

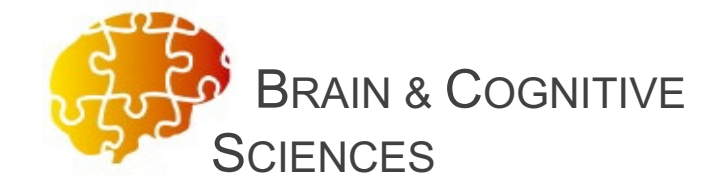
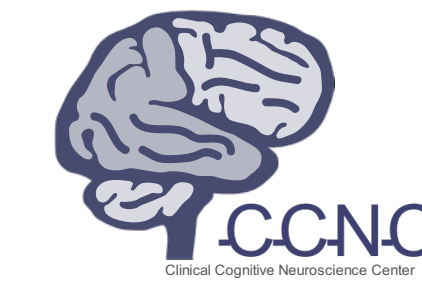
Thalamo-cortical white matter connectivity as an indicator of electroconvulsive therapy response in patients with schizophrenia spectrum disorder

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INTRODUCTION

Electroconvulsive therapy (ECT) is an effective treatment for patients with treatment resistant schizophrenia spectrum disorders (SSD). However, understanding of underlying mechanisms for ECT response has not yet been sufficient in addition to lack of knowledge regarding the target for region specific neuromodulation. Therefore, we investigated thalamo-cortical white matter (WM) connectivity as an indicator of ECT response in patients with SSD.

METHODS

A total of 26 SSD patients and age-, sex-matched 28 healthy controls (HCs) underwent diffusion tensor imaging (DTI) to examine the probabilistic tractography of thalamo-cortical WM connectivity. DTI recordings were performed twice before (T1) and after (T2) the course of ECT (i.e., 1-2 months interval) in SSD group, and data were compared across time and groups (i.e., SSD vs. HCs). Relationship of change in thalamo-cortical WM connectivity and symptomatic improvement by ECT was explored in SSD patients.

Table 1. Demographic characteristics of the participants and clinical characteristics of the patients with schizophrenia spectrum disorder (SSD) before and after the course of electroconvulsive therapy (ECT).

	SSD (N = 26)	HCs (N = 28)	Statistical analysis ^a	
			χ^2 or T	P
Sex (male/female)	13/13	9/19	1.781	0.182
Age (years)	34.0 ± 5.8	32.9 ± 8.4	0.560	0.578
Intelligence quotient	93.7 ± 11.7	114.3 ± 9.3	-7.167	< 0.001**
Education (years)	15.0 ± 4.0	15.3 ± 2.0	-0.332	0.741
Duration of illness (months)	79.0 ± 15.5	-	-	-
Number of ECT sessions	12.9 ± 2.4	-	-	-
Clinical characteristics of the patients			Statistical analysis ^b	
	Before ECT (N = 26)	After ECT (N = 26)	T	P
PANSS				
Total scores	76.3 ± 14.6	61.9 ± 14.8	6.540	< 0.001**
Positive symptoms	20.6 ± 5.4	15.5 ± 5.4	6.277	< 0.001**
Negative symptoms	19.0 ± 6.1	16.9 ± 5.3	2.840	0.009**
General symptoms	37.0 ± 6.9	29.6 ± 7.4	5.899	< 0.001**
HAM-A	8.2 ± 5.7	4.4 ± 3.4	4.383	< 0.001**
HAM-D	12.1 ± 6.8	6.7 ± 4.9	5.182	< 0.001**
CGI-S	5.2 ± 0.7	4.3 ± 1.1	4.738	< 0.001**
Antipsychotics ^c	41.8 ± 21.4	42.1 ± 18.7	-0.120	0.906

Abbreviations: HCs, healthy controls; PANSS, Positive and Negative Syndrome Scale; HAM-A, Hamilton Rating Scale for Anxiety; HAM-D, Hamilton Rating Scale for Depression; CGI-S, Clinical Global Impression-Severity.

^a Independent t test or Welch's t test if the variances were not equal, and χ^2 analysis or Fisher's exact test for categorical data.

^b Paired t test.

^c Mean olanzapine equivalent dose of antipsychotics prescribed.

Data are given as the mean ± standard deviation.

*. Statistical significance is at $p < 0.05$.

** . Statistical significance is at $p < 0.005$.

RESULTS

At T1, SSD patients showed lower thalamo-lateral prefrontal cortex WM connectivity and higher thalamo-parietal cortex (PC) WM connectivity than in HCs. At T2, difference of thalamo-PC WM connectivity shown at T1 was disappeared between SSD patients and HCs. In SSD patients, there was significant decrease of thalamo-PC WM connectivity between T1 and T2. In addition, change in thalamo-PC WM connectivity was significantly associated with improvement in Positive and Negative Syndrome Scale total and Clinical Global Impression-Severity scores in SSD patients.

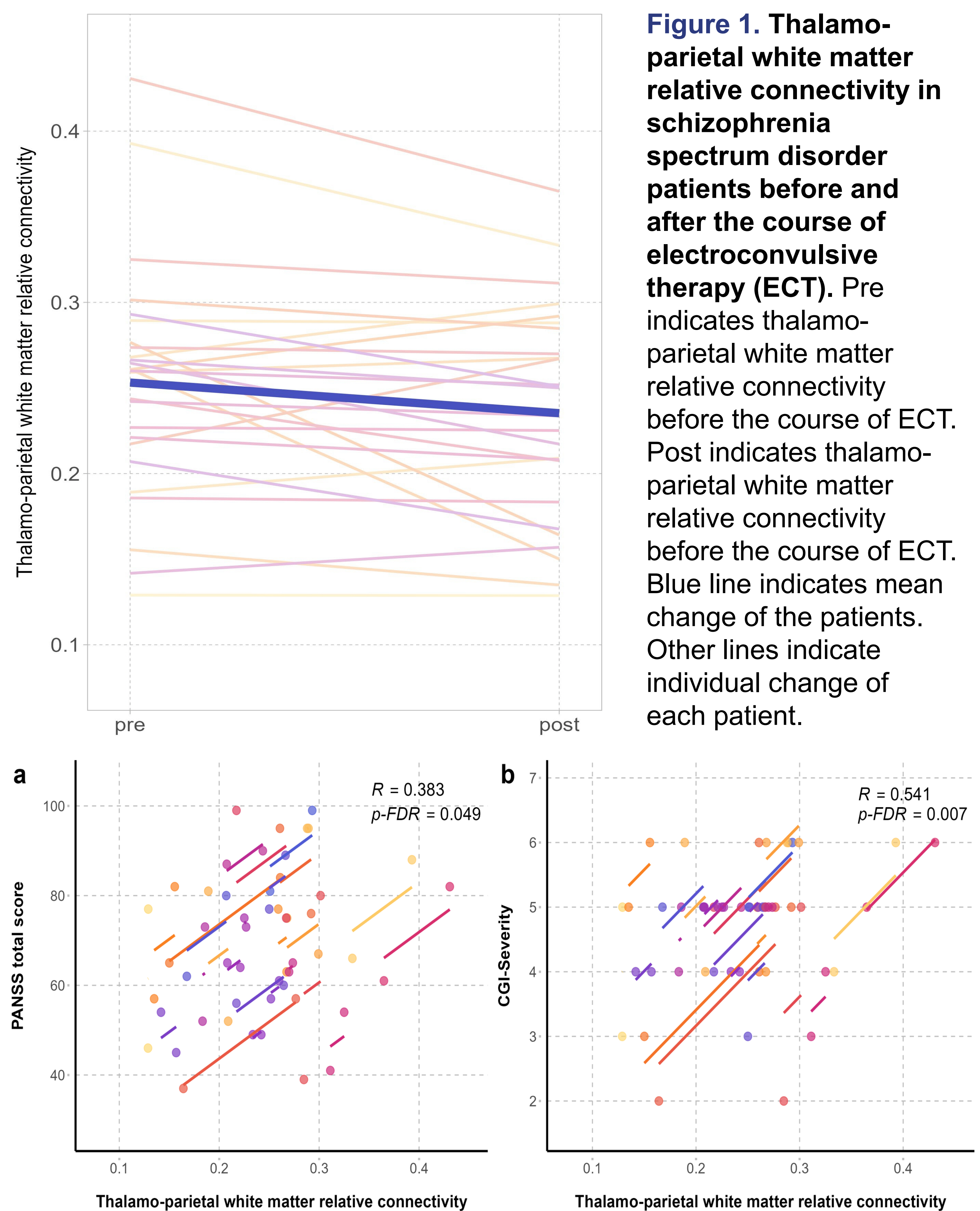


Figure 1. Thalamo-parietal white matter relative connectivity in schizophrenia spectrum disorder patients before and after the course of electroconvulsive therapy (ECT). Pre indicates thalamo-parietal white matter relative connectivity before the course of ECT. Post indicates thalamo-parietal white matter relative connectivity before the course of ECT. Blue line indicates mean change of the patients. Other lines indicate individual change of each patient.

Figure 2. Repeated-measures correlation between change in clinical symptom severity and thalamo-parietal white matter relative connectivity before and after the course of electroconvulsive therapy. Abbreviations: PANSS, Positive and Negative Syndrome Scale; CGI, Clinical Global Impression. Statistical significance was set at False Discovery Rate (FDR) corrected $p < 0.05$.

CONCLUSION

The current study results suggest that decrease in thalamo-PC WM connectivity can be an indicator of ECT response in SSD patients. Furthermore, PC may be a future target for region specific neuromodulation in patients with treatment resistant SSD.