (FSL) for better visibility.

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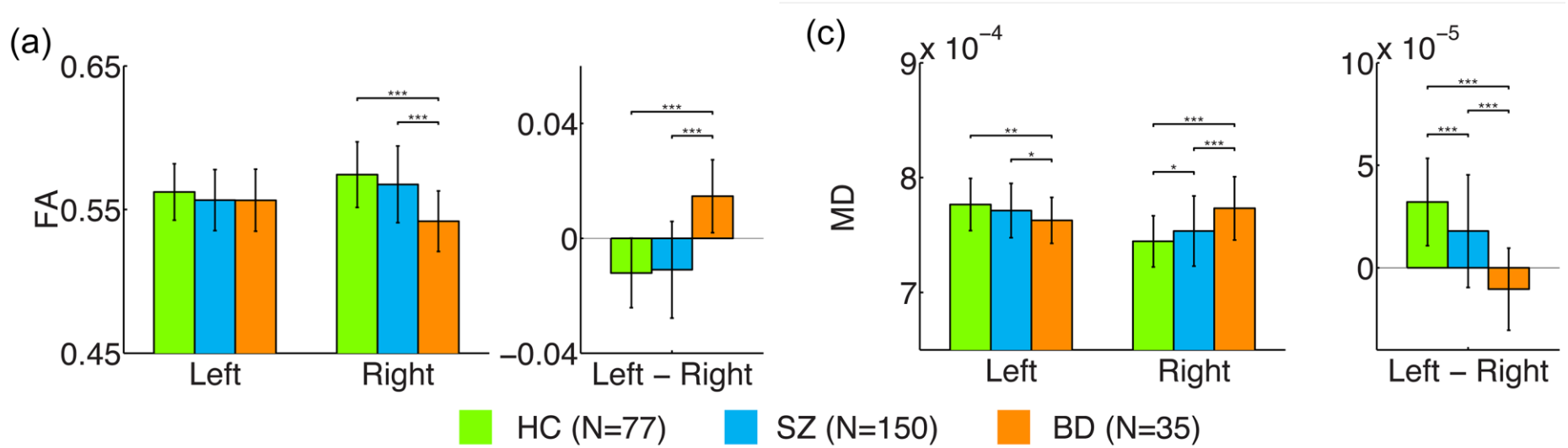
SUPPLEMENTARY FIGURE 4. Group comparisons of mean values of white matter measures and their asymmetry index in healthy controls (HC) schizophrenia (SZ) and bipolar (BD) subjects



The mean values in the left hemisphere, right hemisphere and the symmetry values of (a) fractional anisotropy, FA, (b) axial diffusivity, AD, (c) mean diffusivity, MD and (d) radial diffusivity, RD asymmetry. For every subject, the mean left/right FA, AD, MD, and RD values were extracted based on the regions-of-interests (and their contra-lateral part) defined from the group asymmetry difference maps between SZ and BD highlighted in (Figure S1.c). Subject-level mean asymmetry values were calculated based on the same regions-of-interests on the left hemisphere. Similar to the laterality index comparison (Fig. 3), significant attenuated AD/MD/RD asymmetry was found in SZ group while significant reversed FA/AD/MD/RD asymmetry pattern was presented in BD group. The mean and standard deviation of each group are presented. *, ** and *** denotes $p<0.05$, $p<0.01$, $p<0.001$, respectively. Left – left hemisphere; right – right hemisphere.