Supplementary Table 1. Characteristics of the studies included in the review

Author, year/modality	Study participants	Measurement	ECT protocol	Study findings
Uesugi et al., 1995[1] PET	5 SZ (mean age: 41.4, mean DOI: 22.6) 6 HC	SZ: rCBF at 1) baseline, 2) 5−17 days after completion of ECT, 3) 5−6 months after ECT HC: measured once ROI: both frontal, temporal, and occipital lobes, cerebellum, caudate, parahippocampus, putamen, and thalamus	Bifrontal ECT (four times per week, from 6 to 24 sessions per patient, with a mean of 16.4 sessions)	rCBF was higher in both temporal lobes and the left cerebellum at baseline compared to controls. rCBF in both frontal lobes, the right temporal lobe and the right putamen was lower 5 to 17 days after ECT than baseline. Six months after ECT, however, there were no significant differences in rCBF in each region compared to baseline in schizophrenia patients. The authors suggest higher cerebral blood flow in SZ patients. Additionally, after ECT, 3-methoxy-4-hydroxyphenylglycol (MHPG) decreased, whereas high levels of prolactin persisted, after ECT in SZ patients.
Escobar et al., 2000[2] SPECT	5 SZ with catatonia (mean age: 29.4) 4 MDD with catatonia (mean age: 27)	SZ, MDD: one week before ECT and one week after ECT ROI: both frontal, parietal, temporal, and occipital lobes, basal ganglia, thalamus, and cingulum	Bifrontotemporal ECT (3 times per week, from 5 to 15 sessions per patient)	Pre-ECT SPECT did not differ between SZ and MDD patients. MDD patients required fewer sessions of ECT, and their clinical improvement was greater than those with SZ (using Modified Rogers Scale for measuring severity of catatonia). After a week following completion of ECT, brain SPECT showed significant increases in the parietal, temporal, and occipital regions in MDD. Pre- and post-SPECT measures were not significantly altered after ECT sessions in SZ group.
Fujita et al., 2011[3] NIRS	11 SZ (mean age: 45.8, DOI: 31.1) 10 depression (mean age: 64.5, DOI: 7.5)	rCBF measured by normalized tissue hemoglobin index (nTHI) SZ and depression: before, during, and after each ECT session ROI: bilateral prefrontal cortical regions	Bifrontotemporal ECT (mean of 6.8 sessions per patient)	In SZ compared to mood disorder patients, hemodynamic responses following ECT showed asymmetric alterations. After the ictal period, when blood flow increases were measured to be maximal, SZ patients showed significantly increased ratio of regional blood flow in the left PFC region compared to the right PFC, which was not same in mood disorder patients. Asymmetry index of nTHI was negatively correlated with duration of illness in SZ patients (r=-0.78). All patients responded to ECT treatment.
Gan et al., 2017[4] MRS	Randomized 32 SZ (ECT) (mean age: 27.5, DOI: 9.8, age at onset: 26.7) 34 SZ (antipsychotics; AP) (mean age: 27.8, DOI: 10.0, age at onset: 26.9) 34 HC (mean age: 26.7)	SZ, MDD: NAA/Cr and Cho/Cr ratio before and after ECT HC: measured once ROI: bilateral prefrontal cortices and bilateral thalami	Bitemporal ECT (3 times per week with a total of 8 sessions per patient)	Both ECT and AP groups responded to treatment (PANSS). At baseline, NAA/Cr was lower in the patient group compared to the control group. The reduced NAA/Cr normalized after treatment with either ECT or AP. However, NAA/Cr increased after the treatment only in the ECT group and not in the AP group. Measures of Cho/Cr were not significantly different among the groups or after treatment. NAA/Cr changes in the left PFC positively correlated with age at onset (r=0.44), percentage of PANSS reduction (r=0.41), baseline PANSS total score (r=0.37), and stimulus intensity of ECT (r=0.35) and negatively correlated with the duration of illness (r=-0.41). NAA/Cr changes in the left thalamus positively correlated with age at onset (r=0.33) and negatively correlated with duration of illness (r=-0.35). These results suggest that if age at onset is older and the duration of illness shorter, the greater the NAA/Cr will increase after treatment with ECT.
Lotfi et al., 2018[5] MRS	10 SZ (ECT) 10 SZ (AP) (mean age: 37, DOI: 8)	MRS was measured after treatment in both groups (no pretreatment MRS) ROI: bilateral prefrontal cortices, occipital cortex, thalamus, hippocampus	ECT method not specified (at least twice a week for at least 8 sessions)	Those who received ECT had increased NAA/Cr in the left PFC compared to those who received only AP treatment. Cho/Cr in the left PFC and left thalamus were lower in the ECT group than in the AP group. Clinical improvement did not differ between the two groups.
Xia et al., 2018[6] MRS	14 SZ (ECT) (mean age: 27.6, DOI: 5.72) 17 SZ (AP) (mean age: 31.0, DOI: 7.75) 19 HC (mean age: 30.9)	SZ: medial prefrontal GABA/Cr concentrations before and after 4 weeks of treatment HC: measured once ROI: medial prefrontal cortex	Bitemporal ECT (3 times per week. Number of sessions were determined by individual clinical response Total number of sessions ranged from 8 to 12, with a mean of 11.3)	Medial prefrontal GABA levels did not significantly differ when comparing the three groups. However, when two patient groups (ECT and AP) were combined and compared with controls, their prefrontal GABA levels were lower. After treatment, prefrontal GABA levels in the ECT and AP groups did not differ. rmANOVA showed a nonsignificant group effect and time by group effect, but a significant time effect of baseline versus treatment. Post hoc paired t-test found significant increases in prefrontal GABA only in the ECT group and not in the AP group. Clinical improvement (PANSS score) did not correlate with prefrontal GABA level changes.
Thomann et al., 2017[7] sMRI, fMRI	9 SZ (mean age: 34.2) 12 MDD (mean age: 46.3) 21 HC	GMV, rsFC SZ, MDD: before and after ECT HC: measured once ROI (structural): amygdala, hippocampus, and insula ROI (functional): right amygdala, right cortical regions, and hypothalamus	Right unilateral ECT (3 times per week. Number of sessions were individualized until symptom improvement, with a mean of 11.3 sessions for SZ and 10.8 sessions for MDD)	In both SZ and MDD groups, GMV in the MTL, comprising the amygdala, anterior part of the hippocampus and insula increased after ECT, but did not correlate with symptom improvement. The GMV increase in the amygdala was inversely correlated with baseline GMV in the amygdala. In SZ patients at baseline, there was significantly reduced GMV in the right insula and right amygdala. After ECT, amygdala volume did not differ with the control group, and insula GMV was greater in the SZ group than the control group. GMV in the MDD group did not differ from the control group at baseline, but after ECT, the MDD group showed increased amygdala volumes that exceeded the control group. ECT reduced rsFC between the right amygdala, right temporoparietal junction, right medial PFC, right and left posterior insula and right DLPFC. rsFC between the right amygdala and hypothalamus increased after ECT, and this change was inversely correlated with baseline connectivity strength of the same region. Post hoc comparison showed rsFC increase between the right amygdala and hypothalamus was significant in SZ after ECT. However, these changes did not correlate with clinical improvements.
Li et al., 2017[17] fMRI	13 SZ (ECT+AP) 16 SZ (AP) 34 HC	SZ (ECT, AP): prior to ECT and after 6 weeks of treatment with either ECT+AP or AP HC: at baseline only	Bilateral ECT (gradually tapered from 5/week to 3/week and 1/week)	Authors built a classification model using rsFC to differentiate between schizophrenia subgroups and controls. The six networks included were the DMN, MTL, language network, corticostriatal network, frontal-parietal network, and cerebellum. In the ECT group, FC in the PCC, left STG, right angular gyrus, and right MTG were increased, while FC in the right ACC, left MTG, and right precuneus were decreased after ECT.
Huang et al., 2018[14] fMRI	21 SZ (ECT) (mean age: 29.2, DOI: 6.65) 21 SZ (AP) (mean age: 30.7, DOI: 6.56) 23 HC (mean age: 31.2)	gFCD, rsFC SZ: before and after 4 weeks of treatment HC: measured once Whole brain analysis	Bitemporal ECT (3 times per week. Number of sessions were individualized until symptom improvement from 8 to 12 sessions, with a mean of 11.5 sessions)	Repeated ANCOVA revealed significant differential effects of group by time in the left precuneus, vmPFC, and dmPFC. Post hoc analysis showed that gFCD was increased after ECT compared to baseline in the dmPFC, vmPFC, and left precuneus. However, these changes did not correlate with clinical improvements. In the AP-only group, no significant changes were observed after treatment compared to baseline.
Jiang et al., 2019[9] sMRI, fMRI	21 SZ (ECT) (mean age: 29.2, DOI: 6.65) 21 SZ (AP) (mean age: 30.7, DOI: 6.56) 23 HC (mean age: 31.2)	GMV, rsFC SZ: sMRI and fMRI before and after 4 weeks of treatment HC: measured once ROI: insula	Bitemporal ECT (3 times per week. Number of sessions were individualized until symptom improvement from 8 to 12 sessions, with a mean of 11.5 sessions)	In the ECT group, GMV in the bilateral posterior insula was increased after treatment, and this change correlated with symptom improvements. In the AP group, GMV in the insular subregions were reduced after treatment. After ECT, decreased functional connectivity between the right posterior insula and left orbitofrontal cortex and the left posterior insula and middle occipital gyrus was observed, which also correlated with symptom improvements.
Sambataro et al., 2019[13] fMRI	8 SZ (ECT) 8 MDD (ECT) 20 HC	SZ, MDD: before and after ECT HC: measured once Whole brain analysis	Right unilateral ECT (3 times per week. Number of sessions were individualized until symptom improvement Mean number of ECT sessions were 12.4 for SZ and 10.5 for MDD)	Patients had reduced connectivity within the striatothalamic network (in the thalamus) and increased low-frequency oscillations in the striatal network. ECT reduced low-frequency oscillations in the striatal network and increased functional connectivity in the medial PFC within the DMN. Additionally, after ECT, FC of the executive network and the DMN was reduced and FC of the executive network and the salience network was increased.
Wolf et al., 2016[8] sMRI	9 SZ 12 MDD 21 HC	Source-based morphometry SZ, MDD: before and after ECT HC: measured once Whole brain analysis	Right unilateral ECT (3 times per week)	MDD: Prior to ECT, GMV in the ACC/MPFC, bilateral thalami, and MTL network was smaller. After ECT, structural network strength of the ACC/MPFC and MTL increased but did not correlate with symptom improvements (HAM-D). SZ: Prior to ECT, GMV in the precuneus was larger, and the bilateral thalami, MTL, left DLPFC/ACC, and bilateral cerebellum were lower. After ECT, the MTL and left DLPFC volumes were increased, and the left DLPFC and PANSS total score differences showed negative association (r=-0.70).
Wang et al., 2019[11] sMRI	21 SZ (ECT) 21 SZ (AP) 22 HC	SZ: MRI before 24 hours prior to treatment, MRI 24 to 48 hours after treatment completion HC: measured once ROI analysis followed the results from whole brain analysis	Bitemporal ECT (3 times per week for total of 4 weeks)	Comparing among the three groups, a significant group by time effect was found in four brain regions: left parahippocampal gyrus/hippocampus, right parahippocampal gyrus/hippocampus, right temporal pole and mid/superior temporal gyrus, and right insula. Post hoc analysis showed GMV increases in all four regions in the ECT group, but decreased GMV in the AP group. Both ECT and AP groups showed no significant differences in terms of GMV when compared to controls at both baseline and posttreatment. ECT group showed a significant positive correlation of GMV changes in the right parahippocampal gyrus/hippocampus with reductions in positive subscores on the PANSS.
Jiang et al., 2019[10] sMRI, fMRI	21 SZ (ECT) -10 responders -11 nonresponders 21 SZ (AP)	SZ: MRI before 24 hours prior to treatment, MRI 24 to 48 hours after treatment completion ROI: whole hippocampus and hippocampal subfields	Bitemporal ECT (3 times per week for total of 4 weeks)	Compared to the AP group, the ECT group had increased bilateral hippocampal volume. Both responders and nonresponders showed increased hippocampal volume. In nonresponders, lower baseline volume in the hippocampus-amygdala transition area was found. Increased FC between the hippocampus and the PFC and the default mode network were found in ECT responders.
Wang et al., 2020[15] fMRI	21 SZ (ECT) 21 SZ (AP) 23 HC	SZ: MRI before 24 hours prior to treatment, MRI 24 to 48 hours after treatment completion ROI: 16 thalamic subfields as seeds to whole brain	Bitemporal ECT (3 times per week for total of 4 weeks)	Significant group by time effect in FC of the right thalamus to right putamen. Post hoc analyses showed increased FC between right thalamus to right putamen in the ECT group compared to the AP group. After 4 weeks, FC of thalamus to sensory cortex increased in the ECT group, while FC decreased in the AP group.
Yang et al., 2020[16] fMRI	47 SZ (ECT)	SZ: a day before the start of ECT, a day after the completion of ECT sessions ROI: 10 ROIs using baseline FC modeling to predict ECT response	Bitemporal ECT (3 times per week, with a mean of 9.15 sessions)	Using hypothetical simulation of strong electric fields during ECT stimulus and models to predict ECT response utilizing baseline FC, 10 ROIs were modeled to be of use in predicting ECT response. The actual data from subjects after ECT showed that among the 10 ROIs, FC between the right amygdala and left hippocampus was significantly decreased.
Gong et al., 2019[12] sMRI, DWI	57 SZ (ECT)	SZ: at baseline only (for prediction of ECT effect via improvement in PANSS)	Bitemporal ECT (3 times per week, with a mean of 10.5 sessions)	Aiming to use multiparametric markers of MRI to predict effects of ECT, the authors integrated baseline gray matter (GM) features and white matter features (WM). Selection of GM and WM tract ROIs were performed by simulation of electrical fields during ECT stimulus by modeling, and those regions with electrical field strength larger than 35 V/m were included (23 GM ROIs, 37 WM tracts). Models were tested to predict difference in PANSS scores prior and after ECT. GM features included the left IFG, right insula, left MTG, and right STG, and the WM tracts between the left calcarine-left superior temporal pole, right lingual-right ITG, left MOG- left ITG, right MTG-right ITG, and right IFG-right insula.

ECT: electroconvulsive therapy, SZ: schizophrenia, HC: healthy control, DOI: duration of illness, ECT: electroconvulsive therapy, PET: positron emission tomography, rCBF: regional cerebral blood flow, ROI: region of interest, SPECT: single photon emission computed tomography, MDD: major depressive disorder, NIRS: near-infrared spectroscopy, PFC: prefrontal cortex, nTHI: normalized tissue hemoglobin index, MRS: magnetic resonance spectroscopy, NAA/Cr: N-acetyl-aspartate/creatinine, Cho/Cr: choline/creatinine, PANSS: Positive and Negative Symptom Scale, AP: antipsychotics, GABA/Cr: γ-aminobutyric acid/creatinine, sMRI: structural magnetic resonance imaging, fMRI: functional magnetic resonance imaging, GMV: gray matter volume, MTL: medial temporal lobe, DLPFC: dorsolateral prefrontal cortex, rsFC: resting-state functional connectivity, DMN: default mode network, PCC: posterior cingulate cortex, STG: superior temporal gyrus, MTG: middle temporal gyrus, ACC: anterior cingulate cortex, gFCD: global functional connectivity density, ANCOVA: analysis of covariance, vmPFC: ventromedial prefrontal cortex, dmPFC: dorsomedial prefrontal cortex, FC: functional connectivity, mPFC: medial prefrontal cortex, HAM-D: Hamilton Depression Rating Scale, DWI: diffusion-weighted imaging, GM: gray matter, WM: white matter, IFG: inferior frontal gyrus, ITG: inferior temporal gyrus, MOG: middle occipital gyrus, MRI: magnetic resonance imaging