Appendix 1 to Qi Z, Wang J, Gong J, et al. Common and specific patterns of functional and structural brain alterations in schizophrenia and bipolar disorder: a multimodal voxel-based meta-analysis. J Psychiatry Neurosci 2022. doi: 10.1503/jpn.210111

Common and specific patterns of structural and functional brain alterations in schizophrenia and bipolar disorder: a multimodal voxel-based meta-analysis

Table S1 Quality assessment checklist (score 0/0.5/1 per item; total score out of 10)*.

Category 1: Participants

1. Patients were evaluated with specific standardised diagnostic criteria, and important demographic data (age and gender) were reported.

2. Healthy comparison participants were evaluated to exclude psychiatric and medical illnesses and demographic data was reported.

3. Important variables (e.g., age, sex, illness duration, onset, medication status, comorbidity, severity of illness) were checked either by stratification or statistically.

4. Sample size per group > 10.

Category 2: Methods for image acquisition and analysis

5. Whole brain analysis was automated with no a priori regional selection.

6. Coordinates reported in a standard space.

7. The imaging technique used was clearly described so that it could be reproduced.

8. Measurements were clearly described so that they could be reproduced.

Category 3: Results and conclusions

9. Statistical parameters for significant and important nonsignificant differences were provided.

10. Conclusions were consistent with the results obtained and the limitations were discussed.

*When criteria were partially met, 0.5 points were awarded.

Appendix 1 to Qi Z, Wang J, Gong J, et al. Common and specific patterns of functional and structural brain alterations in schizophrenia and bipolar disorder: a multimodal voxel-based meta-analysis. J Psychiatry Neurosci 2022. doi: 10.1503/jpn.210111

Table S2 Criteria for objective assessment of test/retest reliability of ReHo computation (Zuo/Milham Criteria)

Study	Nuisance variables (score=1 for correction of WM/CSF/Motion)	Spatial smoothing (score=1 for no smoothing before deriving ReHo maps)	Surface based ReHo (score=1 for surface based 3dReHo)	Scan duration (Score=1 for minimum of 5 minutes)	Sampling rate (Score=1 for TR<2 seconds)	Global signal regression (score=1 for no regression)	Zuo/Milham Score for ReHo studies (maximum = 6)
studies of ReHo for SZ							
Liu et al., 2006	WM, CSF, motion regressors (1)	4mm smoothing after deriving ReHo (1)	Volume-based (0)	5mins (1)	TR=2 (0)	GSR done (0)	3
Wang et al., 2009	No regression of nuisance variables (0)	Smoothed before computing ReHo (0)	Volume-based (0)	6mins (1)	TR=2 (0)	No GSR (1)	2
Fang et al., 2013	No regression of nuisance variables (0)	4mm smoothing after deriving ReHo (1)	Volume-based (0)	6mins (1)	TR=1.9 (1)	No GSR (1)	4
Liang et al., 2013	No regression of nuisance variables (0)	Smoothed before computing ReHo (0)	Volume-based (0)	6mins (1)	TR=3 (0)	No GSR (1)	2
Yu et al., 2013	No regression of nuisance variables (0)	6mm smoothing after deriving ReHo (1)	Volume-based (0)	<5 mins (0)	TR=2 (0)	No GSR (1)	2
Gao et al., 2015	No regression of nuisance variables (0)	6mm smoothing after deriving ReHo (1)	Volume-based (0)	8mins (1)	TR=2 (0)	No GSR (1)	3
Xu et al., 2015	No regression of nuisance variables (0)	6mm smoothing after deriving ReHo (1)	Volume-based (0)	9mins (1)	TR=3 (0)	No GSR (1)	3
Bai et al.,	WM, CSF, motion regressors (1)	4mm smoothing after	Volume-based	14mins (1)	TR=2 (0)	No GSR (1)	4

2016		deriving ReHo (1)	(0)				
Cui et al., 2016	WM, CSF, motion regressors (1)	8mm smoothing after deriving ReHo (1)	Volume-based (0)	NA	TR=2 (0)	No GSR (1)	2
Hu et al., 2016	WM, CSF, motion regressors (1)	No smoothing (1)	Volume-based (0)	NA	TR=2 (0)	GSR done (0)	2
Liu et al., 2016	No regression of nuisance variables (0)	No smoothing (1)	Volume-based (0)	6mins (1)	TR=2 (0)	No GSR (1)	3
Liu et al., 2017	No regression of nuisance variables (0)	No smoothing (1)	Volume-based (0)	8mins (1)	TR=2 (0)	No GSR (1)	3
Zhang et al., 2017	No regression of nuisance variables (0)	Smoothed before computing ReHo (0)	Volume-based (0)	8mins (1)	TR=2 (0)	GSR done (0)	1
Deng et al., 2018	No regression of nuisance variables (0)	6mm smoothing after deriving ReHo (1)	Volume-based (0)	6mins (1)	TR=2 (0)	No GSR (1)	3
Gao et al., 2018	No regression of nuisance variables (0)	4mm smoothing after deriving ReHo (1)	Volume-based (0)	8mins (1)	TR=2 (0)	No GSR (1)	3
Wu et al., 2018	WM, CSF, motion regressors (1)	Smoothed before computing ReHo (0)	Volume-based (0)	NA	TR=9 (0)	No GSR (1)	2
Wei et al., 2018	No regression of nuisance variables (0)	No smoothing (1)	Volume-based (0)	NA	TR=2 (0)	No GSR (1)	2
Zhang et al., 2018a	WM, CSF, motion regressors (1)	4mm smoothing after deriving ReHo (1)	Volume-based (0)	6mins (1)	TR=2 (0)	No GSR (1)	4

Zhang et al., 2018b	No regression of nuisance variables (0)	4mm smoothing after deriving ReHo (1)	Volume-based (0)	8mins (1)	TR=2.5 (0)	GSR done (0)	2
Zhao et al., 2018a	WM, CSF, motion regressors (1)	Smoothed before computing ReHo (0)	Volume-based (0)	4mins (0)	TR=2 (0)	GSR done (0)	1
Dong et al., 2019	WM, CSF, motion regressors (1)	6mm smoothing after deriving ReHo (1)	Volume-based (0)	8mins (1)	TR=2 (0)	No GSR (1)	4
Zhao et al., 2019	WM, CSF, motion regressors (1)	4 mm smoothing after deriving ReHo (1)	Volume-based (0)	NA	TR=2 (0)	No GSR (1)	3
Gao et al., 2020	WM, CSF, motion regressors (1)	4 mm smoothing after deriving ReHo (1)	Volume-based (0)	>6mins (1)	TR=2 (0)	No GSR (1)	4
Shan et al., 2020	WM, CSF, motion regressors (1)	4 mm smoothing after deriving ReHo (1)	Volume-based (0)	NA	TR=2 (0)	No GSR (1)	3
Yan et al., 2020	WM, CSF, motion regressors (1)	4 mm smoothing after deriving ReHo (1)	Volume-based (0)	>6mins (1)	TR=2.5 (0)	No GSR (1)	4
Gou et al, 2018	WM, CSF, motion regressors (1)	4mm smoothing after deriving ReHo (1)	Volume-based (0)	6mins (1)	TR=2 (0)	GSR done (0)	3

studies of ReHo for BD

Liu et al.,2012	No regression of nuisance variables (0)	4 mm smoothing after deriving ReHo (1)	Volume-based (0)	>6mins (1)	TR=2 (0)	GSR done (0)	2

Liang et al., 2013	WM, CSF, motion regressors (1)	Smoothed before computing ReHo (0)	Volume-based (0)	>6mins (1)	TR=3 (0)	GSR done (0)	2
Liu et al.,2013	No regression of nuisance variables (0)	Smoothed before computing ReHo (0)	Volume-based (0)	NA	TR=2 (0)	No GSR (1)	1
Wang et al., 2014	No regression of nuisance variables (0)	6 mm smoothing after deriving ReHo (1)	Volume-based (0)	>6mins (1)	TR=2 (0)	No GSR (1)	3
Jiang et al., 2016	No regression of nuisance variables (0)	6 mm smoothing after deriving ReHo (1)	Volume-based (0)	>6mins (1)	TR=2 (0)	GSR done (0)	2
Fu et al., 2017	No regression of nuisance variables (0)	6 mm smoothing after deriving ReHo (1)	Volume-based (0)	>6mins (1)	TR=2 (0)	No GSR (1)	3
He et al., 2017	No regression of nuisance variables (0)	4 mm smoothing after deriving ReHo (1)	Volume-based (0)	>6mins (1)	TR=2 (0)	No GSR (1)	3
Li et al., 2018	WM, CSF, motion regressors (1)	Smoothed before computing ReHo (0)	Volume-based (0)	NA	TR=2 (0)	No GSR (1)	2
Sun et al., 2018	No regression of nuisance variables (0)	No smoothing (1)	Volume-based (0)	>6mins (1)	TR=2 (0)	No GSR (1)	3
Wei et al., 2018	No regression of nuisance variables (0)	No smoothing (1)	Volume-based (0)	NA	TR=2 (0)	No GSR (1)	2
Yao et al., 2018a[1]	WM, CSF, motion regressors (1)	Smoothed before computing ReHo (0)	Volume-based (0)	>6mins (1)	TR=2 (0)	GSR done (0)	3

Yao et al., 2018b[2]	No regression of nuisance variables (0)	Smoothed before computing ReHo (0)	Volume-based (0)	>6mins (1)	TR=2 (0)	No GSR (1)	3
Zhang et al., 2018[3]	No regression of nuisance variables (0)	No smoothing (1)	Volume-based (0)	>6mins (1)	TR=2 (0)	No GSR (1)	3
Qiu et al., 2019[4]	WM, CSF, motion regressors (1)	4 mm smoothing after deriving ReHo (1)	Volume-based (0)	>6mins (1)	TR=2 (0)	GSR done (0)	3
Xue et al., 2019[5]	No regression of nuisance variables (0)	No smoothing (1)	Volume-based (0)	>6mins (1)	TR=2 (0)	No GSR (1)	3
Jiang et al., 2020[6]	WM, CSF, motion regressors (1)	Smoothed before computing ReHo (0)	Volume-based (0)	>6mins (1)	TR=2 (0)	No GSR (1)	3
Li et al., 2020[7]	No regression of nuisance variables (0)	Smoothed before computing ReHo (0)	Volume-based (0)	>6mins (1)	TR=2 (0)	No GSR (1)	3
Liu et al., 2020[8]	WM, CSF, motion regressors (1)	6 mm smoothing after deriving ReHo (1)	Volume-based (0)	>6mins (1)	TR=2 (0)	No GSR (1)	3
Shan et al., 2020[9]	No regression of nuisance variables (0)	4 mm smoothing after deriving ReHo (1)	Volume-based (0)	NA	TR=2 (0)	No GSR (1)	3

Abbreviations: SZ = schizophrenia; BD = bipolar disorder; ReHo = regional homogeneity; NA = not available; WM = white matter; CSF = cerebrospinal fluid; TR = time of repeat; GSR = global signal regression.

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Table S3a. Demographic, clinical and imaging characteristics of the included studies of ReHo for SZ

Study	Demographic characteristics				Clinical characteristics: SZ patients only						Imaging characteristics			Quality score*
	Subjects, n		Mean age, years		Illness duration, months	Medication	FE/Chronic	PANSS total score	PANSS positive score	PANSS negative score	Scanner	Software	Threshold	
	SZ	HC	SZ	HC										
Liu et al., 2006[10]	18	18	23.67	24.4	26.8	NA	NA	80.4	NA	NA	1.5T	SPM2	p<0.05, AlphaSim	9.5
Wang et al., 2009[11]	24	39	35.7	34.1	133.7	Yes	Chronic	97.4	26.2	23.8	1.5T	SPM2	p<0.001, uncorrected	10
Fang et al., 2013[12]	13	13	25	25.8	13.5	No	FE	101.3	NA	NA	3.0T	REST	p<0.05, AlphaSim	9.5
Liang et al., 2013[13]	20	20	31.2	29.6	6.1	NA	NA	76	NA	NA	3.0T	SPM8	p<0.05, AlphaSim	9.5
Yu et al.,	69	62	31.7	29.9	85.2	Yes	Chronic	52.9	12.1	13.4	3.0T	SPM	p<0.05, FWE	10

2013[14]														
Gao et al., 2015[15]	14	14	33.2	34.9	110.4	Yes	Chronic	74.1	16.4	22.6	1.5T	DPARSF	p<0.05	10
Xu et al., 2015[16]	24	21	31.9	34.1	13.9	Yes	Chronic	98.2	2.9	24	3.0T	SPM8	p<0.001, uncorrected	10
Bai et al., 2016[17]	17	17	26	28.7	40.3	No	6 FE/11 Chronic	82.1	15.3	24.9	1.5T	SPM8	p<0.05, AlphaSim	10
Cui et al., 2016[#18]	17	19	21.2	23.8	6.5	No	FE	106.2	31.1	25.5	3.0T	DPARSFA	p<0.01, AlphaSi	10
	15		22.5		10.2	NA	NA	88.1	17.9	22.7				
Hu et al., 2016[19]	42	38	24.9	24.8	8.4	No	FE	91.9	25.6	18.2	3.0T	DPARSFA	p<0.005, uncorrected	10
Liu et al., 2016[20]	27	27	25.4	27.4	18.3	Yes	FE	85.8	21.6	23.2	1.5T	SPM8	p<0.05, FWE	10
Liu et al., 2017[21]	60	32	12.2	33	20.9	Yes	FE	91.7	NA	NA	3.0T	SPM8	p<0.05, AlphaSim	10
Zhang et	22	23	28	28	NA	Yes	NA	79	NA	NA	3.0T	SPM12	P<0.001,	9.5

al., 2017[22]													uncorrected	
Deng et al., 2018[23]	70	84	20	21.9	5.7	NA	FE	NA	NA	NA	3.0T	SPM8	p<0.005, AlphaSim	9.5
Gao et al., 2018[#24]	17	29	31.2	32.7	14	Yes	NA	97.8	27.5	21.1	3.0T	SPM8	p<0.05, GRF	9.5
	17		36.8		7.9	Yes		37.3	9.5	8.4				
Wu et al., 2018[#25]	43	56	26.4	25.1	< 24	Yes	FE	87.1	25.2	21.4	3.0T	SPM8	p<0.05, FDR	9.5
	39		30		> 24	Yes	Chronic	84.9	23.4	22.4				
Wei et al., 2018[26]	126	188	24.9	26.7	52.8	Yes	Chronic	NA	NA	NA	3.0T	DPARSF	p<0.05, AlphaSim	10
Zhang et al., 2018a[27]	16	18	23.8	23.2	NA	NA	NA	76	14.2	18.7	3.0T	SPM8	P<0.001, uncorrected	9.5
Zhang et al., 2018b[28]	28	38	21.9	24.1	12.5	No	FE	82.9	22	19.1	3.0T	DPABI	p<0.05, FWE	9.5
Zhao et al.,	58	39	20.4	22.2	< 24	NA	FE	86	23.6	21.4	3.0T	REST	P<0.001, uncorrected	10

2018a[29]														
Dong et al., 2019[30]	96	122	39.8	38	182.2	Yes	Chronic	62.4	13.4	20.7	3.0T	DPABI	p<0.05, FDR	10
Zhao et al., 2019[31]	44	26	23.7	22.6	12	No	FE	102	15.3	24.7	3.0T	DPARSF	p<0.01, TFCE	10
Gao et al., 2020[32]	50	57	31.6	28.4	30.2	No	FE	91.8	26.4	20.7	3.0 T	SPM12	P<0.05, GRF	10
Shan et al., 2020[33]	40	39	24.4	25.7	NA	NA	NA	103.9	NA	NA	3.0 T	DPABI	p<0.05, FDR	8
Yan et al., 2020[34]	74	69	24.2	26.3	13.7	No	FE	84.2	24.4	17.6	3.0 T	DPARSF	P<0.05, FWE	10
Gou et al., 2018[35]	28	21	23.9	28.8	15.1	Yes	FE	85.7	17.8	21.0	1.5T	SPM8	AlphaSim, P<0.005	10

Note: Unless otherwise indicated, data are means.

two datasets included; * Quality score out of 10.

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Abbreviations: SZ = schizophrenia; HC = healthy control; ReHo = regional homogeneity; FE = first episode; PANSS = Positive and Negative Syndrome Scale; NA = not available; SPM = statistical parametric mapping; REST = the resting-state fMRI data analysis toolkit; FWE = family wise error; FDR = false discovery rate; DPARSF = data processing assistant for resting-State fMRI software; GRF = Gaussian random field; TFCE = threshold-free cluster enhancement.

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Table S3b. Demographic, clinical and imaging characteristics of the included studies of ReHo for BD

Study	Demographic characteristics				Clinical characteristics: patients only					Imaging characteristics				Quality score*
	Subjects, n		Mean age, years		Illness duration, months	HAMD-17	YMRS	State	Subtype	Scanner	Software	FWHM, mm	Threshold	
	BD	HC	BD	HC										
Liu et al.,2012[36]	26	26	32.4	31.9	4.2	19.7	NA	Depressed	NA	3.0T	REST	4	p<0.01, Corrected	10
Liang et al., 2013[37]	17	16	34.5	35.1	3.9	24.5	NA	Depressed	NA	1.5T	REST	8	P < 0.05	10
Liu et al.,2013[38]	21	26	31.1	33.2	3.6	22.1	NA	Depressed	NA	3.0T	REST	4	P < 0.005	10
Wang et al., 2014[39]	43	61	31.7	31.2	NA	7.6	6.7	Depressed, Euthymic, Manic, mixed	BD I	3.0T	REST	6	p<0.05, Monte Carlo corrected	9.5
Jiang et al., 2016[40]	24	28	26.9	26.5	NA	15.4	5.3	Depressed	BD I	3.0T	DPARSF	6	p<0.05, AlphaSim	9.5
Fu et al., 2017[41]	20	30	25.7	26.5	NA	21.4	0.9	Manic	NA	3.0T	DPARSF	6	p<0.01, AlphaSim	9.5

He et al., 2017[42]	22	22	37.6	35.1	NA	27	NA	Manic	BD II	3.0T	REST	4	p<0.01, AlphaSim	9.5
Li et al., 2018[43]	19	25	38.8	33.4	4	4.2	2.6	Euthymic	NA	3.0T	DPABI	6	P<0.01, GRF	10
Sun et al., 2018[#44]	51	54	27.7	27.6	NA	19.8	3.2	Depressed,	BD I/BD II = 25/51	3.0T	REST	NA	P<0.005, AlphaSim	9.5
	25		25		NA	8	19.4	Manic						
Wei et al., 2018[26]	97	188	26.2	26.6	42.2	11.8	7.9	NA	NA	3.0T	DPARSF	4	p<0.05, AlphaSim	9.5
Yao et al., 2018a[1]	20	63	25.5	26	40.4	15.6	NA	Depressed	NA	3.0T	DPABI	6	p<0.05, AlphaSim	9.5
Yao et al., 2018b[2]	55	113	27	29	45.4	20.2	NA	Depressed	BD I/BD II=19/36	3.0T	DPARSF	6	p<0.005, AlphaSim	10
Zhang et al., 2018[3]	12	15	23.5	21.1	6	21.6	22.8	Depressed	BD II	3.0T	DPABI	6	p<0.05, AlphaSim	9.5
Qiu et al., 2019[4]	100	100	26.4	28.3	40.8	26.9	2.8	Depressed	BD II	3.0T	DPABI	4	p<0.05, TFCE	10
Xue et al., 2019[5]	19	22	32.9	31.8	148.5	NA	24	Manic	BD I	1.5T	RESTplus	6	p<0.01, GRF	10
Jiang et al., 2020[6]	24	30	28.1	26.5	11.2	22	0.8	21 Depressed, 3 remission	NA	3.0T	DPARSF	6	p<0.005, GRF	10
Li et al.,	36	36	23.1	22.8	33.8	2.9	3.8	4 depressiv	BD I 3	3.0 T	DPABI	6	P<0.05, GRF	10

2020[7]								e, 4 manic, 28 remission	2/BD II 4					
Liu et al., 2020[8]	40	54	32.8	32.6	NA	25.7	2.2	NA	NA	3.0 T	DPABI	6	P<0.05, Alpha Sim	8.5
Shan et al., 2020[9]	37	37	21.0	20.8	NA	22.2	8.1	NA	BD II	3.0 T	REST	4	p<0.05	9

Note: Unless otherwise indicated, data are means.

[#] two datasets included; * Quality score out of 10.

Abbreviations: BD = bipolar disorder; HC = healthy control; ReHo = regional homogeneity; NA = not available; FWHM = full width at half maximum; SPM = statistical parametric mapping; REST = the resting-state fMRI data analysis toolkit; DPARSF = data processing assistant for resting-State fMRI software; GRF = Gaussian random field; DPABI = data processing & analysis of brain imaging; HAMD = Hamilton depression rating scale; YMRS = Young mania rating scale score; TFCE = threshold-free cluster enhancement.

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Table S3c. Demographic, clinical and imaging characteristics of the included studies of VBM for SZ

Study	Demographic characteristics				Clinical characteristics: SZ patients only						Imaging characteristics			Quality score*
	Subjects, n		Mean age, years		Illness duration, months	Medication	FE/Chronic	PANSS total score	PANSS positive score	PANSS negative score	Scanner	Software	Threshold	
	SZ	HC	SZ	HC										
Amann2016[45]	45	45	43.2	43.3	258	Yes	Chronic	NA	13.3	17.8	1.5T	FSL	P<0.01	9.5
Ananth2002[46]	20	20	37.8	38.6	184.2	Yes	Chronic	NA	NA	NA	2.0T	SPM99	p<0.05, FWE	9.5
Antonova2005[47]	45	43	40.5	33.7	16.9	Yes	4 FE/41 Chronic	NA	27.8	21.5	1.5T	SPM99	uncorrected, p<0.001	10
Asami2012[48]	33	36	22.5	22.9	4.9	Yes	FE	NA	NA	NA	1.5T	SPM5	FDR, p<0.01	9.5
Asami2013[49]	54	54	39	36.8	NA	Yes	NA	NA	NA	NA	1.5T	SPM5	FDR p<0.001	9.5
Bassitt2007[50]	50	30	31.7	31.2	136.8	Yes	Chronic	59.1	12.9	19.8	1.5T	SPM2	FEW p<0.05	9.5
Benoit2012[51]	16	60	24.2	24.8	9.3	Yes	FE	NA	NA	NA	1.5T	VBM8	FEW p<0.05	9.5
Bonilha2008[52]	14	13	40	35	NA	No	NA	96.2	24.2	21.3	3.0T	SPM5	p<0.05	9.5

Borgwardt2010[53]	28	34	37.7	39.3	315.6	Yes	Chronic	NA	NA	NA	1.5T	SPM2	p<0.05	9.5
Brown2011[54]	17	21	44.8	45	229.2	Yes	Chronic	NA	12.3<	13.5	1.5T	SPM5	p<0.05	9.5
Cascella2010[55]	50	90	39.8	46.3	189	Yes	Chronic	NA	NA	NA	1.5T	SPM5	FWE p<0.05	9
Chang2016[56]	60	71	18.3	20.6	8.1	Yes	FE	NA	NA	NA	3.0T	SPM8	P<0.01, AlphaSim	9.5
Chang2020[57]	51	128	28.7	33.3	58.1	No	FE	85.3	22.2	21.3	1.5 T	SPM8	uncorrectionp <0.05	9.5
Chua2007[58]	26	38	32	38	4	No	FE	72	NA	NA	1.5T	SPM2	NA	9.5
Cooke2008[59]	52	30	38.4	32.1	166.8	Yes	Chronic	66.2	16.5	18	1.5T	SPM2	FWE p<0.05	10
Corradi2012[60]	68	77	40.2	39.6	115.9	Yes	Chronic	NA	NA	NA	1.5T	SPM5	uncorrected p<0.01	9.5
Cui2011[61]	23	36	24.8	26.6	48.5	Yes	Chronic	NA	22.5	20.9	3.0T	SPM5	Uncorrected p<0.001	10
De_Castro_Manglano2011[62]	28	20	18.6	20.5	7.1	Yes	FE	42.3	17.2	19.1	1.5T	SPM2	Uncorrected P<0.001	10
Delvecchio2017[63]	61	59	40.8	40.2	175.2	Yes	Chronic	NA	NA	NA	1.5T	SPM12	FEW p<0.05	9.5
DeRamus2020[64]	167	159	38.2	40.0	NA	NA	NA	NA	14	14	3.0 T	SPM12	FDR correction	8

													p<0.05	
Douaud2007[65]	25	25	16.2	15.9	1.4	Yes	FE	NA	22	16	1.5T	SPM2	Uncorrected P<0.01	9.5
Egashira2014_EOS[66]	24	41	58.2	58.8	415.2	Yes	Chronic	NA	11.8	19	1.5T	SPM8	FEW p<0.05	10
Egashira2014_LOS[66]	22		58.3		62.4	Yes	Chronic	NA	8.2	8.4				
Euler2009[67]	19	23	43.3	43.3	NA	Yes	NA	NA	NA	NA	1.5T	SPM5	FDR P<0.005	9.5
Filippi2014[68]	43	17	29.3	30.7	7.9	No	FE	100.8	28.2	23	1.5T	SPM8	Uncorrected p<0.001	10
Fukuta2013[69]	40	50	45.6	45	276	Yes	NA	NA	NA	NA	1.5T	SPM5	FWE p<0.05	9
Gong2015_Janpanese[70]	28	28	25.1	25	7.3	Yes	FE	NA	15.3	8.9	3.0T	SPM8	Uncorrected P<0.05	10
Gong2015_AfricanCaribbean[70]	18	18	26.3	26.6	1.7	Yes	FE	63.6	14.6	18.3	3.0T	SPM8	Uncorrected P<0.005	10
Gong2015_Caucasian[70]	29	29	26.5	26.2	2	Yes	FE	61.9	15.5	16	3.0T	SPM8	Uncorrected P<0.001	10
Gong2015_Chinese[70]	50	50	24.3	24.3	8.3	Yes	FE	97.5	25.3	18.8	3.0T	SPM8	FDR p<0.05	10
Guo2014a[71]	19	19	24	25.2	9.4	Yes	FE	77.8	19.5	20.3	3.0T	SPM8	Uncorrected P<0.005	10
Guo2014b[72]	20	43	23.4	23.7	12.9	Yes	FE	88.9	22.8	22.2	3.0T	SPM8	Uncorrected	10

													P<0.001	
Guo2014c[73]	51	41	22.5	22.8	8.4	No	FE	91.3	22.4	22.8	3.0T	SPM8	FDR p<0.05	10
Guo2015[74]	49	50	22.7	23.5	22.5	No	FE	91.3	22.3	22.8	3.0T	FSL	GRF p<0.005	10
Guo2019[75]	33	33	24.3	23.8	NA	No	FE	88.1	22.4	20.8	3.0T	SPM2	FWE p<0.05	10
Henze2011[76]	13	13	17.1	17.6	7.6	Yes	FE	NA	NA	NA	3.0T	SPM2	FWE p<0.05	10
Herold2009[77]	18	21	28.7	27.4	40.8	Yes	Chronic	68.3	14.2	19.6	4.0T	SPM8	Uncorrected P<0.005	9.5
Hirao2008[78]	20	20	36.7	35	127.2	Yes	Chronic	NA	14.6	16.2	3.0T	SPM8	FDR corrected P<0.05	10
Honea2008[79]	169	212	36.4	33.3	NA	Yes	Chronic	NA	NA	NA	3.0T	SPM8	FWE p<0.05	10
Hooker2011[80]	21	17	44.3	43.8	293.6	Yes	Chronic	NA	12.3	16.5	3.0T	SPM8	FWE p<0.05	10
Hu2013[81]	51	59	22.3	23.2	11.1	Yes	FE	91.5	22.4	22.8	3.0T	SPM8	FDR p<0.05	10
Huang2015_AVHs[82]	18	18	22.6	25.1	5.9	No	FE	106.4	31.1	25.8	3.0T	SPM8	Uncorrected P<0.001	10
Huang2015_NonAVHs[82]	18		22.7		12.4		FE	88.1	18.6	22.1				
Hyza2014[83]	24	24	32.8	31.8	110.4	Yes	Chronic	NA	NA	NA	1.5T	SPM8	FWE p<0.05	10
Jayakumar2005[84]	18	18	24.9	25.7	10.3	No	FE	79	19	23	1.5T	SPM2	FDR P<0.05	10

Job2002[85]	34	36	21.4	21.2	NA	NA	FE	NA	NA	NA	1.0T	SPM99	Uncorrected P<0.001	9.5
Kawada2009[86]	26	26	36.7	36.3	118.8	Yes	Chronic	61.1	14.5	15	3.0T	SPM5	FDR P<0.05	10
Kim2017[87]	22	22	31.7	31.6	110.4	Yes	Chronic	NA	18.4	21.1	3.0T	SPM8	FWE p<0.05	10
Koelkebeck 2013[88]	18	30	34.9	39.1	141.6	Yes	Chronic	NA	12.8	15.1	3.0T	SPM8	Uncorrected P<0.001	10
Kuhn2012[89]	29	45	27.6	31.3	45.6	NA	FE	NA	NA	NA	3.0T	SPM5	p<0.01	9.5
Lee2020[90]	65	65	37.0	34.5	186.2	NA	NA	NA	NA	NA	3.0T	SPM8	FWE corrected P<0.017	8
Lei2015[#91]	44	44	22.9	22.6	19.9	NA	NA	96	22	27.6	3.0T	SPM8	Uncorrected P<0.001	9
Li2019[92]	86	86	23.5	24	14.2	NA	FE	86.8	21.7	20.6	3.0T	SPM8	FWE p<0.05	9.5
Liao2015[93]	93	99	27	25.8	54.1	Yes	45 FE, 48 Chronic	77.3	23.4	18.3	3.0T	SPM8	FWE p< 0.05	10
Lui2009[94]	68	68	24.2	24.7	8.6	No	FE	107.4	26.6	20.6	3.0T	SPM2	FWE p<0.05	10
Lyu2014[95]	51	59	22.3	23.2	11.1	No	FE	91.5	22.4	22.8	3.0T	SPM8	FDR P<0.005	10
Maggioni2017[96]	243	383	33.2	30.4	NA	Yes	NA	73.4	NA	NA	3.0T	SPM12	FWE p<0.05	9.5
Mane2009[97]	15	11	25.6	30.3	5.8	Yes	FE	93.1	24.9	23.99	1.5T	SPM5	FWE p<0.05	9.5
Marti-Bonmati2007[98]	21	10	39	35	180	Yes	Chronic	NA	NA	NA	1.5T	SPM2	Uncorrected P<0.005	9.5

Madeira2020[99]	20	20	31.5	31.5	72.0	Yes	NA	NA	NA	NA	3.0T	SPM12	FWE correction, p<0.05	8
Martin2014_nodel[100]	21	10	44.6	46.5	NA	Yes	NA	NA	27.6	16.7	3.0T	SPM8	FWE p<0.05	9.5
Martin2014_del[100]	65	50	46.1		NA	NA	NA	NA	27.5	18.2				9.5
Molina2010a[101]	17		25.8	29.4	14.5	No	FE	NA	21.9	19.2	1.5T	SPM5	FDR p<0.05	9.5
Molina2010b_Kraepelinian[102]	30	40	36.3	29.4	124.8	Yes	Chronic	NA	24	26.2	1.5T	SPM8	FWE p<0.05	9.5
Molina2010b_non-Kraepelinian[102]	26	41	36.9		130.8	Yes	Chronic	NA	21.2	28.3				9.5
Molina2011a[103]	19		34.4	34.6	117.6	Yes	Chronic	NA	23.2	27	1.5T	SPM8	FDR p<0.05	9.5
Molina2011b[104]	38	24	34.1	36.8	160.8	Yes	Chronic	97.3	28.3	24.1	1.5T	SPM8	FWE p<0.05	9.5
Nagashima2012[105]	30	31	43.8	44.8	244.6	Yes	Chronic	NA	17.5	26.1	1.5T	SPM5	Uncorrected P<0.001	8.5
Nakamura2013[106]	8	8	24.7	23.9	1.7	Yes	FE	NA	NA	NA	1.5T	SPM8	FWE p<0.001	9.5
Narayanasw	34	51	NA	30.3	16.3	N0	FE	NA	21.7	23.9	1.5T	SPM8	FWE p<0.05	9.5

amy et al., 2015[107]														
Neckelmann2006[108]	55	45	NA	NA	NA	Yes	NA	NA	NA	NA	1.5T	SPM99	Uncorrected P<0.001	9.5
Nenadic2012_All[108]	99	113	36.2	32.4	NA	Yes	Chronic	NA	NA	NA	1.5T	VBM2	FWE p<0.05	9.5
Nenadic2012_Negative[109]	35		35.1		93.6	Yes	Chronic	NA	NA	NA				
Nenadic2012_Disorganized[109]	29		36.0		104.4	Yes	Chronic	NA	NA	NA				
Nenadic2012_Paranoid[109]	35		37.6		123.6	Yes	Chronic	NA	NA	NA				
Nenadic2015a[110]	24	49	24.9	23.8	4.1	No	FE	53.2	30.4	29.1	3.0T	SPM8	Uncorrected P<0.001	9.5
Nenadic2015b[111]	34	34	33	34.3	106.8	Yes	Chronic	NA	NA	NA	3.0T	SPM8	FDR p< 0.05	9.5
Oertel-Knochel2012[112]	37	31	38	39.4	164.5	Yes	Chronic	62.8	15.7	15.1	3.0T	SPM8	p< 0.05	9
Onay 2017[113]	20	16	36.5	34.4	128.4	Yes	Chronic	NA	NA	NA	1.5T	SPM8	FWE p<0.05	9.5
Ota2011[114]	9	10	29	26.1	NA	Yes	FE	NA	NA	NA	1.5T	SPM5	Uncorrected	8.5

													P<0.001	
Picado2015[115]	20	20	35.9	33.2	NA	Yes	NA	59.4	12.3	15.5	1.5T	SPM5	FWE p< 0.05	10
Quinn2018[116]	158	88	29.6	29.5	108.1	Yes	Chronic	67.9	18.8	16.5	3.0T	SPM8	FDR p< 0.05	10
Rosa2015[117]	32	34	28.2	30.8	NA	Yes	FE	51	12.1	14.1	1.5T	SPM2	FWE p< 0.05	10
Salgado-pineda2004[118]	14	14	25.1	25.1	17.5	Yes	FE/Chronic	NA	NA	NA	1.5T	SPM2	FDR P<0.05	9.5
Salgado-Pineda2014[119]	14	14	37.3	34.6	168	Yes	Chronic	60.7	24.7	13.1	3.0T	SPM5	FDR p< 0.05	10
Sapara2016[120]	20	20	37.8	35.3	NA	Yes	NA	66.8	17.1	18.2	1.5T	SPM8	FWE p< 0.05	10
Schaufelberger2007[121]	62	94	27.6	30.2	6.3	NA	FE	47.8	10.8	13.6	1.5T	SPM2	FWE p<0.05	10
Segarra2008[122]	28	28	27.3	28.8	NA	Yes	NA	NA	NA	NA	1.5T	SPM2	FDR P<0.05	9.5
Shivakumar2018[123]	30	60	32.8	26.3	32	No	FE	NA	24.8	24.7	3.0T	SPM8	FWE p<0.05	10
Singh2014[124]	14	14	34.1	32.6	115.2	Yes	Chronic	NA	NA	NA	3.0T	SPM8	FWE p< 0.05	9.5
Singh2015[125]	14	14	31.5	27.2	120.4	Yes	Chronic	NA	NA	NA	3.0T	SPM8	FWE p< 0.05	9.5
Singh2018[126]	28	28	33.9	31.4	112.9	Yes	Chronic	NA	NA	NA	3.0T	SPM12	FWE p<0.05	9.5

Spalthoff2018[127]	51	102	35.2	33.2	105.6	Yes	Chronic	NA	NA	NA	3.0T	SPM12	FWE p<0.05	9.5
Suazo2014[128]	17	13	33.3	30.9	63.3	No	10 FE/7 Chronic	74.2	20.9	16.5	1.5T	SPM8	Uncorrected P<0.001	9.5
Szendi2017[129]	21	13	39	34	192	Yes	Chronic	79.3	13.8	24.3	1.5T	FSL	p<0.036	9.5
Tikàsz2019[130]	47	23	34.4	31.9	NA	Yes	NA	NA	9.7	7.9	3.0T	SPM12	FWE p<0.05	9.5
Tomelleri2009[131]	70	79	39.7	40.3	169.6	Yes	Chronic	NA	NA	NA	1.5T	SPM5	FWE p<0.05	9.5
Torres2016[132]	161	151	30.4	30.6	60	Yes	FE + Chronic	56.1	NA	NA	1.5T	SPM8	FWE p<0.05	9
Tregellas2007[133]	32	32	39.6	35.3	NA	Yes	NA	NA	NA	NA	1.5T	SPM2	FDR P<0.05	9.5
Van2014[134]	51	51	34	36.1	105.2	Yes	Chronic	NA	11.5	14.4	3.0T	SPM8	Uncorrected P<0.005	10
Venkatasubramanian2010[135]	30	27	30.1	27.4	41.7	No	FE	NA	22	23	1.5T	SPM2	FDR p<0.05	10
Vijayakumari2015[136]	41	39	27.3	26.3	24.5	Yes	FE	54.7	14.4	14.3	3.0T	SPM8	FWE p< 0.001	10
Whitford2005[137]	31	30	19.3	19.3	6.4	Yes	FE	NA	NA	NA	1.5T	SPM99	p<0.05	9.5
Witthaus20	23	29	26.4	25.7	NA	Yes	FE	NA	19.3	18	1.5T	SPM2	Uncorrected	9.5

09[138]													P<0.005	
Yang2015[139]	30	30	21.5	24.3	6.4	Yes	FE	82.4	NA	NA	1.5T	HAMMER	p<0.05, FDR	9.5
Yang2019[140]	37	28	42	40.5	220.9	Yes	Chronic	NA	10.1	15.3	3.0T	SPM12	FDR p< 0.05	10
Yokoyama2018[141]	60	40	38	35.1	152.3	NA	Chronic	NA	13.8	15.9	3.0T	SPM8	FWE p< 0.05	8.5
Yue2016[142]	20	24	24.5	24.8	22.9	Yes	FE	89	21.3	19.1	3.0T	SPM8	FWE p< 0.05	10
Yuksel2012[143]	43	58	38.7	36.4	NA	Yes	NA	62.3	18.1	NA	1.5T	FSL	FWE p<0.05	9.5
Zhang2015[144]	37	30	15.5	15.3	16	No	FE	74.6	20.4	20.9	3.0T	SPM8	AlphaSim p< 0.5	10
Zhang2017[145]	75	83	24.9	24.9	4.2	No	FE	93.4	25.1	20.5	3.0T	SPM8	FWE p<0.05	9
Zierhut2013[146]	34	36	34.6	31	120.4	Yes	Chronic	71.1	16.4	19	3.0T	SPM5	FDR p<0.05	10
Cui2007[147]	20	20	27.2	28.1	62.2	Yes	Chronic	NA	18.8	15.7	3.0T	SPM2	Uncorrected p<0.001	10
Dong2007[148]	10	10	28	29	NA	NA	NA	NA	NA	NA	1.5T	SPM5	p<0.001	9.5
Huang2009[149]	15	38	31	35.3	NA	No	FE	NA	NA	NA	3.0T	SPM5	Uncorrected p<0.001	9
Jin2020[150]	26	22	27.5	33.2	41.7	NA	NA	82.8	NA	NA	3.0T	SPM12	FDR correction,	8

													p<0.05	
Liu2020_VSP[151]	48	28	29.0	26.1	86.0	Yes	NA	84.7	25.0	17.1	3.0T	SPM8	FWE correction, p<0.05	9.5
Liu2020_nVSP	27	28	27.7	26.1	74.8	Yes	NA	83.8	21.3	19.9	3.0T	SPM8	FWE correction, p<0.05	9.5
Lv2007[152]	13	13	24	NA	< 6	No	FE	NA	NA	NA	3.0T	SPM2	p<0.05	9
Zhang2018[153]	34	32	15.7	15.4	4	No	FE	88.5	26	20.1	3.0T	SPM8	Uncorrected p<0.001	9.5
Zou2018[153]	38	40	28.9	28.2	< 12	No	FE	40.4	25.2	21.6	3.0T	SPM8	Uncorrected P<0.001	10
Bose2009[154]	34	33	40.0	39.5	144	YES	Chronic	NA	NA	NA	1T	SPM99	p<0.05, corrected	8.5
Horn2010[156]	20	20	30.1	30.1	NA	YES	Chronic	NA	NA	NA	1.5T	SPM5	FDR p<0.05	8
McDonald2005[157]	25	52	37.3	39.3	208.8	YES	Chronic	NA	NA	NA	1.5T	SPM99	p<0.05	8.5
Morgan2007[158]	44	44	27.1	30.1	16.8	NA	YES	NA	NA	NA	1.5T	AFNI	p<0.05	8
Moriya2010[159]	19	19	29.9	29.7	9.4	YES	YES	68.2	15.9	17.2	3.0T	SPM5	FDR p<0.05	10
O'Daly2007[160]	28	32	33.0	34.0	96	YES	Chronic	NA	NA	NA	1.5T	AFNI	P<0.01	8.5

Palaniyappan2012[161]	57	41	26.1	28.0	NA	YES	Chronic	NA	NA	NA	3.0T	SPM8	p<0.0125	8.5
Plaze2011[162]	45	20	31.8	31.9	NA	YES	Chronic	NA	NA	NA	1.5T	SPM2	FWE p<0.05	8.5
Price2010[163]	48	47	26.2	24.8	NA	YES	Chronic	NA	NA	NA	1.5T	SPM2	FWE p<0.05	8.5
Tregellas2007[164]	32	32	39.6	35.3	NA	YES	Chronic	NA	NA	NA	1.5T	SPM2	FDR p<0.05	8.5

Note: Unless otherwise indicated, data are means.

* Quality score out of 10.

Abbreviations: SZ = schizophrenia; HC = healthy control; VBM = voxel-based morphometry; FE = first episode; PANSS = Positive and Negative Syndrome Scale; NA = not available; SPM = statistical parametric mapping; FWE = family wise error; FDR = false discovery rate; GRF = Gaussian random field; FSL = functional MRI of the brain's software library; AFNI = analysis of functional neuro-images.

Appendix 1 to Qi Z, Wang J, Gong J, et al. Common and specific patterns of functional and structural brain alterations in schizophrenia and bipolar disorder: a multimodal voxel-based meta-analysis. J Psychiatry Neurosci 2022. doi: 10.1503/jpn.210111

Table S3d. Demographic, clinical and imaging characteristics of the included studies of VBM for BD

Study	Demographic characteristics				Clinical characteristics: patients only					Imaging characteristics				Quality score*
	Subjects, n		Mean age, years		Illness duration, months	HAMD-17	YMRS	State	Subtype	Scanner	Software	FWHM, mm	Threshold	
	BD	HC	BD	HC										
Adler2005[165]	32	27	31.2	30.5	NA	NA	NA	5 Manic/2 Depressed	NA	3.0T	SPM99	12	P<0.001	9
Adler2007[166]	33	33	19.9	21.5	NA	NA	NA	18 Manic/13 mixed	NA	3.0T	SPM2	12	P<0.001	9
Almeida2009[167]	27	28	31.9	30.8	11.1	NA	NA	17 Euthymic/17 Depressed	BD I	3.0T	SPM5	6	p<0.05	9.5
Alonso-Lana2016[168]	28	33	44.0	44.1	201.1	2.6	1.2	Euthymic	BD I	1.5T	SPM12	4	FWE p<0.05	9.5
Altamura 2018_NPBD[169]	56	46	25.3	33.7	NA	NA	NA	hypomanic or manic/Depr	24 BD I, 21 BD II, 1 NA	3.0T	SPM12	6	P<0.001	9.5

Altamura 2018_PBD[169]	62		27.3		NA	NA	NA	essed hypomanic or manic/Depressed	60 BD I, 1 BD II, 1 NA					8.5
Ambrosi2013[170]	20	21	42.0	34.6	151.2	NA	NA	NA	BD II	1.5T	spm8	8	p<0.05	10
Brown2011[171]	15	21	45.0	46.2	226.8	20.9	NA	NA	BD I	1.5T	SPM5	8	p<0.05	10
Bruno2004[172]	39	35	39.1	34.8	158.4	NA	NA	NA	NA	Y	1.5 T	12	uncorrected, p<0.05	8
Cai2015[173]	23	23	25.7	28.2	73.1	28.5		NA	BD I	3.0T	SPM8	8	Uncorrected P<0.005	10
Chen2007[174]	24	25	38.2	NA	170.0	NA	NA	NA	BD I	1.5T	SPM2	12	uncorrected p<0.001	9.5
Chen2012[175]	18	27	32.0	31.3	50.4	3.2	24.8	Manic	NA	3.0T	SPM5	8	p<0.001	10
Cui2011[61]	24	36	28.4	26.6	73.4	NA	25.9	Manic	BD I	3.0T	SPM5	6	P<0.001	10
Duarte2016_CM[176]	20	20	40.4	37.4	181.2	NA	NA	NA	BD I	1.5T	spm8	8	FWE p< 0.05	9.5
Eker2014[177]	28	30	36.4	34.7	195.0	2.3	1.0	NA	BD I	3.0T	spm8	8	FWE p<0.05	9.5
Frangou2011[178]	47	71	46.2	39.8	240.0	3.0	1.3	NA	BD I	1.5T	SPM5	12	p < 0.001	9.5

Ha2009_BipolarII[179]	23	23	35.2	36	126.0	13.1	NA	7 depressed/16 remission	BD II	1.5T	SPM2	8	p<0.05 FDR	10
Ha2009_BipolarI[177]	23		35.6		124.8	8.8	NA	4 depressed/19 remission	BD I					
Hajek2012[180]	12	11	45.6	46.0	307.2	2.6	1.1	NA	9 BD I 3 BD II	1.5T	FSL	3	p<0.05	9.5
Hajek2014[181]	33	11	51.6	43.1	334.8	NA	NA	NA	23 BD I/10 BD II	1.5T	FSL	NA	p<0.05, TFCE	9.5
Haldane2008[182]	44	44	42.7	43.1	195.6	5.0	1.2	NA	BD I	1.5T	SPM99	5	P < 0.01	10
Ishida2017[183]	29	33	42.7	37.6	141.6	4.8	2.1	mania and depression	15 BD I/14 BD II	3.0T	SPM8	8	p<0.05, TFCE	9.5
Ji2018[184]	35	30	28.9	31.5	NA	NA	NA	NA	BD I	3.0 T	FSL	7	TFCE, P<0.05	8
Kandilarova2019[185]	11	42	43.6	42.6	185.5	NA	NA	NA	NA	3.0T	SPM12	8	FDR p<0.05	9.5
Knochel2014[186]	21	20	35.7	36.9	91.4	NA	NA	Euthymic	BD I	3.0T	SPM8	8	p<0.05, FDR	9
Kozicky2013[187]	41	30	22.8	22.9	NA	3.8	0.9	manic	BD I	3.0T	SPM8	8	p<0.05, FEW	9.5

Kozicky2016[188]	21	25	22.9	22	NA	10.2	4.4	10 Depressed, 4 Manic, 7 both	BD I	3.0T	SPM8	8	FWE p<0.01	9.5
Lee2017[189]	21	21	37.0	37	92.1	4.8	2.3	18 euthymic,3 mildly depressed	BD I	3.0T	SPM12	8	p<0.05, FWE	9.5
Li2011[190]	24	36	28.4	25.6	72.0	20.0	25.9	17 Manic/7 Depressed	BD I	3.0T	SPM2	8	p<0.05	9.5
Li2017[191]	13	20	31	28	108	24.8	NA	NA	NA	3.0 T	SPM8	8	FDR, P<0.05	8
Lochhead 2004[192]	31	11	38.2	24.3	NA	NA	NA	NA	17 BDI/14 BD II	1.5T	SPM99	12	p<0.001	9
Lyoo2004[193]	39	43	38.0	35.7	217.2	17.4	14.2	22 Depressive/ 17 Manic/Hypomanic/Mixed	BD I	1.5T	SPM99	8	p<0.05	9.5
Maggioni 2017[96]	176	383	44.7	30.4	NA	14.5	NA	22 Euthymic, 1 hypomanic,	54 BD I, 28 BD II	3.0T	SPM12	6	FWE p<0.05	9

								0 mixed, 49 depressed, 12 manic, 1 NA						
Matsubara2016[194]	10	27	46.9	48.3	74.1	21.3	0.0	depressive	7 BD I/3 BD II	1.5T	SPM8	NA	p<0.05, FEW	9.5
Minuzzi2018[195]	32	36	29.0	32.8	NA	5.7	1.5	NA	18 BD I 14 BD II	3.0T	SPM12	8	FDR p<0.05	10
Molina2011[103]	19	24	38.3	34.6	NA	NA	NA	Euthymic	BD I	1.5T	SPM8	8	P<0.001	9.5
Narita2011_rapidcycling[196]	14	84	40.2	41.1	103.2	NA	NA	2 euthymic, 2 elevated,10 depressed	BD II	1.5T	SPM5	12	p<0.05, FDR	9.5
Narita2011_norapidcycling[196]	17		41.4		74.4	NA	NA	6 Euthymic, 2 Elevated, 9 Depressed						
Nenadic2015[111]	17	34	37.7	34.3	118.8	2.7	2.7	NA	BD I	1.5T	SPM5	12	p<0.05, FDR	9.5
Nery2015[197]	25	27	35.7	31.2	163.2	2.9	1.2	NA	BD I	3.0T	SPM8	8	FWE p< 0.05	9.5
Neves2015[197]	21	21	39.0	37.9	139.2	2.0	3.0	NA	BD I	1.5T	SPM8	8	FWE p< 0.05	9.5
Nugent20	20	65	41.0	38	276.0	NA	NA	NA	BD I/BD	3.0T	SPM2	12	P<0.001	9.5

06_medicated[199]									II					
Nugent2006_unmedicated[199]	16		37.0		204.0	NA	NA	NA	NA					
Perico2011[200]	26	94	27.1	30.2	5.9	7.6	7.4	manic	BD I	1.5T	SPM2	8	p<0.05, FEW	10
Poletti2016[201]	206	136	46.2	33.3	185.5	19.6	NA	Manic/Depressive	NA	3.0T	SPM8	8	p<0.05, FEW	9.5
Redlich2014[202]	58	58	37.5	37.7	170.7	21.0	3.0	Manic/Depressive	BD I	3.0T	SPM8	8	P<0.001	10
Rossi2013[203]	14	40	43.0	40	204.0	18 .0	NA	euthymic	13 BD I/1 BD II	1.5T	SPM5	8	p<0.001	9.5
Sani2016[204]	78	78	44.6	44.4	207.4	11.0	5.1	41 Depressed, 29 Euthymia, 5 mania, 3 mixed	49 BD I, 29 BD II	3.0T	SPM8	8	FWE p<0.05	9.5
Saricicek2015[205]	28	29	36.3	33.6	127.2	1.3	0.6	NA	BD I	1.5 T	SPM8	12	FWE p< 0.05	9.5
Scherk2008[204]	35	32	43.3	33.7	172.6	NA	2.5	manic/depressive	NA	1.5 T	SPM2	8	P<0.05, unclear	9
Shepherd	30	34	39.1	32.6	NA	NA	6.7	NA	BD I	3.0T	SPM8	8	p<0.05,	9

2015[207]													FEW	
Song2015[208]	44	35	34.8	33.9	NA	NA	23.9	NA	NA	3.0T	SPM8	8	p<0.05, FWE	9
Song2019[209]	36	29	30.6	29.3	94.8	NA	NA	NA	BD I 32, BD II 4	3.0 T	SPM12	8	FDR, P<0.01	8.5
Stanfield2009[209]	66	66	36.4	39	184.8	1	3.0	NA	NA	1.5T	SPM99	12	Uncorrected p<0.05	9.5
Tang2014[211]	27	27	32.0	32.6	50.3	19.6	1.0	Depressed	BD I	3.0T	SPM8	8	p<0.05, FEW	9.5
Tost2010_BD[212]	42	42	42.4	42.2	190.8	NA	11.4	NA	BD I	1.5 T	SPM2	12	p<0.05, FEW	9.5
Yatham2007[213]	15	15	36.0	36	46.8	NA	27.0	manic	BD I	1.5 T	SPM99	8	P<0.002	9.5
Zou2014[214]	17	17	23.7	24.9	13.5	NA	NA	remission	NA	3.0 T	SPM8	NA	p<0.001, uncorrected	8
Cao2018[215]	22	25	26.3	27.1	NA	NA	NA	NA	BD I	3.0 T	SPM8	12	P<0.01 Uncorrected	9.5
Chang2017[216]	86	156	22.0	22.3	20.6	8.3	9.7	NA	NA	3.0 T	SPM8	8	P<0.05, FDR	9.5
Cui2010[217]	20	20	30.9	28.1	69.3	NA	26.0	Manic	NA	3.0 T	SPM2	8	P<0.001, Uncorrected	9.5
Fan2016_female[218]	26	26	26.1	24.4	NA	NA	NA	NA	BD II	3.0 T	SPM8	8	P<0.001, Uncorrected	9.5
Fan2016_	24	25	26.0	24										

male[218]														
Hu2016[219]	17	28	25.2	25	47.8	22.0	1.7	Depressed	NA	3.0 T	SPM8	8	P<0.001, Uncorrected	9.5
Li2014[220]	34	36	31.1	31.4	NA	9.9	9.2	13 Depressed,13 Euthymia, 8 Manic	NA	1.5 T	SPM8	8	P<0.05, FWE	10
Li2018[221]	30	31	36.3	33.6	NA	23.6	NA	Depressed	NA	3.0 T	SPM8	8	P<0.05, GRF	9
Qiu2018[222]	28	28	31.8	33.5	NA	31.0	NA	Depressed	NA	3.0 T	SPM8	8	P<0.01, FEW	9
Wang2019[223]	30	31	36.3	33.6	NA	NA	NA	NA	NA	3.0 T	SPM8	NA	P<0.05, FWE	8.5
Wang2013[224]	19	30	26.5	25.6	49.8	23.2	2.1	Depressed	5 BD II, 14 BD I	3.0 T	SPM8	8	P<0.005, Uncorrected	10
Zhang2018_SI[225]	28	46	27.2	25.5	NA	9.4	6.4	NA	NA	3.0 T	SPM8	8	P<0.001, GRF	9
Zhang2018_NSI[225]	40		27.7		NA	11.4	8.3							
Chen2020[226]	22	22	28.1	27.4	3.6	NA	5.4	Manic	BD I	3.0 T	SPM12	8	uncorrected P<0.001	9.5
Lee2020[227]	65	65	35.1	34.5	13.8	NA	NA	NA	BD I/BD II	3.0 T	SPM8	8	FWE corrected, P<0.0	8.5

													17	
Li2020[228]	44	36	23.1	22.8	33.8	2.9	3.8	4 depressive, 4 manic, 36 remission	BD I 40, BD II 4	3.0 T	SPM12	8	GRF, P<0.05	10
Sun2020[229]	30	31	36.3	33.6	NA	23.6	NA	Depressed	NA	3.0 T	SPM8	8	P<0.05, GRF	8.5
Vai2020[230]	74	74	47.3	36.3	208.2	23.7	NA	NA	NA	3.0 T	FSL5.0	8	p<0.001, uncorrected	8.5

Note: Unless otherwise indicated, data are means.

* Quality score out of 10.

Abbreviations: BD = bipolar disorder; HC = healthy control; VBM = voxel-based morphometry; NA = not available; FWHM = full width at half maximum; SPM = statistical parametric mapping; GRF = Gaussian random field; FWE = family wise error; FDR = false discovery rate; FSL = functional MRI of the brain's software library; HAMD = Hamilton depression rating scale; YMRS = Young mania rating scale score; TFCE = threshold-free cluster enhancement.

In summary, for the ReHo meta-analysis there were 479 chronic SZ and 562 first-episode SZ patients, 586 with medication and 493 without medication, the others were not applicable. For the BD patients, 170 were BD I and 262 were BD II, and 351 BD patients with depressed state, 58 with remission, 90 with manic state, and 349 with medication and 300 without medication, the others were not applicable; For the VBM meta-analysis, there were 2166 chronic SZ and 1949 first-episode SZ patients, 3690 with medication and 1036 without medication, the others were not applicable. For the BD patients, 1224 were BD I and 303 were BD II, and 318 BD patients with depressed state, 371 mixed, 301 with remission, 527 with manic state, and 1997 with medication and 107 without medication, the others were not applicable.

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Table S4 Meta-analyses results regarding ReHo difference between first episode SZ without medication and HCs.

Local Maximum				**Cluster**	
Region	**Peak MNI coordinate (x, y, z)**	**SDM-Z value**	***p* value**	**No. of voxels**	**Breakdown (No. of voxels)**
SZ > HCs					
Left striatum	-12, 6, -2	2.144	3.612e-5	1475	Left striatum (402) Left caudate nucleus (193) Left lenticular nucleus, putamen (70) Left olfactory cortex, BAs 25, 48 (42) Left gyrus rectus, BA 11 (14)
Right superior frontal gyrus, dorsolateral, BA 9	24, 40, 38	2.000	5.674e-5	1105	Left superior frontal gyrus, medial, BAs 8, 9, 10, 32 (459) Right superior frontal gyrus, dorsolateral (242) Right middle frontal gyrus, BAs 9, 46 (257) Right superior frontal gyrus, medial, BA 9 (79)

Right middle frontal gyrus, BA 10	36, 54, 12	1.683	3.044e-4	138	
Right inferior frontal gyrus, triangular part, BA 45	44, 30, 18	1.262	3.385e-3	56	
SZ < HCs					
Corpus callosum	46, -2, 34	-1.501	3.044e-4	710	Right precentral gyrus, BAs 4, 6, 44 (350) Right postcentral gyrus, BAs 3, 4, 43 (150) Right inferior frontal gyrus, opercular part, BA 44 (14)
Right cuneus cortex, BA 19	18, -80, 38	-1.531	2.116e-4	688	Right cuneus cortex, BAs 7, 18, 19 (356) Right precuneus, BAs 7 (59) Right superior occipital gyrus, BA 19 (55) Left cuneus cortex, BAs 18, 19 (50)
Left thalamus	-6, -20, 4	-1.409	7.173e-4	281	

Abbreviations: ReHo, regional homogeneity; HCs, healthy controls; SZ, schizophrenia; MNI, Montreal Neurological Institute; SDM, signed differential mapping; BA, Brodmann area.

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Table S5 Meta-analyses results regarding ReHo difference between depressed BD and HCs.

Local Maximum				**Cluster**	
Region	**Peak MNI coordinate (x, y, z)**	**SDM-Z value**	***p* value**	**No. of voxels**	**Breakdown (No. of voxels)**
BD > HCs					
Left anterior cingulate / paracingulate gyri, BA 10	-4, 46, 6	1.808	4.335e-4	917	Bilateral anterior cingulate / paracingulate gyri, BAs 10,11,24,25,32 (421) Bilateral superior frontal gyrus, medial, BAs 10, 11 (343) Bilateral gyrus rectus, BA 11 (94)
Right precentral gyrus, BA 6	28, -16, 68	1.722	9.031e-4	249	
Left inferior frontal gyrus, orbital part, BA 47	-36, 40, -10	1.465	3.483e-3	47	
BD < HCs					
Left superior temporal gyrus, BA 48	-56, -12,10	-2.044	4.131e--5	2709	Left insula, BA 48 (539) Left superior temporal gyrus, BAs 22, 41,32,48 (651) Left postcentral gyrus, BA 48 (62) Left supramarginal gyrus, BAs 42,

					48 (48) Left striatum (24) Left lenticular nucleus, putamen (21)
Left cuneus cortex, BA 18	-10, -98, 22	-1.412	1.754e-3	70	

Abbreviations: ReHo, regional homogeneity; HCs, healthy controls; BD, bipolar disorder; MNI, Montreal Neurological Institute; SDM, signed differential mapping; BA, Brodmann area.

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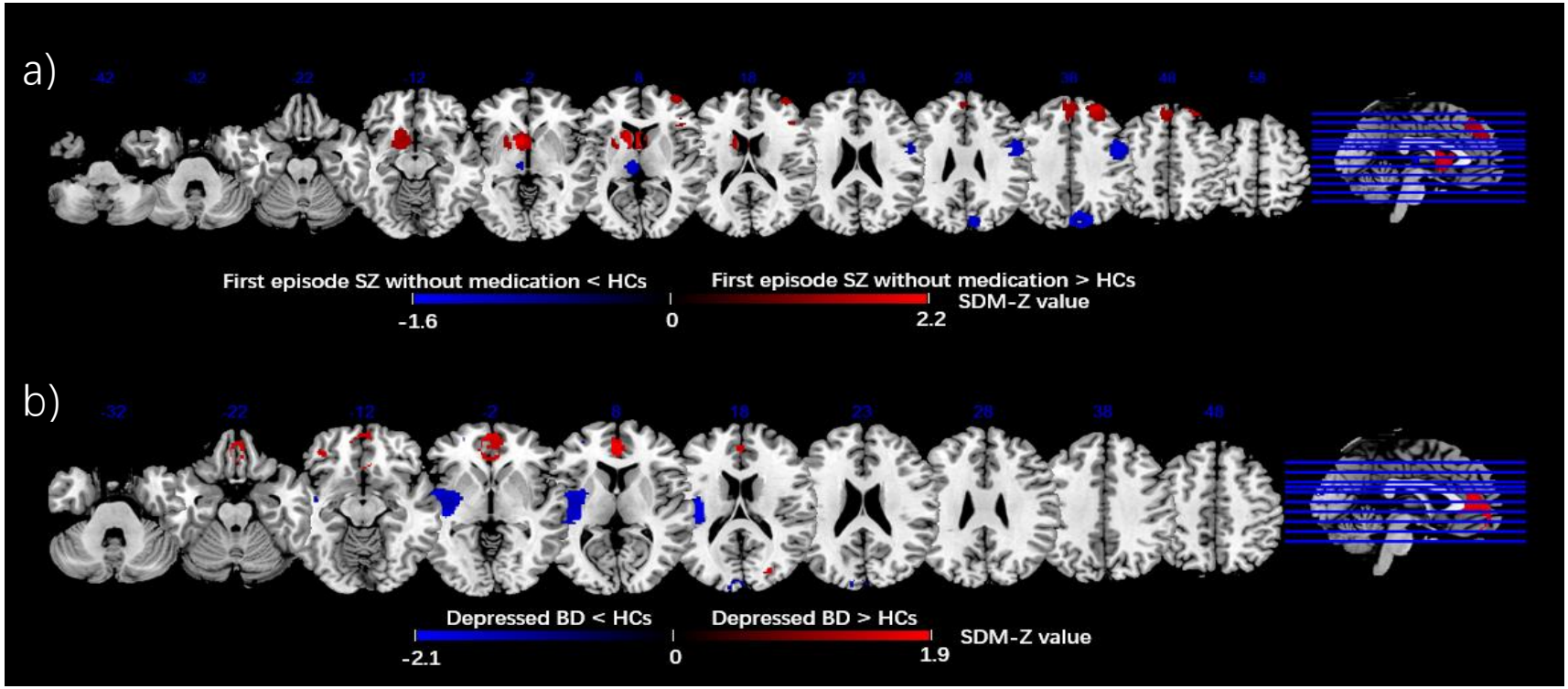

Figure S1 a) meta-analyses results regarding ReHo difference between first episode SZ without medication and HCs; b) between depressed BD and HCs. Areas with decreased ReHo value are displayed in blue, and areas with increased ReHo value are displayed in red. The color bar indicates the maximum and minimum SDM-Z values. Abbreviations: ReHo, regional homogeneity; HCs, healthy controls; SZ,

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schizophrenia; BD, bipolar disorder; SDM, Seed-based *d* Mapping.

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Table S6 Meta-analyses results regarding VBM difference between first episode SZ without medication and HCs.

Local Maximum				**Cluster**	
Region	**Peak MNI coordinate (x, y, z)**	**SDM-Z value**	***p* value**	**No. of voxels**	**Breakdown (No. of voxels)**
SZ < HCs					
Right insula, BA 48	48, -2, -6	-3.733	<e-10	4461	Right insula (689) Right superior temporal gyrus, BAs 21, 22, 38, 42, 48 (1089) Right middle temporal gyrus, BAs 20, 21, 22 (378) Right lenticular nucleus, putamen, BA 48 (206) Right heschl gyrus, BA 48 (156) Right temporal pole, superior temporal gyrus (158) Right supramarginal gyrus, BA 48 (41) Right striatum (35) Right inferior frontal gyrus, opercular part, BA 48 (16)

					Right temporal pole, middle temporal gyrus, BA 21 (15)
Left insula	-44, -10, 0	-2.987	<e-10	3129	Left insula, BA 48 (524) Left superior temporal gyrus, BAs 21, 22, 38, 41, 42, 48 (798) Left temporal pole, superior temporal gyrus, BAs 21, 38, 48 (368) Left heschl gyrus, BA 48 (167) Left middle temporal gyrus, BAs 21, 22 (170) Left lenticular nucleus, putamen, BA 48 (26)
Right median cingulate / paracingulate gyri, BA 24	2, 16, 34	-2,221	7.638e-4	256	Right median cingulate / paracingulate gyri, BA 24 (67) Left median cingulate / paracingulate gyri, BA 24 (63) Left anterior cingulate / paracingulate gyri (39) Right anterior cingulate / paracingulate gyri, BA 24 (13)

Abbreviations: VBM, voxel-based morphometry; HCs, healthy controls; SZ, schizophrenia; MNI, Montreal Neurological Institute; SDM, signed differential mapping; BA, Brodmann area.

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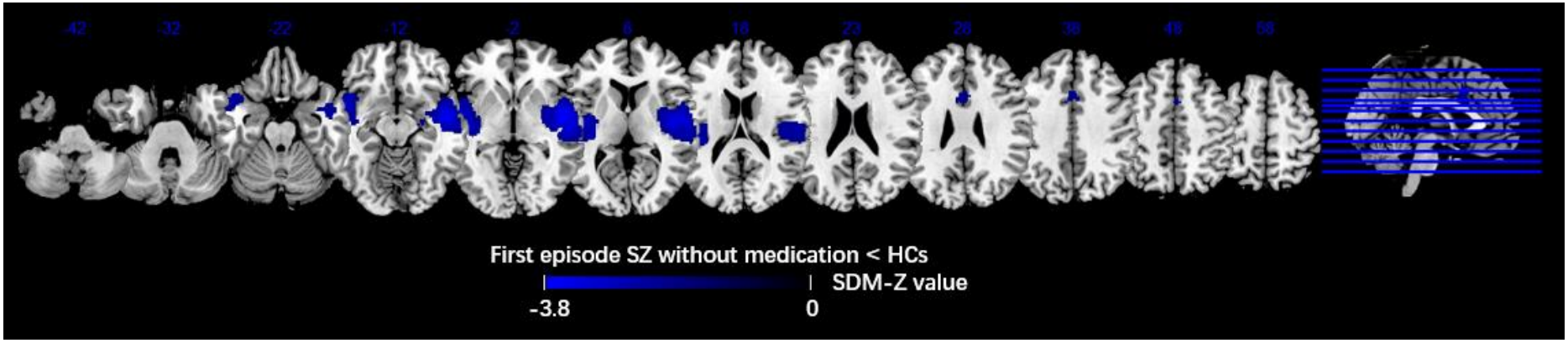

Figure S2 Meta-analyses results regarding VBM difference between first episode SZ without medication and HCs. Areas with decreased VBM value are displayed in blue. The color bar indicates the maximum and minimum SDM-Z values. Abbreviations: VBM, voxel-based morphometry; HCs, healthy controls; SZ, schizophrenia; SDM, signed differential mapping.

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Meta-regression analyses for VBM

As for VBM, in patients with SZ, meta-regression analysis indicated that longer illness duration was correlated with greater GMV decrease in the bilateral IFG and right SFG, higher PANSS total score was correlated with greater GMV decrease in the left IFG. In the patients with BD, meta-regression analysis indicated that higher HAMD score was correlated greater GMV decrease in the bilateral STG, and higher YMRS score was correlated with greater GMV decrease in the right MTG, right middle frontal gyrus, and right caudate nucleus (Table S6).

Table S7 Results of meta-regression analyses for VBM for SZ and BD.

Group	Region	Peak MNI coordinate (x, y, z)	No. of voxels	SDM-Z value	*p* value
SZ	***Effect of illness duration***				
	Abnormal activities in studies with longer illness duration				
	Left superior temporal gyrus, BA 42	-58, -28, 18	167	1.406	9.805e-5
	Right superior temporal gyrus	54, -30, 18	34	1.238	2.529e-4
	Left inferior frontal gyrus, orbital part, BA 38	-40, 26, -14	1972	-4.220	<e-10
	Right inferior frontal gyrus, opercular part, BA 48	52, 18, 6	209	-2.955	3.099e-5
	Right superior frontal gyrus, medial, BA 9	4, 46, 30	182	-2.716	1.032e-4
	Effect of PANSS total score				
	Abnormal activities in studies with higher PANSS total score				
	Left inferior frontal gyrus, triangular part, BA 47	-42, 22, 2	1207	4.222	<e-10

		42, 12, 0	247	-2.336	5.674e-5
BD	***Effect of illness duration***				
	Abnormal activities in studies with longer illness duration				
	Left insula, BA 48	-40, 0, 12	30	3.065	1.599e-4
	Effect of HAMD score				
	Abnormal activities in studies with higher HAMD score				
	Right cerebellum, crus I, BA 18	20, -90, -20	131	1.942	5.162e-5
	Left inferior frontal gyrus, orbital part, BA 47	-38, 30, -14	24	1.612	2.580e-4
	Right temporal pole, superior temporal gyurs, BA 38	44, 8, -14	708	-3.041	2.062e-5
	Left temporal pole, superior temporal gyurs, BA 48	-48, 8, -6	110	-2.450	1.342e-4
	Effect of YMRS score				
	Abnormal activities in studies with higher YMRS score				
	Right lenticular nucleus, putamen, BA 48	32, -8, 8	533	2.305	4.131e-5
	Right middle frontal gyrus, BA 45	60, -50, 14	409	-3.113	1.031e-5
	Right middle temporal gyrus, BA 45	42, 44, 14	76	-2.821	1.084e-4
	Right caudate nucleus	12, 18, 6	11	-2.458	4.335e-4

Abbreviations: SZ, schizophrenia; BD, bipolar disorder; HAMD, Hamilton Depression Scale; HAMD, Hamilton Depression Scale; YMRS, Young mania rating scale score; PANSS, Positive and Negative Syndrome Scale; BA, Brodmann area; MNI, Montreal Neurological Institute; SDM, Seed-based *d* Mapping.

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Table S8 Meta-analyses results regarding VBM difference between BD and HCs, between SZ and HCs, and between first episode SZ without medication and HCs, respectively, based on SDM-PSI (FWER < 0.05). Abbreviations: VBM, voxel-based morphometry; HCs, healthy controls; SZ, schizophrenia; BD, bipolar disorder; SDM-PSI, signed differential mapping via permutation subject images.

Local Maximum				**Cluster**	
Region	**Peak MNI coordinate (x, y, z)**	**SDM-Z value**	***p* value**	**No. of voxels**	**Breakdown (No. of voxels)**
BD vs. HCs					
BD < HCs					
Right insula	44, 16, -4	-5.210	7.000e-3	446	Right insula, BAs 38, 47, 48 (198) Right temporal pole, superior temporal gyrus, BAs 21, 38 (90) Right inferior frontal gyrus, orbital part, BA 38 (23) Right rolandic operculum, BA 48 (12)
SZ vs. HCs					
SZ < HCs					
Right superior temporal gyrus, BA 48	56, -6, -6	-9.445	9.999e-4	11559	BAs 38, 47, 48 (1408)

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Right middle temporal gyrus, BAs 20, 21, 22, 42 (1091)
Right superior temporal gyrus, BAs 21, 22, 38, 41, 42, 48 (1500)
Right temporal pole, superior temporal gyrus, BAs 20, 21, 34, 38, 48 (674)
Right precentral gyrus, BAs 4, 6 (522)
Right lenticular nucleus, putamen, BA 48 (386)
Right inferior frontal gyrus, opercular part, BAs 6, 38, 44, 45, 48 (479)
Right supramarginal gyrus, BAs 42, 43, 48 (238)
Right postcentral gyrus, BAs 3, 4, 43, 48 (560)
Right heschl gyrus, BA 48 (172)
Right inferior frontal gyrus, triangular part, BAs 45, 47, 48 (218)
Right inferior frontal part, orbital part, BAs 38, 41 (273)
Right parahippocampal gyrus, BAs

					35, 36 (83) Right striatum (58) Right fusiform gyrus, BA 36 (14)
Left superior temporal gyrus	-48, -6, -2	-11.115	9.999e-4	6935	Left insula, BAs 38, 47, 48 (1008) Left superior temporal gyrus, BAs 21, 22, 38, 41, 42, 48 (1219) Left temporal pole, superior temporal gyrus, BAs 21, 24, 28, 38, 48 (662) Left inferior frontal gyrus, triangular part, BAs 45, 47, 48 (429) Left middle temporal gyrus, BAs 21, 22, 42 (416) Left inferior frontal gyrus, orbital part, BAs 38, 47 (362) Left inferior frontal gyrus, opercular part, BAs 6, 44, 48 (319) Left heschl gyrus, BA 48 (160) Left parahippocampal gyurs, BAs 28, 35, 36 (238) Left supramarginal gyrus, BAs 42, 48 (93) Left amygdala, BAs 28, 34, 36 (124)

					Left hippocampus, BAs 28, 35 (37)
Left anterior cingulate / paracingulate gyri, BA 32	0, 36, 26	-8.009	9.999e-4	4860	Left superior frontal gyrus, medial, BAs 8, 9, 10, 32 (1052) Left anterior cingulate / paracingulate gyri, BAs 10, 11, 24, 25, 32 (922) Right superior frontal gyrus, medial, BAs 8, 9, 10, 32 (522) Right anterior cingulate / paracingulate gyri, BAs 10, 11, 24, 32 (567) Right superior frontal gyrus, medial orbital, BAs 10, 11 (436) Left superior frontal gyrus, medial orbital, BAs 10, 11 (376) Left gyrus rectus, BA 11 (165) Right gyrus rectus, BA 11 (120) Right median cingulate / paracingulate gyri, BA 24, 32 (145) Left median cingulate / paracingualte gyri, BA 24 (93)
Right median cingulate / paracingulate gyri	6, -32, 46	-5.326	4.999e-3	851	Left median cingulate / paracingulate gyri, BA 23 (389) Right median cingulate /

					paracingualte gyri, BA 23 (322) Left supplementary motor area (12) Left posterior cingulate gyrus, BA 23 (10)
First episode SZ without medication vs. HCs					
First episode SZ without medication < HCs					
Right superior temporal gyrus, BA 48	58, -8, 2	-4.902	9.999e-4	684	Right insula, BA 48 (131) Right superior temporal gyrus, BAs 21, 22, 48 (189) Right heschl gyrus, BA 48 (59) Right lenticular nucleus, putamen, BA 48 (19) Right middle temporal gyrus, BA 21 (18)

Abbreviations: VBM, voxel-based morphometry; HCs, healthy controls; SZ, schizophrenia; BD, bipolar disorder; MNI, Montreal Neurological Institute; SDM, Seed-based *d* Mapping; BA, Brodmann area.

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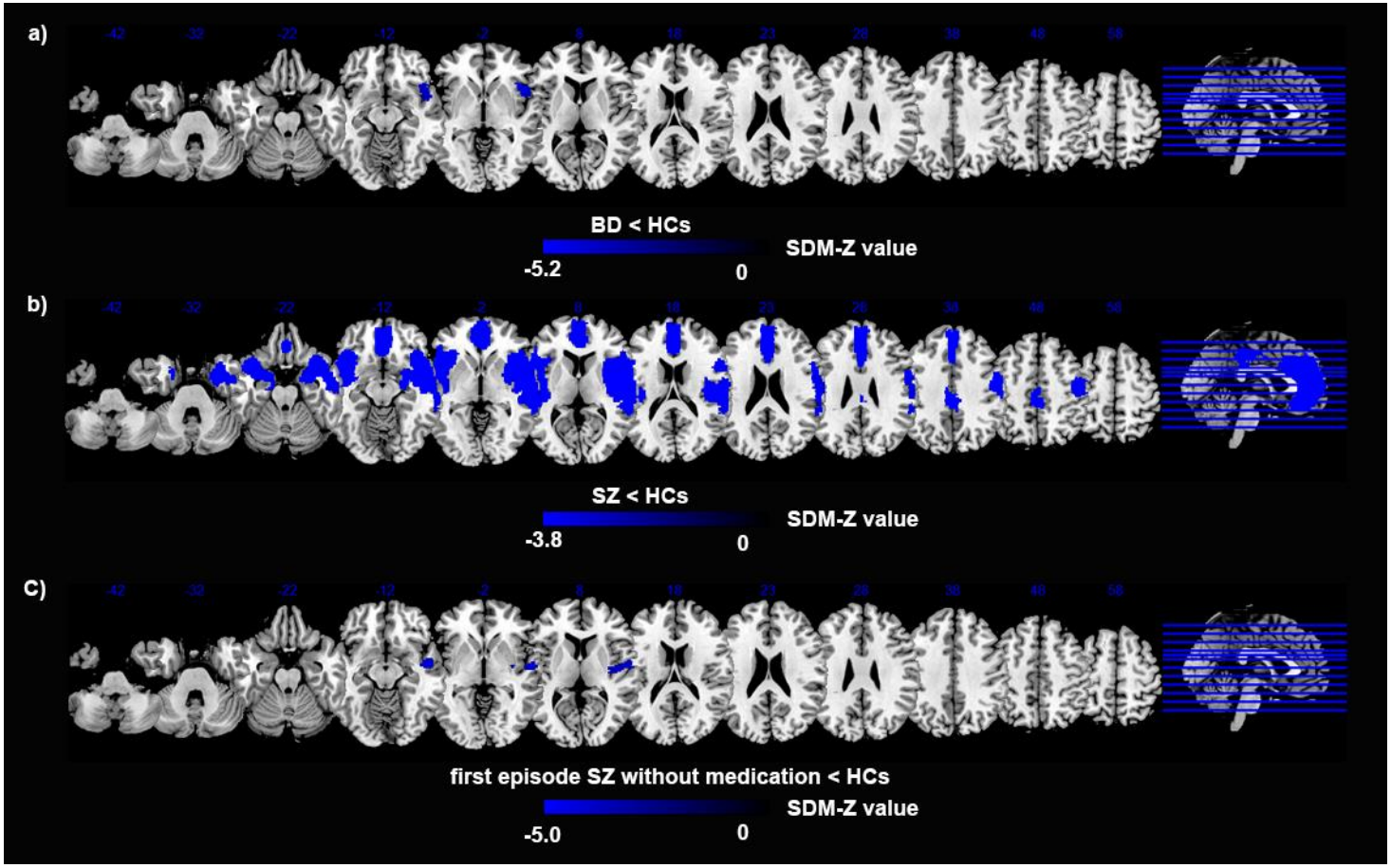

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Figure S3 Meta-analyses results regarding VBM difference a) between BD and HCs, b) between SZ and HCs, c) between first episode SZ without medication and HCs, respectively, based on SDM-PSI (FWER < 0.05). Abbreviations: VBM, voxel-based morphometry; HCs, healthy controls; SZ, schizophrenia; BD, bipolar disorder; SDM-PSI, signed differential mapping via permutation subject images.

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References:

1. Yao X. *Study of Bipolar Disorder and Major Depressive Disorder during Depressive State on Resting-state Functional Magnetic Resonance Imaging and Correlation with Brain-Derived Neurotrophic Factor*; 2018.

2. Yao X, Yin Z, Liu F, et al. Shared and distinct regional homogeneity changes in bipolar and unipolar depression. *Neurosci Lett*. 2018;673:28-32.

3. Zhang H. *Abnormal Functional Activities in Brains of Early Bipolar Ⅱ Disorder: A Resting-State fMRI Study*; 2018.

4. Qiu S, Chen F, Chen G, et al. Abnormal resting-state regional homogeneity in unmedicated bipolar II disorder. *J Affect Disord*. 2019;256:604-10.

5. Xue F. *Resting State Functional Magnetic Resonance Imaging Study in Bipolar Mania Based on ReHo and ALFF*; 2019.

6. Jiang X, Fu S, Yin Z, et al. Common and distinct neural activities in frontoparietal network in first-episode bipolar disorder and major depressive disorder: Preliminary findings from a follow-up resting state fMRI study. *J Affect Disord*. 2020;260:653-9.

7. Li H, Cui L, Cao L, et al. Identification of bipolar disorder using a combination of multimodality magnetic resonance imaging and machine learning techniques. *BMC Psychiatry*. 2020;20:488.

8. Liu P, Li Q, Zhang A, et al. Similar and Different Regional Homogeneity Changes Between Bipolar Disorder and Unipolar Depression: A Resting-State fMRI Study. *Neuropsychiatr Dis Treat*. 2020;16:1087-93.

9. Shan X, Qiu Y, Pan P, et al. Disrupted Regional Homogeneity in Drug-Naive Patients with Bipolar Disorder. *Front Psychiatry*. 2020;11:825.

10. Liu H, Liu Z, Liang M, et al. Decreased regional homogeneity in schizophrenia: a resting state functional magnetic resonance imaging study. *Neuroreport*. 2006;17:19-22.

11. Wang J. *The analysis of clinical characters and MRI study on brain functional and structural changes in patients with treatment-resistant schizophrenia and their relatives*; 2009.

12. Fang L, Cao D, Xie S, et al. Resting-state functional magnetic resonance imaging study of regional homogeneity in first-episode, antipsychotic-naive patients with schizophrenia (In Chinese). *Chin J Nerv Ment Dis*. 2013;39:29-33.

13. Liang J, Xie S, Du J, Yan W. Regional homogeneity of functional magnetic resonance imaging in male schizophrenia patients with delusion symptoms (In Chinese). *J Clin Psychiatry*. 2013;23:379-82.

14. Yu R, Hsieh MH, Wang HL, et al. Frequency dependent alterations in regional homogeneity of baseline brain activity in schizophrenia. *PLOS ONE*. 2013;8:e57516.

15. Gao B, Wang Y, Liu W, et al. Spontaneous Activity Associated with Delusions of Schizophrenia in the Left Medial Superior Frontal Gyrus: A Resting-State fMRI Study. *PLoS One*. 2015;10:e133766.

16. Xu X, Shi X, Peng Z, et al. A study of resting-state functional magnetic resonance imaging in treatment-refractory schizophrenia patients using regional homogeneity (In Chinese). *J Clin Psychiatry*. 2015;25:377-80.

17. Bai Y, Wang W, Xu J, et al. Altered resting-state regional homogeneity after 13 weeks of paliperidone injection treatment in schizophrenia patients. *Psychiatry Res Neuroimaging*. 2016;258:37-43.

18. Cui LB, Liu K, Li C, et al. Putamen-related regional and network functional deficits in first-episode schizophrenia with auditory verbal hallucinations. *Schizophr Res*. 2016;173:13-22.

19. Hu ML, Zong XF, Zheng JJ, et al. Short-term Effects of Risperidone Monotherapy on Spontaneous Brain Activity in First-episode Treatment-naive Schizophrenia Patients: A Longitudinal fMRI Study. *Sci Rep*. 2016;6:34287.

20. Liu C, Xue Z, Palaniyappan L, et al. Abnormally increased and incoherent resting-state activity is shared between patients with schizophrenia and their unaffected siblings. *Schizophr Res*. 2016;171:158-65.

21. Liu L, Gao Y, Xie S, Wang R. Resting state functional magnetic resonance imaging study with regional homogeneity in first-episode schizophrenic patients (In Chinese). *Radiol Practice*. 2017;32:691-5.

22. Zhang X, Li J, Liao J, et al. Abnormal gray matter volume and regional homogeneity of resting fMRI in patients with schizophrenia and obsessive-compulsive disorder (In Chinese). *Chinese Mental Health Journal*. 2017;31:768-74.

23. Deng X. *Comparative Study of Regional Homogeneity in First-Episode Schizophrenia and Individuals with a Genetic High Risk of Schizophrenia: A Resting-State Functional Magnetic Resonance*; 2018.

24. Gao S, Lu S, Shi X, et al. Distinguishing Between Treatment-Resistant and Non-Treatment-Resistant Schizophrenia Using Regional Homogeneity. *Front Psychiatry*. 2018;9:282.

25. Wu F, Zhang Y, Yang Y, et al. Structural and functional brain abnormalities in drug-naive, first-episode, and chronic patients with schizophrenia: a multimodal MRI study. *Neuropsychiatr Dis Treat*. 2018;14:2889-904.

26. Wei Y, Chang M, Womer FY, et al. Local functional connectivity alterations in schizophrenia, bipolar disorder, and major depressive disorder. *J Affect Disord*. 2018;236:266-73.

27. Zhang S, Hu Q, Tang T, et al. Changes in Gray Matter Density, Regional Homogeneity, and Functional Connectivity in Methamphetamine-Associated Psychosis: A Resting-State Functional Magnetic Resonance Imaging (fMRI) Study. *Med Sci Monit*. 2018;24:4020-30.

28. Zhang R, Yan W, Lv L, Lu S, Xie S. Regional homogeneity and cognitive function in first-episode patients with schizophrenia. *J Clin Psychiatry*. 2018;28:222-5.

29. Zhao C, Zhu J, Liu X, et al. Structural and functional brain abnormalities in schizophrenia: A cross-sectional study at different stages of the disease. *Prog Neuropsychopharmacol Biol Psychiatry*. 2018;83:27-32.

30. Dong D, Duan M, Wang Y, et al. Reconfiguration of Dynamic Functional Connectivity in Sensory and Perceptual System in

Schizophrenia. *Cereb Cortex*. 2019;29:3577-89.

31. Zhao X, Yao J, Lv Y, et al. Abnormalities of regional homogeneity and its correlation with clinical symptoms in Naive patients with first-episode schizophrenia. *Brain Imaging Behav*. 2019;13:503-13.

32. Gao S, Ming Y, Wang J, et al. Enhanced Prefrontal Regional Homogeneity and Its Correlations with Cognitive Dysfunction/Psychopathology in Patients With First-Diagnosed and Drug-Naive Schizophrenia. *Front Psychiatry*. 2020;11:580570.

33. Shan X, Liao R, Ou Y, et al. Increased regional homogeneity modulated by metacognitive training predicts therapeutic efficacy in patients with schizophrenia. *Eur Arch Psychiatry Clin Neurosci*. 2020.

34. Yan W, Zhang R, Zhou M, et al. Relationships between abnormal neural activities and cognitive impairments in patients with drug-naive first-episode schizophrenia. *BMC Psychiatry*. 2020;20:283.

35. Gou N, Liu Z, Palaniyappan L, et al. Effects of DISC1 Polymorphisms on Resting-State Spontaneous Neuronal Activity in the Early-Stage of Schizophrenia. *Front Psychiatry*. 2018;9:137.

36. Liu CH, Ma X, Li F, et al. Regional homogeneity within the default mode network in bipolar depression: a resting-state functional

magnetic resonance imaging study. *PLoS One*. 2012;7:e48181.

37. Liang MJ, Zhou Q, Yang KR, et al. Identify changes of brain regional homogeneity in bipolar disorder and unipolar depression using resting-state FMRI. *PLoS One*. 2013;8:e79999.

38. Liu CH, Ma X, Wu X, et al. Regional homogeneity of resting-state brain abnormalities in bipolar and unipolar depression. *Prog Neuropsychopharmacol Biol Psychiatry*. 2013;41:52-9.

39. Wang S. *A resting--state functional magnetic resonance imaging study in B ipolar Disorder subjects*; 2014.

40. Jiang X, Zhou Q, Tang Y, Wang F. Altered Regional Homogeneity in Bipolar Depression：A Resting-state Functional Magnetic Resonance Imaging Study (In Chinese). *Journal of China Medical University*. 2016;45:305-8.

41. Fu S. *Comparative StudyofRegional Homogeneity ofFirst-episode Bipolar Disorder Depression and First-episode Major Depressive Disorder：A Resting-State Functional Magnetic Resonance Imaging Study*; 2017.

42. He X. *A resting-state fMRI study of bipolar disorder with onset of major depressive episode*; 2017.

43. Li G, Liu P, Andari E, Zhang A, Zhang K. The Role of Amygdala in Patients with Euthymic Bipolar Disorder During Resting State.

Front Psychiatry. 2018;9:445.

44. Sun X. *Comparative Study of Regional Homogeneity between Bipolar Disorder Patients in Depressive State and Manic State: A Resting-State Functional Magnetic Resonance Imaging Study*; 2018.

45. Amann BL, Canales-Rodriguez EJ, Madre M, et al. Brain structural changes in schizoaffective disorder compared to schizophrenia and bipolar disorder. *Acta Psychiatr Scand*. 2016;133:23-33.

46. Ananth H, Popescu I, Critchley HD, et al. Cortical and subcortical gray matter abnormalities in schizophrenia determined through structural magnetic resonance imaging with optimized volumetric voxel-based morphometry. *Am J Psychiatry*. 2002;159:1497-505.

47. Antonova E, Kumari V, Morris R, et al. The relationship of structural alterations to cognitive deficits in schizophrenia: a voxel-based morphometry study. *Biol Psychiatry*. 2005;58:457-67.

48. Asami T, Bouix S, Whitford TJ, et al. Longitudinal loss of gray matter volume in patients with first-episode schizophrenia: DARTEL automated analysis and ROI validation. *Neuroimage*. 2012;59:986-96.

49. Asami T, Whitford TJ, Bouix S, et al. Globally and locally reduced MRI gray matter volumes in neuroleptic-naive men with schizotypal

personality disorder: association with negative symptoms. *JAMA Psychiat.* 2013;70:361-72.

50. Bassitt DP, Neto MR, de Castro CC, Busatto GF. Insight and regional brain volumes in schizophrenia. *Eur Arch Psychiatry Clin Neurosci*. 2007;257:58-62.

51. Benoit A, Bodnar M, Malla AK, Joober R, Lepage M. The structural neural substrates of persistent negative symptoms in first-episode of non-affective psychosis: a voxel-based morphometry study. *Front Psychiatry*. 2012;3:42.

52. Bonilha L, Molnar C, Horner MD, et al. Neurocognitive deficits and prefrontal cortical atrophy in patients with schizophrenia. *Schizophr Res*. 2008;101:142-51.

53. Borgwardt SJ, Picchioni MM, Ettinger U, et al. Regional gray matter volume in monozygotic twins concordant and discordant for schizophrenia. *Biol Psychiatry*. 2010;67:956-64.

54. Brown GG, Lee JS, Strigo IA, et al. Voxel-based morphometry of patients with schizophrenia or bipolar I disorder: a matched control study. *Psychiatry Res*. 2011;194:149-56.

55. Cascella NG, Fieldstone SC, Rao VA, et al. Gray-matter abnormalities in deficit schizophrenia. *Schizophr Res*. 2010;120:63-70.

56. Chang M, Womer FY, Bai C, et al. Voxel-Based Morphometry in Individuals at Genetic High Risk for Schizophrenia and Patients with Schizophrenia during Their First Episode of Psychosis. *PLoS One*. 2016;11:e163749.

57. Chang WH, Chen KC, Tseng HH, et al. Bridging the associations between dopamine, brain volumetric variation and IQ in drug-naive schizophrenia. *Schizophr Res*. 2020;220:248-53.

58. Chua SE, Cheung C, Cheung V, et al. Cerebral grey, white matter and csf in never-medicated, first-episode schizophrenia. *Schizophr Res*. 2007;89:12-21.

59. Cooke MA, Fannon D, Kuipers E, et al. Neurological basis of poor insight in psychosis: a voxel-based MRI study. *Schizophr Res*. 2008;103:40-51.

60. Corradi-Dell'Acqua C, Tomelleri L, Bellani M, et al. Thalamic-insular dysconnectivity in schizophrenia: evidence from structural equation modeling. *Hum Brain Mapp*. 2012;33:740-52.

61. Cui L, Li M, Deng W, et al. Overlapping clusters of gray matter deficits in paranoid schizophrenia and psychotic bipolar mania with family history. *Neurosci Lett*. 2011;489:94-8.

62. de Castro-Manglano P, Mechelli A, Soutullo C, et al. Structural brain abnormalities in first-episode psychosis: differences between affective psychoses and schizophrenia and relationship to clinical outcome. *Bipolar Disord*. 2011;13:545-55.

63. Delvecchio G, Lorandi A, Perlini C, et al. Brain anatomy of symptom stratification in schizophrenia: a voxel-based morphometry study. *Nord J Psychiatry*. 2017;71:348-54.

64. DeRamus TP, Silva RF, Iraji A, et al. Covarying structural alterations in laterality of the temporal lobe in schizophrenia: A case for source-based laterality. *NMR Biomed*. 2020;33:e4294.

65. Douaud G, Smith S, Jenkinson M, et al. Anatomically related grey and white matter abnormalities in adolescent-onset schizophrenia. *Brain*. 2007;130:2375-86.

66. Egashira K, Matsuo K, Mihara T, et al. Different and shared brain volume abnormalities in late- and early-onset schizophrenia. *Neuropsychobiology*. 2014;70:142-51.

67. Euler M, Thoma RJ, Gangestad SW, Canive JM, Yeo RA. The impact of developmental instability on Voxel-Based Morphometry analyses of neuroanatomical abnormalities in schizophrenia. *Schizophr Res*. 2009;115:1-7.

68. Filippi M, Canu E, Gasparotti R, et al. Patterns of brain structural changes in first-contact, antipsychotic drug-naive patients with schizophrenia. *AJNR Am J Neuroradiol*. 2014;35:30-7.

69. Fukuta H, Ito I, Tateno A, et al. Effects of menopause on brain structural changes in schizophrenia. *Psychiatry Clin Neurosci*. 2013;67:3-11.

70. Gong Q, Dazzan P, Scarpazza C, et al. A Neuroanatomical Signature for Schizophrenia Across Different Ethnic Groups. *Schizophr Bull*. 2015;41:1266-75.

71. Guo Q, Tang Y, Li H, et al. Both volumetry and functional connectivity of Heschl's gyrus are associated with auditory P300 in first episode schizophrenia. *Schizophr Res*. 2014;160:57-66.

72. Guo W, Hu M, Fan X, et al. Decreased gray matter volume in the left middle temporal gyrus as a candidate biomarker for schizophrenia: a study of drug naive, first-episode schizophrenia patients and unaffected siblings. *Schizophr Res*. 2014;159:43-50.

73. Guo X, Li J, Wang J, et al. Hippocampal and orbital inferior frontal gray matter volume abnormalities and cognitive deficit in treatment-naive, first-episode patients with schizophrenia. *Schizophr Res*. 2014;152:339-43.

74. Guo W, Liu F, Liu J, et al. Abnormal causal connectivity by structural deficits in first-episode, drug-naive schizophrenia at rest. *Schizophr Bull*. 2015;41:57-65.

75. Guo F, Zhu YQ, Li C, et al. Gray matter volume changes following antipsychotic therapy in first-episode schizophrenia patients: A longitudinal voxel-based morphometric study. *J Psychiatr Res*. 2019;116:126-32.

76. Henze R, Brunner R, Thiemann U, et al. Gray matter alterations in first-admission adolescents with schizophrenia. *J Neuroimaging*. 2011;21:241-6.

77. Herold R, Feldmann A, Simon M, et al. Regional gray matter reduction and theory of mind deficit in the early phase of schizophrenia: a voxel-based morphometric study. *Acta Psychiatr Scand*. 2009;119:199-208.

78. Hirao K, Miyata J, Fujiwara H, et al. Theory of mind and frontal lobe pathology in schizophrenia: a voxel-based morphometry study. *Schizophr Res*. 2008;105:165-74.

79. Honea RA, Meyer-Lindenberg A, Hobbs KB, et al. Is gray matter volume an intermediate phenotype for schizophrenia? A voxel-based morphometry study of patients with schizophrenia and their healthy siblings. *Biol Psychiatry*. 2008;63:465-74.

80. Hooker CI, Bruce L, Lincoln SH, Fisher M, Vinogradov S. Theory of mind skills are related to gray matter volume in the ventromedial prefrontal cortex in schizophrenia. *Biol Psychiatry*. 2011;70:1169-78.

81. Hu M, Li J, Eyler L, et al. Decreased left middle temporal gyrus volume in antipsychotic drug-naive, first-episode schizophrenia patients and their healthy unaffected siblings. *Schizophr Res*. 2013;144:37-42.

82. Huang P, Xi Y, Lu ZL, et al. Decreased bilateral thalamic gray matter volume in first-episode schizophrenia with prominent hallucinatory symptoms: A volumetric MRI study. *Sci Rep*. 2015;5:14505.

83. Hyza M, Huttlova J, Kerkovsky M, Kasparek T. Psychosis effect on hippocampal reduction in schizophrenia. *Prog Neuropsychopharmacol Biol Psychiatry*. 2014;48:186-92.

84. Jayakumar PN, Venkatasubramanian G, Gangadhar BN, Janakiramaiah N, Keshavan MS. Optimized voxel-based morphometry of gray matter volume in first-episode, antipsychotic-naive schizophrenia. *Prog Neuropsychopharmacol Biol Psychiatry*. 2005;29:587-91.

85. Job DE, Whalley HC, McConnell S, et al. Structural gray matter differences between first-episode schizophrenics and normal controls using voxel-based morphometry. *Neuroimage*. 2002;17:880-9.

86. Kawada R, Yoshizumi M, Hirao K, et al. Brain volume and dysexecutive behavior in schizophrenia. *Prog Neuropsychopharmacol Biol Psychiatry*. 2009;33:1255-60.

87. Kim GW, Kim YH, Jeong GW. Whole brain volume changes and its correlation with clinical symptom severity in patients with schizophrenia: A DARTEL-based VBM study. *PLoS One*. 2017;12:e177251.

88. Koelkebeck K, Hirao K, Miyata J, et al. Impact of gray matter reductions on theory of mind abilities in patients with schizophrenia. *Soc Neurosci*. 2013;8:631-9.

89. Kuhn S, Romanowski A, Schubert F, Gallinat J. Reduction of cerebellar grey matter in Crus I and II in schizophrenia. *Brain Struct Funct*. 2012;217:523-9.

90. Lee DK, Lee H, Park K, et al. Common gray and white matter abnormalities in schizophrenia and bipolar disorder. *PLoS One*. 2020;15:e232826.

91. Lei W, Deng W, Li M, et al. Gray matter volume alterations in first-episode drug-naive patients with deficit and nondeficit schizophrenia. *Psychiatry Res*. 2015;234:219-26.

92. Li C, Liu W, Guo F, et al. Voxel-based morphometry results in first-episode schizophrenia: a comparison of publicly available software packages. *Brain Imaging Behav*. 2019.

93. Liao J, Yan H, Liu Q, et al. Reduced paralimbic system gray matter volume in schizophrenia: Correlations with clinical variables, symptomatology and cognitive function. *J Psychiatr Res*. 2015;65:80-6.

94. Lui S, Deng W, Huang X, et al. Association of cerebral deficits with clinical symptoms in antipsychotic-naive first-episode schizophrenia: an optimized voxel-based morphometry and resting state functional connectivity study. *Am J Psychiatry*. 2009;166:196-205.

95. Lyu H, Hu M, Eyler LT, et al. Regional white matter abnormalities in drug-naive, first-episode schizophrenia patients and their healthy unaffected siblings. *Aust N Z J Psychiatry*. 2015;49:246-54.

96. Maggioni E, Crespo-Facorro B, Nenadic I, et al. Common and distinct structural features of schizophrenia and bipolar disorder: The European Network on Psychosis, Affective disorders and Cognitive Trajectory (ENPACT) study. *PLoS One*. 2017;12:e188000.

97. Mane A, Falcon C, Mateos JJ, et al. Progressive gray matter changes in first episode schizophrenia: a 4-year longitudinal magnetic

resonance study using VBM. *Schizophr Res*. 2009;114:136-43.

98. Marti-Bonmati L, Lull JJ, Garcia-Marti G, et al. Chronic auditory hallucinations in schizophrenic patients: MR analysis of the coincidence between functional and morphologic abnormalities. *Radiology*. 2007;244:549-56.

99. Madeira N, Duarte JV, Martins R, et al. Morphometry and gyrification in bipolar disorder and schizophrenia: A comparative MRI study. *Neuroimage Clin*. 2020;26:102220.

100. Kenneth MA, Robinson G, Reutens D, Mowry B. Cognitive and structural neuroimaging characteristics of schizophrenia patients with large, rare copy number deletions. *Psychiatry Res*. 2014;224:311-8.

101. Molina V, Sanz J, Villa R, et al. Voxel-based morphometry comparison between first episodes of psychosis with and without evolution to schizophrenia. *Psychiatry Res*. 2010;181:204-10.

102. Molina V, Hernandez JA, Sanz J, et al. Subcortical and cortical gray matter differences between Kraepelinian and non-Kraepelinian schizophrenia patients identified using voxel-based morphometry. *Psychiatry Res*. 2010;184:16-22.

103. Molina V, Galindo G, Cortes B, et al. Different gray matter patterns in chronic schizophrenia and chronic bipolar disorder patients

identified using voxel-based morphometry. *Eur Arch Psychiatry Clin Neurosci*. 2011;261:313-22.

104. Molina V, Martin C, Ballesteros A, de Herrera AG, Hernandez-Tamames JA. Optimized voxel brain morphometry: association between brain volumes and the response to atypical antipsychotics. *Eur Arch Psychiatry Clin Neurosci*. 2011;261:407-16.

105. Nagashima T, Inoue M, Kitamura S, et al. Brain structural changes and neuropsychological impairments in male polydipsic schizophrenia. *BMC Psychiatry*. 2012;12:210.

106. Nakamura K, Takahashi T, Nemoto K, et al. Gray matter changes in subjects at high risk for developing psychosis and first-episode schizophrenia: a voxel-based structural MRI study. *Front Psychiatry*. 2013;4:16.

107. Narayanaswamy JC, Kalmady SV, Venkatasubramanian G, Gangadhar BN. Clinical correlates of superior temporal gyrus volume abnormalities in antipsychotic-naive schizophrenia. *J Neuropsychiatry Clin Neurosci*. 2015;27:e128-33.

108. Neckelmann G, Specht K, Lund A, et al. Mr morphometry analysis of grey matter volume reduction in schizophrenia: association with hallucinations. *Int J Neurosci*. 2006;116:9-23.

109. Nenadic I, Sauer H, Smesny S, Gaser C. Aging effects on regional brain structural changes in schizophrenia. *Schizophr Bull*.

2012;38:838-44.

110. Nenadic I, Dietzek M, Schonfeld N, et al. Brain structure in people at ultra-high risk of psychosis, patients with first-episode schizophrenia, and healthy controls: a VBM study. *Schizophr Res*. 2015;161:169-76.

111. Nenadic I, Maitra R, Langbein K, et al. Brain structure in schizophrenia vs. psychotic bipolar I disorder: A VBM study. *Schizophr Res*. 2015;165:212-9.

112. Oertel-Knochel V, Knochel C, Matura S, et al. Cortical-basal ganglia imbalance in schizophrenia patients and unaffected first-degree relatives. *Schizophr Res*. 2012;138:120-7.

113. Onay A, Yapici EH, Ulasoglu YC, Aslan S, Tali ET. A combined VBM and DTI study of schizophrenia: bilateral decreased insula volume and cerebral white matter disintegrity corresponding to subinsular white matter projections unlinked to clinical symptomatology. *Diagn Interv Radiol*. 2017;23:390-7.

114. Ota M, Obu S, Sato N, Asada T. Neuroimaging study in subjects at high risk of psychosis revealed by the Rorschach test and first-episode schizophrenia. *Acta Neuropsychiatr*. 2011;23:125-31.

115. Picado M, Carmona S, Hoekzema E, et al. The neuroanatomical basis of panic disorder and social phobia in schizophrenia: a voxel based morphometric study. *PLoS One*. 2015;10:e119847.

116. Quinn M, McHugo M, Armstrong K, et al. Impact of substance use disorder on gray matter volume in schizophrenia. *Psychiatry Res Neuroimaging*. 2018;280:9-14.

117. Rosa PG, Zanetti MV, Duran FL, et al. What determines continuing grey matter changes in first-episode schizophrenia and affective psychosis? *Psychol Med*. 2015;45:817-28.

118. Salgado-Pineda P, Junque C, Vendrell P, et al. Decreased cerebral activation during CPT performance: structural and functional deficits in schizophrenic patients. *Neuroimage*. 2004;21:840-7.

119. Salgado-Pineda P, Landin-Romero R, Fakra E, et al. Structural abnormalities in schizophrenia: further evidence on the key role of the anterior cingulate cortex. *Neuropsychobiology*. 2014;69:52-8.

120. Sapara A, Ffytche DH, Cooke MA, Williams SC, Kumari V. Voxel-based magnetic resonance imaging investigation of poor and preserved clinical insight in people with schizophrenia. *World J Psychiatry*. 2016;6:311-21.

121. Schaufelberger MS, Duran FL, Lappin JM, et al. Grey matter abnormalities in Brazilians with first-episode psychosis. *Br J Psychiatry Suppl*. 2007;51:s117-22.

122. Segarra N, Bernardo M, Valdes M, et al. Cerebellar deficits in schizophrenia are associated with executive dysfunction. *Neuroreport.* 2008;19:1513-7.

123. Shivakumar V, Kalmady SV, Rajasekaran A, et al. Telomere length and its association with hippocampal gray matter volume in antipsychotic-naive/free schizophrenia patients. *Psychiatry Res Neuroimaging*. 2018;282:11-7.

124. Singh S, Goyal S, Modi S, et al. Motor function deficits in schizophrenia: an fMRI and VBM study. *Neuroradiology*. 2014;56:413-22.

125. Singh S, Modi S, Goyal S, et al. Functional and structural abnormalities associated with empathy in patients with schizophrenia: An fMRI and VBM study. *J Biosci.* 2015;40:355-64.

126. Singh S, Khushu S, Kumar P, et al. Evidence for regional hippocampal damage in patients with schizophrenia. *Neuroradiology*. 2018;60:199-205.

127. Spalthoff R, Gaser C, Nenadic I. Altered gyrification in schizophrenia and its relation to other morphometric markers. *Schizophr Res*.

2018;202:195-202.

128. Suazo V, Diez A, Montes C, Molina V. Structural correlates of cognitive deficit and elevated gamma noise power in schizophrenia. *Psychiatry Clin Neurosci*. 2014;68:206-15.

129. Szendi I, Szabo N, Domjan N, et al. A New Division of Schizophrenia Revealed Expanded Bilateral Brain Structural Abnormalities of the Association Cortices. *Front Psychiatry*. 2017;8:127.

130. Tikasz A, Dumais A, Lipp O, et al. Reward-related decision-making in schizophrenia: A multimodal neuroimaging study. *Psychiatry Res Neuroimaging*. 2019;286:45-52.

131. Tomelleri L, Jogia J, Perlini C, et al. Brain structural changes associated with chronicity and antipsychotic treatment in schizophrenia. *Eur Neuropsychopharmacol*. 2009;19:835-40.

132. Torres US, Duran FL, Schaufelberger MS, et al. Patterns of regional gray matter loss at different stages of schizophrenia: A multisite, cross-sectional VBM study in first-episode and chronic illness. *Neuroimage Clin*. 2016;12:1-15.

133. Tregellas JR, Shatti S, Tanabe JL, et al. Gray matter volume differences and the effects of smoking on gray matter in schizophrenia.

Schizophr Res. 2007;97:242-9.

134. van Tol MJ, van der Meer L, Bruggeman R, et al. Voxel-based gray and white matter morphometry correlates of hallucinations in schizophrenia: The superior temporal gyrus does not stand alone. *Neuroimage Clin*. 2014;4:249-57.

135. Venkatasubramanian G. Neuroanatomical correlates of psychopathology in antipsychotic-naive schizophrenia. *Indian J Psychiatry*. 2010;52:28-36.

136. Vijayakumari AA, John JP, Halahalli HN, et al. Effect of polymorphisms of three genes mediating monoamine signalling on brain morphometry in schizophrenia and healthy subjects. *Clin Psychopharmacol Neurosci*. 2015;13:68-82.

137. Whitford TJ, Farrow TF, Gomes L, et al. Grey matter deficits and symptom profile in first episode schizophrenia. *Psychiatry Res*. 2005;139:229-38.

138. Witthaus H, Kaufmann C, Bohner G, et al. Gray matter abnormalities in subjects at ultra-high risk for schizophrenia and first-episode schizophrenic patients compared to healthy controls. *Psychiatry Res*. 2009;173:163-9.

139. Yang C, Wu S, Lu W, Bai Y, Gao H. Brain differences in first-episode schizophrenia treated with quetiapine: a deformation-based

morphometric study. *Psychopharmacology (Berl)*. 2015;232:369-77.

140. Yang ZY, Wang SK, Li Y, et al. Neural correlates of prospection impairments in schizophrenia: Evidence from voxel-based morphometry analysis. *Psychiatry Res Neuroimaging*. 2019;293:110987.

141. Yokoyama N, Sasaki H, Mori Y, et al. Additive Effect of Cigarette Smoking on Gray Matter Abnormalities in Schizophrenia. *Schizophr Bull*. 2018;44:535-41.

142. Yue Y, Kong L, Wang J, et al. Regional Abnormality of Grey Matter in Schizophrenia: Effect from the Illness or Treatment? *PLoS One*. 2016;11:e147204.

143. Yuksel C, McCarthy J, Shinn A, et al. Gray matter volume in schizophrenia and bipolar disorder with psychotic features. *Schizophr Res*. 2012;138:177-82.

144. Zhang Y, Zheng J, Fan X, et al. Dysfunctional resting-state connectivities of brain regions with structural deficits in drug-naive first-episode schizophrenia adolescents. *Schizophr Res*. 2015;168:353-9.

145. Zhang C, Wang Q, Ni P, et al. Differential Cortical Gray Matter Deficits in Adolescent- and Adult-Onset First-Episode

Treatment-Naive Patients with Schizophrenia. *Sci Rep*. 2017;7:10267.

146. Zierhut KC, Schulte-Kemna A, Kaufmann J, et al. Distinct structural alterations independently contributing to working memory deficits and symptomatology in paranoid schizophrenia. *Cortex*. 2013;49:1063-72.

147. Cui L, Deng W, Jiang L, et al. A Comparative Study of Voxel-based Morphometry in Patients with Paranoid Schizophrenia and Bipolar Mania (In Chinese). *J Sichuan Univ (Med Sci Edi)*. 2010;41:5-9.

148. Dong W, Liu L, Pei X, et al. Voxel-based morphometric analysis on the structure of white matter in schizophrenic patients (In Chinese). *Journal of Clinical Rehabilitative Tissue Engineering Research*. 2007;11:2454-8.

149. Huang C, Deng W, Chen Z, et al. Brain structure abnormality as genetic endophenotype of schizophrenia (In Chinese). *Chin J Med Genet*. 2009;26:490-4.

150. Jin L. *Study on grey matter volume and resting state brain function of schizophrenia and first-degree relatives (In Chinese)*; 2020.

151. Liu F, Shao Y, Li X, et al. Volumetric Abnormalities in Violent Schizophrenia Patients on the General Psychiatric Ward. *Front Psychiatry*. 2020;11:788.

152. Lv S, Ouyang L, Huang X, et al. An optimized voxel-based morphometry MRI study of the brain in patients with first episode schizophrenia (In Chinese). *Chin J Radiol*. 2007;41:495-8.

153. Zhang L, Wang X, Zhang Y, et al. Cerebral grey matter changes of pre--and post·-treatment in first-episode drug-naive adolescents schizophrenia (In Chinese). *Natl Med J China*. 2018;98:2968-72.

154. Zou W, Li R, Huang J, et al. Voxel-based morphological analysis of brain gray matter Volume changes and resting-state fractional amplitude of low-frequency analysis in young patients with first episode schizophrenia (In Chinese). *Chin J Med Imaging Technol*. 2018;34:1782-6.

155. Bose SK, Mackinnon T, Mehta MA, et al. The effect of ageing on grey and white matter reductions in schizophrenia. *Schizophr Res*. 2009;112:7-13.

156. Horn H, Federspiel A, Wirth M, et al. Gray matter volume differences specific to formal thought disorder in schizophrenia. *Psychiatry Res*. 2010;182:183-6.

157. McDonald C, Bullmore E, Sham P, et al. Regional volume deviations of brain structure in schizophrenia and psychotic bipolar disorder:

computational morphometry study. *Br J Psychiatry*. 2005;186:369-77.

158. Morgan KD, Dazzan P, Orr KG, et al. Grey matter abnormalities in first-episode schizophrenia and affective psychosis. *Br J Psychiatry Suppl*. 2007;51:s111-6.

159. Moriya J, Kakeda S, Abe O, et al. Gray and white matter volumetric and diffusion tensor imaging (DTI) analyses in the early stage of first-episode schizophrenia. *Schizophr Res*. 2010;116:196-203.

160. O'Daly OG, Frangou S, Chitnis X, Shergill SS. Brain structural changes in schizophrenia patients with persistent hallucinations. *Psychiatry Res*. 2007;156:15-21.

161. Palaniyappan L, Liddle PF. Differential effects of surface area, gyrification and cortical thickness on voxel based morphometric deficits in schizophrenia. *Neuroimage*. 2012;60:693-9.

162. Plaze M, Paillere-Martinot ML, Penttila J, et al. "Where do auditory hallucinations come from?"--a brain morphometry study of schizophrenia patients with inner or outer space hallucinations. *Schizophr Bull*. 2011;37:212-21.

163. Price G, Cercignani M, Chu EM, et al. Brain pathology in first-episode psychosis: magnetization transfer imaging provides additional

information to MRI measurements of volume loss. *Neuroimage*. 2010;49:185-92.

164. Tregellas JR, Shatti S, Tanabe JL, et al. Gray matter volume differences and the effects of smoking on gray matter in schizophrenia. *Schizophr Res*. 2007;97:242-9.

165. Adler CM, Levine AD, DelBello MP, Strakowski SM. Changes in gray matter volume in patients with bipolar disorder. *Biol Psychiatry*. 2005;58:151-7.

166. Adler CM, DelBello MP, Jarvis K, et al. Voxel-based study of structural changes in first-episode patients with bipolar disorder. *Biol Psychiatry*. 2007;61:776-81.

167. Almeida JR, Akkal D, Hassel S, et al. Reduced gray matter volume in ventral prefrontal cortex but not amygdala in bipolar disorder: significant effects of gender and trait anxiety. *Psychiatry Res*. 2009;171:54-68.

168. Alonso-Lana S, Goikolea JM, Bonnin CM, et al. Structural and Functional Brain Correlates of Cognitive Impairment in Euthymic Patients with Bipolar Disorder. *PLoS One*. 2016;11:e158867.

169. Altamura AC, Maggioni E, Dhanoa T, et al. The impact of psychosis on brain anatomy in bipolar disorder: A structural MRI study. *J*

Affect Disord. 2018;233:100-9.

170. Ambrosi E, Rossi-Espagnet MC, Kotzalidis GD, et al. Structural brain alterations in bipolar disorder II: a combined voxel-based morphometry (VBM) and diffusion tensor imaging (DTI) study. *J Affect Disord*. 2013;150:610-5.

171. Brown GG, Lee JS, Strigo IA, et al. Voxel-based morphometry of patients with schizophrenia or bipolar I disorder: a matched control study. *Psychiatry Res*. 2011;194:149-56.

172. Bruno SD, Barker GJ, Cercignani M, Symms M, Ron MA. A study of bipolar disorder using magnetization transfer imaging and voxel-based morphometry. *BRAIN*. 2004;127:2433-40.

173. Cai Y, Liu J, Zhang L, et al. Grey matter volume abnormalities in patients with bipolar I depressive disorder and unipolar depressive disorder: a voxel-based morphometry study. *Neurosci Bull.* 2015;31:4-12.

174. Chen X, Wen W, Malhi GS, Ivanovski B, Sachdev PS. Regional gray matter changes in bipolar disorder: a voxel-based morphometric study. *Aust N Z J Psychiatry*. 2007;41:327-36.

175. Chen Z, Cui L, Li M, et al. Voxel based morphometric and diffusion tensor imaging analysis in male bipolar patients with first-episode

mania. *Prog Neuropsychopharmacol Biol Psychiatry*. 2012;36:231-8.

176. Duarte DG, Neves MC, Albuquerque MR, et al. Gray matter brain volumes in childhood-maltreated patients with bipolar disorder type I: A voxel-based morphometric study. *J Affect Disord*. 2016;197:74-80.

177. Eker C, Simsek F, Yilmazer EE, et al. Brain regions associated with risk and resistance for bipolar I disorder: a voxel-based MRI study of patients with bipolar disorder and their healthy siblings. *Bipolar Disord*. 2014;16:249-61.

178. Frangou S. Brain structural and functional correlates of resilience to Bipolar Disorder. *Front Hum Neurosci*. 2011;5:184.

179. Ha TH, Ha K, Kim JH, Choi JE. Regional brain gray matter abnormalities in patients with bipolar II disorder: a comparison study with bipolar I patients and healthy controls. *Neurosci Lett*. 2009;456:44-8.

180. Hajek T, Cullis J, Novak T, et al. Hippocampal volumes in bipolar disorders: opposing effects of illness burden and lithium treatment. *Bipolar Disord*. 2012;14:261-70.

181. Hajek T, Calkin C, Blagdon R, et al. Insulin resistance, diabetes mellitus, and brain structure in bipolar disorders. *Neuropsychopharmacol*. 2014;39:2910-8.

182. Haldane M, Cunningham G, Androutsos C, Frangou S. Structural brain correlates of response inhibition in Bipolar Disorder I. *J Psychopharmacol*. 2008;22:138-43.

183. Ishida T, Donishi T, Iwatani J, et al. Elucidating the aberrant brain regions in bipolar disorder using T1-weighted/T2-weighted magnetic resonance ratio images. *Psychiatry Res Neuroimaging*. 2017;263:76-84.

184. Ji E, Bai Y, Li L, et al. Effect of mood stabilizer on gray matter volume in patients with bipolar disorder Ⅰ (In Chinese). *Chin J Behav Med & Brain Sci*. 2018;27:808-13.

185. Kandilarova S, Stoyanov D, Sirakov N, Maes M, Specht K. Reduced grey matter volume in frontal and temporal areas in depression: contributions from voxel-based morphometry study. *Acta Neuropsychiatr*. 2019;31:252-7.

186. Oertel-Knochel V, Reinke B, Feddern R, et al. Episodic memory impairments in bipolar disorder are associated with functional and structural brain changes. *Bipolar Disord*. 2014;16:830-45.

187. Kozicky JM, Ha TH, Torres IJ, et al. Relationship between frontostriatal morphology and executive function deficits in bipolar I disorder following a first manic episode: data from the Systematic Treatment Optimization Program for Early Mania (STOP-EM).

Bipolar Disord. 2013;15:657-68.

188. Kozicky JM, McGirr A, Bond DJ, et al. Neuroprogression and episode recurrence in bipolar I disorder: A study of gray matter volume changes in first-episode mania and association with clinical outcome. *Bipolar Disord*. 2016;18:511-9.

189. Lee J, Choi S, Kang J, et al. Structural characteristics of the brain reward circuit regions in patients with bipolar I disorder: A voxel-based morphometric study. *Psychiatry Res Neuroimaging*. 2017;269:82-9.

190. Li M, Cui L, Deng W, et al. Voxel-based morphometric analysis on the volume of gray matter in bipolar I disorder. *Psychiatry Res*. 2011;191:92-7.

191. Li H. *A study of multimodal imaging technique in differentiating bipolar depression from unipolar depression (In Chinese)*; 2017.

192. Lochhead RA, Parsey RV, Oquendo MA, Mann JJ. Regional brain gray matter volume differences in patients with bipolar disorder as assessed by optimized voxel-based morphometry. *Biol Psychiatry*. 2004;55:1154-62.

193. Lyoo IK, Kim MJ, Stoll AL, et al. Frontal lobe gray matter density decreases in bipolar I disorder. *Biol Psychiatry*. 2004;55:648-51.

194. Matsubara T, Matsuo K, Harada K, et al. Distinct and Shared Endophenotypes of Neural Substrates in Bipolar and Major Depressive

Disorders. *PLoS One*. 2016;11:e168493.

195. Minuzzi L, Syan SK, Smith M, et al. Structural and functional changes in the somatosensory cortex in euthymic females with bipolar disorder. *Aust N Z J Psychiatry*. 2018;52:1075-83.

196. Narita K, Suda M, Takei Y, et al. Volume reduction of ventromedial prefrontal cortex in bipolar II patients with rapid cycling: a voxel-based morphometric study. *Prog Neuropsychopharmacol Biol Psychiatry*. 2011;35:439-45.

197. Nery FG, Gigante AD, Amaral JA, et al. Gray matter volumes in patients with bipolar disorder and their first-degree relatives. *Psychiatry Res*. 2015;234:188-93.

198. Neves MC, Albuquerque MR, Malloy-Diniz L, et al. A voxel-based morphometry study of gray matter correlates of facial emotion recognition in bipolar disorder. *Psychiatry Res*. 2015;233:158-64.

199. Nugent AC, Milham MP, Bain EE, et al. Cortical abnormalities in bipolar disorder investigated with MRI and voxel-based morphometry. *Neuroimage*. 2006;30:485-97.

200. de Azevedo-Marques PC, Duran FL, Zanetti MV, et al. A population-based morphometric MRI study in patients with first-episode

psychotic bipolar disorder: comparison with geographically matched healthy controls and major depressive disorder subjects. *Bipolar Disord*. 2011;13:28-40.

201. Poletti S, Vai B, Smeraldi E, et al. Adverse childhood experiences influence the detrimental effect of bipolar disorder and schizophrenia on cortico-limbic grey matter volumes. *J Affect Disord*. 2016;189:290-7.

202. Redlich R, Almeida JJ, Grotegerd D, et al. Brain morphometric biomarkers distinguishing unipolar and bipolar depression. A voxel-based morphometry-pattern classification approach. *JAMA Psychiat.* 2014;71:1222-30.

203. Rossi R, Pievani M, Lorenzi M, et al. Structural brain features of borderline personality and bipolar disorders. *Psychiatry Res*. 2013;213:83-91.

204. Sani G, Chiapponi C, Piras F, et al. Gray and white matter trajectories in patients with bipolar disorder. *Bipolar Disord*. 2016;18:52-62.

205. Saricicek A, Yalin N, Hidiroglu C, et al. Neuroanatomical correlates of genetic risk for bipolar disorder: A voxel-based morphometry study in bipolar type I patients and healthy first degree relatives. *J Affect Disord*. 2015;186:110-8.

206. Scherk H, Kemmer C, Usher J, et al. No change to grey and white matter volumes in bipolar I disorder patients. *Eur Arch Psychiatry*

Clin Neurosci. 2008;258:345-9.

207. Shepherd AM, Quide Y, Laurens KR, et al. Shared intermediate phenotypes for schizophrenia and bipolar disorder: neuroanatomical features of subtypes distinguished by executive dysfunction. *J Psychiatry Neurosci*. 2015;40:58-68.

208. Song J, Han DH, Kim SM, et al. Differences in gray matter volume corresponding to delusion and hallucination in patients with schizophrenia compared with patients who have bipolar disorder. *Neuropsychiatr Dis Treat*. 2015;11:1211-9.

209. Song H, Chon MW, Ryu V, et al. Cortical Volumetric Correlates of Childhood Trauma, Anxiety, and Impulsivity in Bipolar Disorder. *Psychiatry Investig*. 2020;17:627-35.

210. Stanfield AC, Moorhead TW, Job DE, et al. Structural abnormalities of ventrolateral and orbitofrontal cortex in patients with familial bipolar disorder. *Bipolar Disord*. 2009;11:135-44.

211. Tang LR, Liu CH, Jing B, et al. Voxel-based morphometry study of the insular cortex in bipolar depression. *Psychiatry Res*. 2014;224:89-95.

212. Tost H, Ruf M, Schmal C, et al. Prefrontal-temporal gray matter deficits in bipolar disorder patients with persecutory delusions. *J Affect*

Disord. 2010;120:54-61.

213. Yatham LN, Lyoo IK, Liddle P, et al. A magnetic resonance imaging study of mood stabilizer- and neuroleptic-naive first-episode mania. *Bipolar Disord*. 2007;9:693-7.

214. Zou W, Cao L, Cui L, et al. Preliminary voxel-based morphometry analysis of grey matter abnormalities in early stage of bipolar disorder I (In Chinese). *J Pract Radiol*. 2014;30:1075-9.

215. Cao L, Wang J, Nie B, et al. Lateralization of grey matter volume alterations in patients with bipolar disorder I type (In Chinese). *Sichuan Mental Health*. 2018;31:209-13.

216. Chang M. *Similarities and distinctions of major psychiatric diagnostic categories： multi-modal magnetic resonance imaging studies*; 2017.

217. Cui L, Deng W, Jiang L, et al. A Comparative Study of Voxel-based Morphometry in Patients with Paranoid Schizophrenia and Bipolar Mania (In Chinese). *J Sichuan Univ (Med Sci Edi)*. 2010;41:5-9.

218. Fan L, Zhao S, Wu G, et al. Gender Differences of Gray Matter Abnormalities in Patients with Bipolar Disorder (In Chinese). *Chinese*

Journal of Clinical Psychology. 2016;24:395-9.

219. Hu A, Xue Z, Liu Z, Wang P, He Z. Grey Matter Volume in Patients with Unipolar Depression and Bipolar Depression (In Chinese). *Chinese Journal of Clinical Psychology*. 2016;24:191-5.

220. Li W. *Regional gray matter volume changes in bipolar disorder: a voxel-based morphometric study (In Chinese)*; 2014.

221. Li Y. *Fractional amplitude of low frequency fluctuations and gray matter volume on patients with depressed bipolar disorder*; 2018.

222. Qiu M, Liu Q, Huang Y, et al. Abnormalities of Grey Matter Volume in Patients with Bipolar Depressive Disorder: A Voxel-based Morphometry-DARTEL Study (In Chinese). *Chinese Journal of Medical Computer Imaging*. 2018;24:6-9.

223. Wang X, Zhao N, Shi J, et al. Discussion on Patients with Bipolar Disorder and Depressive Episode by Ratio Low Frequency Amplitude Combined with Grey Matter Volume Analysis. *J Med Syst*. 2019;43:117.

224. Wang P. *A Study of Brain Gray Matter Volume in Patients with Unipolar and Bipolar Depressive Disorder*; 2013.

225. Zhang C, Zhang R, Wei S, Wang F. Changes of gray matter volume in patients with bipolar disorder and suicidal ideation: a voxel based morphometric analysis (In Chinese). *Chin J Nerv Ment Dis*. 2018;44:668-72.

226. Chen P, Chen F, Chen G, et al. Inflammation is associated with decreased functional connectivity of insula in unmedicated bipolar disorder. *Brain Behav Immun*. 2020;89:615-22.

227. Lee DK, Lee H, Park K, et al. Common gray and white matter abnormalities in schizophrenia and bipolar disorder. *PLoS One*. 2020;15:e232826.

228. Li H, Cui L, Cao L, et al. Identification of bipolar disorder using a combination of multimodality magnetic resonance imaging and machine learning techniques. *BMC Psychiatry*. 2020;20:488.

229. Sun N, Li Y, Zhang A, et al. Fractional amplitude of low-frequency fluctuations and gray matter volume alterations in patients with bipolar depression. *Neurosci Lett*. 2020;730:135030.

230. Vai B, Parenti L, Bollettini I, et al. Predicting differential diagnosis between bipolar and unipolar depression with multiple kernel learning on multimodal structural neuroimaging. *Eur Neuropsychopharmacol*. 2020;34:28-38.