Resting state functional MRI is widely used for studying brain functional networks. However, in-scanner head movement and other non-neuronal noise can disproportionately bias connectivity estimates, despite various preprocessing efforts. To address these issues, the technique combining data acquisition with multiecho (ME) echo planar imaging and analysis with spatial independent component analysis (ICA), called ME-ICA, has been developed to distinguish BOLD (neuronal) and non-BOLD (artifactual) components based on linear echo-time dependence of signals, and has been demonstrated to successfully remove non-neuronal confounds. Nonetheless, such research approach has never been applied in psychiatric populations. The study aims to fill in the gap as shown in the following.

<table>
<thead>
<tr>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attention-deficit/Hyperactivity Disorder</td>
</tr>
</tbody>
</table>

**Study Type:** Observational

**Study Design:**
- Observational Model: Case Control
- Time Perspective: Cross-Sectional

**Official Title:** Addressing Motion and Confounds Issues in Resting fMRI- Application of Multi-echo EPI Scanning

Further study details as provided by National Taiwan University Hospital:
Primary Outcome Measures:

- Psychiatric Interview [Time Frame: 1 hour] [Designated as safety issue: No]

Subjects will be interviewed by Chinese Version of the Kiddie Epidemiologic version of the Schedule for Affective Disorders and Schizophrenia (K-SADS-E)

Enrollment: 80

Study Start Date: January 2015

Primary Completion Date: December 2015 (Final data collection date for primary outcome measure)

### Groups/Cohorts

<table>
<thead>
<tr>
<th>Group</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADHD group</td>
<td>Subjects with clinical diagnosis of ADHD according to the DSM-IV criteria</td>
</tr>
<tr>
<td>TD group</td>
<td>Typically development controls without lifetime diagnosis with ADHD</td>
</tr>
</tbody>
</table>

**Detailed Description:**

**Specific Aims:**

1. To replicate feasibility and efficacy of multi-echo fMRI in removal of non-neuronal confounds as shown in work of Kundu and colleagues (2012, 2013)

2. To characterize intrinsic functional connectivity (iFC) differences between adults with attention deficit hyperactivity disorder (ADHD) and healthy volunteers using ME-ICA denoising methods. Then compare the results with iFC differences derived from single-echo fMRI scan, in order to further separate "authentic" group differences from spurious findings introduced by non-neuronal confounds.

3. To explore the neural signature of in-scanner motion restlessness by comparing intrasubject differences in iFC between single-echo and multi-echo fMRI, and inter-subject differences between subjects of high- and low-motion levels.

The investigators plan to recruit 80 participants (40 adults with ADHD, 40 healthy control), without current and past history of any systemic physical illness, neither any major psychiatric disorder other than ADHD. All the participants will receive psychiatric interviews (The Chinese Version of the Kiddie Epidemiologic version of the Schedule for Affective Disorders and Schizophrenia, K-SADS-E). They will receive the Wechsler Adult Intelligence Scale-3rd edition (WAIS-III) first to ensure their full-scale IQ greater than 80. The MRI assessments (T1 imaging, single-echo echo planar imaging (EPI) and multi-echo EPI resting-state fMRI) will be subsequently arranged within 2 weeks after psychiatric/neuropsychological assessments.

This study (1) will be the first report in Taiwan in terms of implementation of multi-echo EPI for denoise; (2) will be the first report in the world on the functional connective differences using multi-echo EPI; (3) will provide further evidence about the mechanism underpinning in-scanner motion restless and improve specificity of motion biomarkers by using multi-echo EPI.
Eligibility

Ages Eligible for Study: 18 Years to 35 Years
Genders Eligible for Study: Both
Accepts Healthy Volunteers: No
Sampling Method: Non-Probability Sample

Study Population
The sample consists of 40 adults with ADHD and 40 age-, sex- matched healthy volunteers.

Criteria

Inclusion Criteria:
1. Subjects who have clinical diagnosis of ADHD according to the DSM-IV and DSM-5 diagnostic criteria

Exclusion Criteria:
1. Systemic medical illness
2. Current symptoms or lifetime history of DSM-5 diagnosis of mood disorder, any psychotic disorder, substance use disorder, learning disability, pervasive developmental disorder, claustrophobia, obsessive compulsive disorder, or mental retardation.
3. With neurodegenerative disorder, epilepsy, involuntary movement disorder, congenital metabolic disorder, brain tumor, history of severe head trauma, and history of craniotomy;
4. Full-scale IQ < 80.

Contacts and Locations
Choosing to participate in a study is an important personal decision. Talk with your doctor and family members or friends about deciding to join a study. To learn more about this study, you or your doctor may contact the study research staff using the Contacts provided below. For general information, see Learn About Clinical Studies.

Please refer to this study by its ClinicalTrials.gov identifier: NCT02720562

Sponsors and Collaborators
National Taiwan University Hospital

Investigators

Principal Investigator: Hsiang-Yuan Lin, MD
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Study Director: Susan Shur-Fen Gau, MD, PhD
National Taiwan University Hospital & College of Medicine

More Information

No publications provided

Responsible Party: National Taiwan University Hospital
ClinicalTrials.gov Identifier: NCT02720562 History of Changes
Other Study ID Numbers: 201406032RINB
Study First Received: March 22, 2016
Last Updated: March 25, 2016
Health Authority: Taiwan: Ministry of Health and Welfare

Additional relevant MeSH terms:
Attention Deficit Disorder with Hyperactivity
Attention Deficit and Disruptive Behavior Disorders
Mental Disorders
Mental Disorders Diagnosed in Childhood

ClinicalTrials.gov processed this record on March 28, 2016