First, we examined the effects of applying transcranial direct-current stimulation (tDCS) to the frontal cortex, and found improved error-monitoring and adaptive control behaviors in schizophrenia patients that were accompanied by normalized error-related negativity.

Second, we combined deep brain stimulation (DBS) with functional near-infrared spectroscopy (fNIRS) to observe the potential cortical and behavioral effects of DBS of the subthalamic nucleus (STN) in early stage of Parkinson’s disease. We found that frontal cortical activity increased during a working memory task with STN-DBS. However, there was no addition behavioral benefit above and beyond the dopaminergic medication in this group.

Third, we used a neuroplasticity-based brain fitness training to boost cognitive function in pediatric survivors of brain tumor and documented changes in frontal activity using fNIRS before and after training. Working memory and frontal cortical activity improved after 6-week brain fitness training.

Lastly, we demonstrate that the most effective, high-compliance and safe solution for improving cognitive, social and affective functioning in people with schizophrenia might lie in music. Music-making is a complex and multisensory, cognitive and social activity that promotes pro-social behavior and leads to brain reorganization. Hence, music-training is a readily available cognitive remediation strategy. Furthermore, singing (or speaking) inhibits auditory hallucinations that originate from inner-speech. We found beneficial effects of music training on working memory and social cognition across old and young participants.

In sum, these strategies provide excellent options for adjunct therapies in addition to traditional pharmacotherapy and suggest that there is a need for a more integrative and innovative treatment approaches to remediate and enhance human cognition at all levels of performance.

**Speaker 4: Daniel Javitt, USA**

**Title: Transcranial electrical stimulation (tES) for enhancement of neuroplasticity in schizophrenia**

**Abstract**

Treatments for brain dysfunction have relied traditionally on medication-based approaches. Non-invasive transcranial electric stimulation (tES) approaches such as transcranial direct current stimulation (tDCS) and transcranial alternating current stimulation (tACS) offer an alternative approach for psychiatric treatment. In this approach, low level (1–2 mA) currents are applied over appropriate brain regions to target specific symptoms of neuro psychiatric illness.

This presentation will discuss use of tDCS/tACS approaches in combination with neurophysiological measures such as EEG or event-related potentials (ERP) to target persistent cognitive deficits of schizophrenia, including impairments in learning, social cognition and reading ability related to basic auditory and visual impairments. Human and animal data will be compared to highlight underlying mechanisms. Finally, we will discuss use of tDCS to treat specific symptoms of schizophrenia, including persistent auditory hallucinations.

Overall, studies will demonstrate potential opportunities arising from tES-based treatment, as well as current challenges to widespread application.

**CPO1: Bipolar Disorders**

**Speaker: Lakshmi N. Yatham, Canada**

**Title: Contemporary challenges in the management of bipolar disorder**

**Abstract**

Bipolar disorder is a complex condition with different mood episodes, varied course, and increased incidence of comorbidity. Further, there are many areas of treatment where the data are inconsistent. Thus, it is not surprising that the management presents challenges for clinicians. This presentation will review some of the controversies in the management of bipolar disorder. For instance, whether antidepressants should be used for treating bipolar depression or not is a major area of controversy. Similarly, when manic patients improve on the combination of a mood stabilizer and an atypical antipsychotic, how long should the atypical antipsychotic be continued given their propensity to cause weight gain and metabolic side effects? These and other controversies in management will be addressed in this presentation.

**Speaker: Tadafumi Kato, Japan**

**Title: Diagnosis of bipolar disorder**

**Abstract**

Bipolar disorder is characterized by recurrent episodes of depression and (hypo)mania. Bipolar I disorder is diagnosed by the presence of mania in the course of illness, whereas bipolar II disorder is defined by the presence of depression and hypomania. Currently, the diagnosis of bipolar disorder is based solely on the clinical course, and therefore when the first episode is depression, it is diagnosed as major depression. Because some of antidepressants can cause manic switch and worsen the course of illness, earlier diagnosis is indispensable to improve the prognosis of bipolar disorder.

To enable biological diagnosis of bipolar disorder, numerous studies have been performed. Several lines of blood biomarkers have been proposed in mood disorders; serum/plasma brain derived neurotrophic factor, inflammatory cytokines including interleukin-6 and tumor necrosis factor alpha, and dexamethasone suppression test, among others. However, none of them can robustly discriminate bipolar disorder from unipolar depression. Recent neuroimaging studies suggest that structural magnetic resonance imaging (MRI) or functional MRI can potentially differentiate between bipolar disorder and unipolar depression. To discriminate bipolar depression from unipolar depression, Mitchell and colleagues proposed a probabilistic approach. In this approach, features more common in bipolar depression were several clinical features such as earlier age of onset, more prior depressive episodes, shorter depressive episodes, and a family history of bipolar disorder are more common in bipolar depression. Several symptomatic features such as atypical features (hypersomnia and hyperphagia), psychomotor retardation; psychotic features, and pathological guilt and lability of mood, may be more common in bipolar disorder. These features may be useful to discriminate bipolar depression from unipolar depression.

In the presentation, clinical diagnosis of bipolar disorder and future directions toward biological diagnosis bipolar disorder will be discussed.

**Reference**

Mitchell PB, Goodwin GM, Johnson GF, Hirschfeld RM. Diagnostic guidelines for bipolar depression: a probabilistic approach. Bipolar Disord. 10:144–152, 2008.