ウェブサイト公開用

（様式 10）
（海外特別研究員事業）

令和 3 年 4 月 27 日

海 外 特 別 研 究 員 最 終 報 告 書

独立行政法人日本学術振興会 理事長 殿

採 用 年 度 平成 31 年度
受 付 番 号 201960031

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（氏名は必ず自署すること）

海外特別研究員としての派遣期間を終了しましたので、下記のとおり報告いたします。
なお、下記及び別紙記載の内容については相違ありません。

記

1. 用務地（派遣先国名）用務地： サンディエゴ （国名： 米国 ）

2. 研究課題名（和文）※研究課題名は申請時のものと違わないように記載すること。
発症後早期統合失調症の異常神経回路に対するメマンチン投与効果の電気生理学的検討

3. 派遣期間：平成 31 年 4 月 1 日 ～ 令和 3 年 3 月 31 日

4. 受入機関名及び部局名
受入機関名： カリフォルニア大学サンディエゴ校
部局名： 精神科

5. 所期の目的の遂行状況及び成果…書式任意 **書式任意（A4 判相当 3 ページ以上、英語で記入も可）**
（研究・調査実施状況及びその成果の発表・関係学会への参加状況等）
（注）「6. 研究発表」以降については様式 10－別紙 1～4 に記入の上、併せて提出すること。

Title: Auditory-based cognitive training drives short- and long-term plasticity in cortical networks in schizophrenia

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Summary:
Schizophrenia patients have widespread deficits in neurocognitive functioning linked to underlying abnormalities in gamma oscillations that are readily measured by the 40-Hz auditory steady state response (ASSR). Emerging interventions such as auditory-based targeted cognitive training (TCT) improve neurocognitive function in patients. While acute ASSR changes after 1-hour of TCT predict clinical and cognitive gains after a 30-hour course of TCT, the neural substrates of underlying short- and long-term TCT interventions are unknown. To determine the neural substrates underlying TCT-associated ASSR changes, a novel data analysis method was applied to assess the effective connectivity of gamma-band ASSR among estimated cortical sources. In this study, schizophrenia patients (N=52) were randomized to receive either a treatment as usual (TAU; N=22) or TAU augmented with TCT (N=30; **Figure 1**). EEG recordings were obtained immediately before (T0) and after 1-hour of either computer games (TAU) or cognitive training (TCT; T1), and at 65±15 days (mean±SD) post randomization (T2). Results showed increased connectivity from the left ventral middle cingulate gyrus to the left posterior cingulate gyrus, accompanied by decreased connectivity from the left Rolandic operculum (a region that includes auditory cortex) to the right ventral middle cingulate gyrus after 1-hour of TCT (**Figure 2, 3, 4**). After 30-hour, decreased connectivity from the frontal cortex to a region near the calcarine sulcus were detected. Auditory-based cognitive training drives short- and long-term plasticity in cortical network functioning in schizophrenia patients. These findings may help us understand the mechanisms underlying cognitive training effects in schizophrenia patients and enhance the development of pro-cognitive therapeutics.

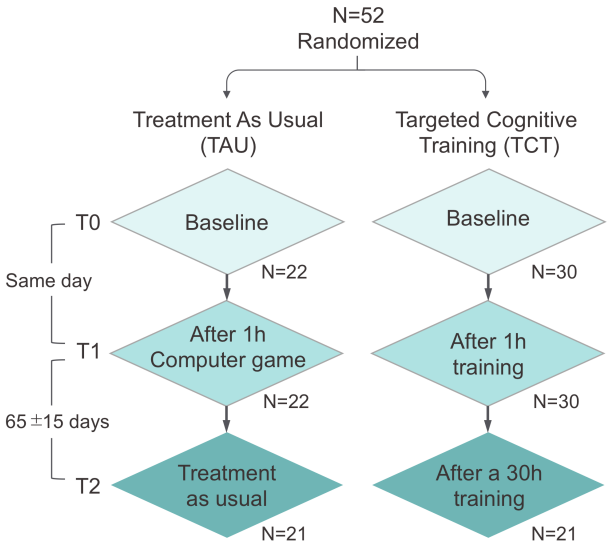

Figure 1 Subjects of this study

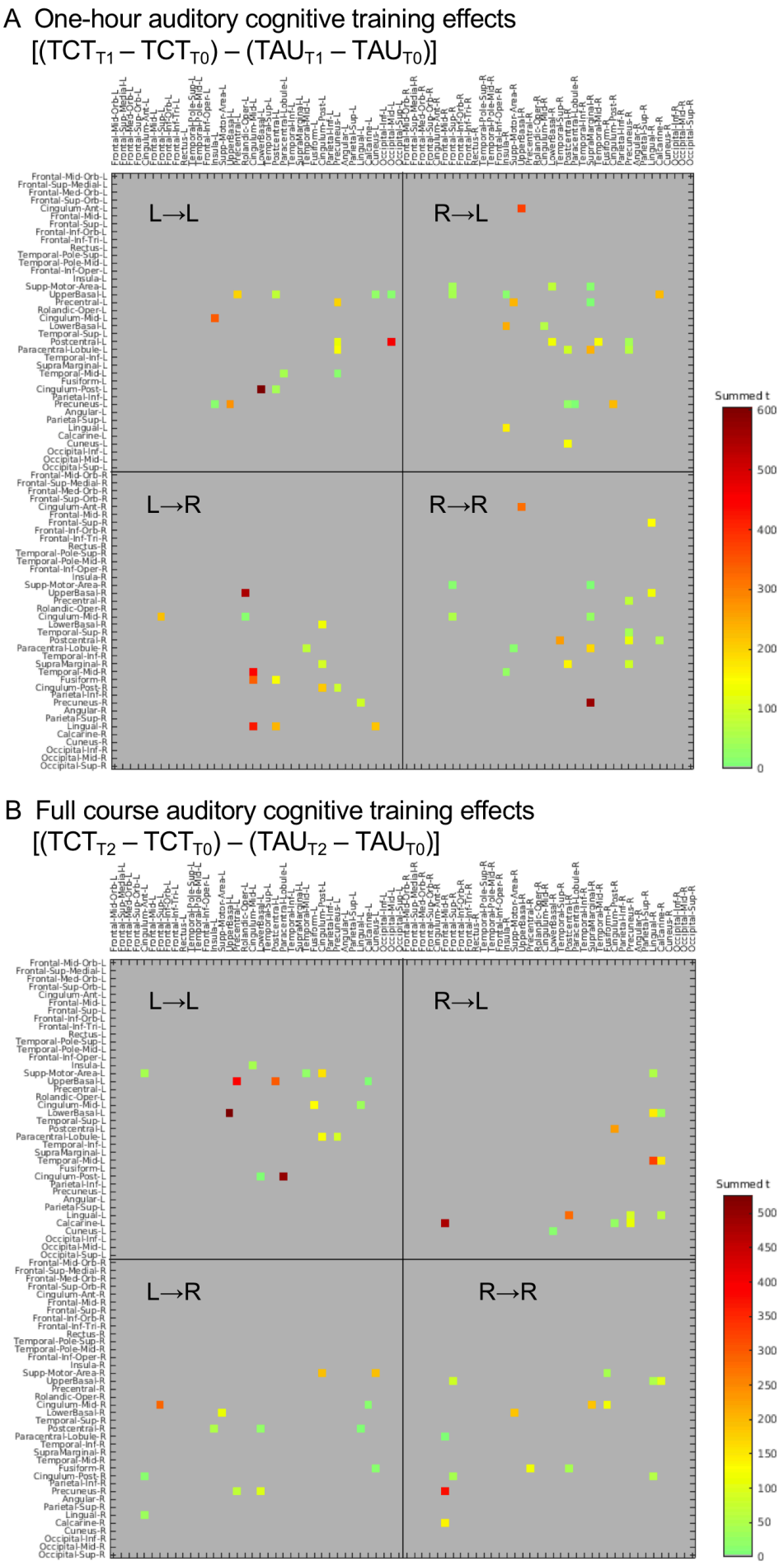

Figure 2 Connectivity matrix of 76 × 76 anatomical region of interests (ROIs)

Legend: The ROI at the top represents the starting point and the ROI at the side represents the ending point.

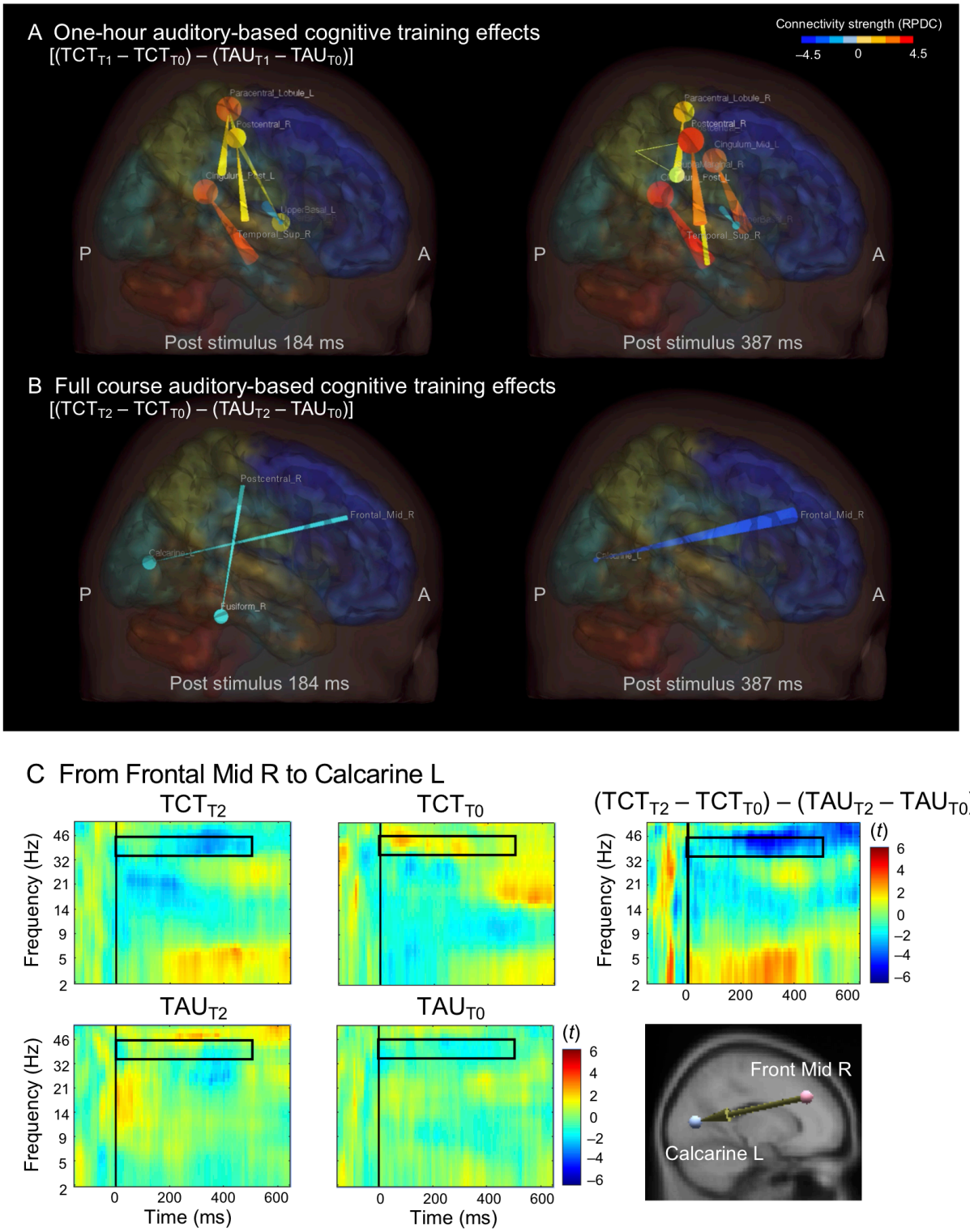

Figure 3 Effective connectivity of the effect of auditory-based cognitive training

Legend: One frame of the effective connectivity movie of the effect of (A) one-hour auditory-based cognitive training and (B) a full course training at 184 ms and 387 ms after the stimulus onset seen from a sagittal view. Effective connectivity of the effect of a full course training from the right middle frontal gyrus to a region near the left calcarine sulcus (C). Abbreviations: RPDC, renormalized partial directed coherence; A, anterior; P, posterior.

Figure 4 Effect of auditory-based cognitive training on neural networks and temporal dynamics underlying gamma oscillation

Legend: Neural networks formed by one-hour auditory cognitive training effects at post stimuli 1–250 ms (A) and 251–500 ms (B) and by full course auditory cognitive training effects at post stimuli 1–250 ms (C) and 251–500 ms (D). Temporal dynamics formed by one-hour auditory cognitive training effects (E) and by full course auditory cognitive training effects (F). Abbreviations: Cing Mid Dors, dorsal middle cingulate gyrus; Cing Mid Vent, ventral middle cingulate gyrus; Cing Post, posterior cingulate gyrus; Front Inf, inferior frontal gyrus; Front Mid, middle frontal gyrus; Front Sup; superior frontal gyrus; Occipit Mid, middle occipital gyrus; Rolandic, Rolandic operculum; RPDC, renormalized partial directed coherence; Supp Mot, Supple motor area; Supramarginal; supramarginal gyrus; Temp Sup, superior temporal gyrus.