significant improvements in the variables of the WCST. There were significant decreases in fALFF in regions including the lingual gyrus, supramarginal gyrus, cingulate gyrus, precuneus, and middle frontal gyrus. Positive correlations were observed between changes in the CBCL scores and fALFF. Only the repetitive assault group showed significant decreases in CBCL scores and fALFF.

Conclusions: The present results indicate that this anti-bullying intervention had positive effects on executive function and behavior that were associated with functional changes in brain activity.

PM341
Magnetoencephalography as a potential candidate to detect treatment effect of dyslexia
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Abstract
Background: Dyslexia is a specific learning disability that is neurobiological in origin. It is characterized by difficulties with accurate and/or fluent word recognition and by poor spelling and decoding abilities. Most established dyslexia treatments focus on remedial education and providing psychological and social support. Apart from such remedial education treatments, pharmacological approaches include piracetam are limited for social support. However, there were few studies about effect of treatment assessed by biological marker reflecting underlining brain function. There is a necessity of established biological markers detecting changes of brain function responding to treatment for dyslexia.

Objective: We conducted magnetoencephalography (MEG) while reading in order to identify biological markers to assess dyslexic state.

Methods: Fourteen dyslexic and 10 control children participated in this study. Ages were 6 to 14 years old. Tasks consisted of real word, non-word and picture (line drawing). Subjects were asked to read aloud during word tasks and name the picture during picture task. Objects consisting of 2–5 morae were presented for 4 seconds. In all sessions, stimulus was presented in 107 patterns respectively. MEG data were recorded in spine position by 306ch whole-head type MEG. We calculated MNE (Minimum norm estimation) and dSPM (dynamic statistical parametric mapping) from averaged gradiometer data.

Result: In non-word task, dSPM of dyslexia group showed declined activity in bilateral temporal and frontal lobes. On the other hand, in picture naming task, dSPM and MNE of right inferior frontal lobe showed increased activity in dyslexia.

Conclusion: MEG is potentially a good candidate of biological marker for assessment of dyslexic children. However, patterns of brain activities of dyslexic children are heterogeneous and it suggested necessity of a large study and subclassification of dyslexia in order to better assess dyslexic state and potential treatment response.

PM342
Treatment effect of Methylphenidate on Functional Brain Network in children with ADHD: findings from multivariate pattern analysis
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Abstract
Objective: The aim of this study is to investigate the treatment effect of methylphenidate on functional brain network in children with ADHD using multivariate pattern analysis

Subjects and Methods: From 20 medication-naïve ADHD children, resting state functional magnetic resonance imaging was acquired before methylphenidate prescription and 4 weeks later. Using publicly available template consisting 10 resting state-related functional networks (RSFNs) and 10 noise components, spatial maps of 10 RSFNs and their functional connectivities were calculated. The medication effects were investigated using network-based statistics, dual regression, graph theory, and random Forest as well as amplitude of low frequency functional fluctuation (ALFF/fALFF).

Results: The medication effects were found in increased ALFF of superior parietal lobe, increased functional connectivity of right fronto-parietal (F-P) RSFN with insula and visual RSFN with various regions including both superior parietal lobe, increased clustering coefficients of right F-P and decreased betweeness centrality of left F-P. In random Forest analysis, improvement of K-ARS were explained with changes in functional changes of lateral visual – sensory/motor, executive control – cerebellum, auditory – right F-P, left F-P – cerebellum, and executive control – default mode network.

Conclusions: Our multivariate approach using random Forest indicates the clinical improvement after methylphenidate medication was explained with combination of several interaction among RSFNs, especially functional connection of F-P with other RSFNs.

Key words: ADHD, resting state, fMRI, Machine learning, multimodal data, functional connectivity, methylphenidate, treatment effect

PM343
Functional magnetic resonance imaging study on neural aspects of cognitive and emotional empathy in autism spectrum disorder
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Abstract
Objective: The essential feature of autism spectrum disorder (ASD) is impairment in social interaction. Empathic ability plays a key role in social relationship. Recent evidence supposed that there are two systems for empathy: cognitive and emotional. We purposed to elucidate psychological aspects and brain activity in ASD from the viewpoint of cognitive and emotional empathy.

Methods: 17 individuals with ASD and 22 age- and sex-matched healthy comparison individuals were scanned with functional magnetic resonance imaging (fMRI) during both cognitive and emotional empathy tasks. Differences in brain activation between two groups were assessed by contrasting neural activation during the tasks.

Results: During both cognitive and emotional empathy tasks, ASD subjects showed greater neural activities in the bilateral cuneus (Brodmann area 18) compared to control subjects.
And they showed more activation in the bilateral precuneus (Brodmann area 7) only during emotional empathy task. There was no brain region more activated in control subjects during cognitive empathy task. But while carrying out emotional empathy task, control subjects exhibited greater neural activities in the left middle frontal gyrus (Brodmann area 46) and right anterior cingulate gyrus (Brodmann area 32) than ASD subjects.

**Conclusion:** This fMRI study suggested that the brain regions associated with cognitive and emotional empathy in ASD differed from those in healthy individuals. The results of this study might provide some explanation for impaired empathic ability in autism. Further research will be needed to investigate more definite neurobiology of ASD in terms of empathy.

**PM344**
Association between peripheral cytokine levels and cognitive abilities in children with autism spectrum disorder

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**Abstract**

**Objective:** Accumulating data in the literature suggest that cytokines may be one of the factors influencing cognitive development of autism spectrum disorder (ASD). The present study investigated whether cytokines influence cognitive development in children with ASD.

**Methods:** The Wechsler Intelligence Scale for Children (WISC-III or WISC-IV depending on the time of testing) was administered to 14 children with ASD (9 boys and 5 girls; mean age (standard deviation) = 11.6 (2.1) years). The serum levels of 10 cytokines (granulocyte macrophage colony-stimulating factor, interferon-γ, interleukin (IL)-1β, IL-2, IL-4, IL-5, IL-6, IL-8, IL-10, and tumor necrosis factor-α) were examined using the Human Ultrasensitive Cytokine Magnetic 10-Plex Panel for the Luminex platform. Each serum sample was assayed in duplicate, and all samples were run on the same assay. The relationships between WISC scores and serum levels of the cytokines were examined.

**Results:** The serum level of IL-6 was significantly negatively correlated with IQ in children who were administered the WISC-III (p < 0.001) as well as in those administered the WISC-IV (p < 0.01). Significant correlation of serum IL-6 levels with IQ was also observed when children administered the WISC-III and those administered the WISC-IV were analyzed together (p < 0.001). No other cytokines were significantly correlated with IQ.

**Conclusions:** The present results suggest that peripheral IL-6 levels are negatively correlated with cognitive development in children with ASD. Although the mechanisms underlying the association between cytokines and cognitive development remain to be clarified, our preliminary findings add to the evidence that cytokines may be involved in the neural development of ASD.

**PM345**
Resveratrol Suppresses Neuroinflammation in the Experimental Paradigm of Autism Spectrum Disorders

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**Abstract**

**Objective:** Neuroinflammation triggered by the stimulation of matrix metalloproteinases and the subsequent release of pro-inflammatory cytokines, as a result of oxidative stress and mitochondrial dysfunction, leads to neuronal dysfunction and is one of the probable mechanisms involved in the pathogenesis of autism spectrum disorders (ASD). The aim of the present study was to explore the ameliorative potential of resveratrol on neuroinflammation in the experimental paradigm of neuroinflammatory model of ASD in rats.

**Method:** 1M Propanoic acid (PPA)(4µl) was infused over 10 minutes into the anterior portion of the lateral ventricle to induce ASD like symptoms in rats. Resveratrol (5, 10 and 15mg/kg) was administered starting from the 2nd day of the surgery and continued upto 28th day. Rats were tested for various behavioural paradigms such as social interaction, stereotypy, locomotor activity, anxiety and novelty, depression, spatial learning and memory, repetitive and pervasive behaviour between the 7th day and 28th day. In addition, biochemical tests for oxidative stress, mitochondrial complexes, TNF-α and MMP-9 were also assessed.

**Results:** Intracerebroventricular injection of propanoic acid produced neurological, sensory, behavioural, biochemical and molecular deficits which were assessed as endophenotypes of autism spectrum disorders. Continued treatment with resveratrol for four weeks restored, significantly and dose dependently, all these endophenotypes in PPA induced ASD in rats.

**Conclusion:** The major finding of the study is that resveratrol restored the core and associated symptoms of autistic phenotype by suppressing oxidative-nitrosative stress, mitochondrial dysfunction, TNF-α and MMP-9 expression in PPA induced ASD in rats. Therefore, resveratrol might serve as an adjunct potential therapeutic agent for amelioration of neurobehavioural and biochemical deficits associated with autism spectrum disorders.

**Keywords:** Autism spectrum disorders (ASD), resveratrol, neurobehavioural, oxido-nitrosative stress, TNF-α, MMP-9

**PM346**
Social defeat stress as juveniles impairs persistent social behaviors and neurogenesis

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**Abstract**

**Objective:** Adverse childhood experiences, including physical abuse, often have negative physical and mental health consequences later in life. In the present study, we investigated the influence of social defeat stress as juveniles on emotional behaviors, and also the causal role of glucocorticoids in neurogenesis of mice exposed to the stress.

**Methods:** The juvenile and adult male C57BL/6J mice were exposed to social defeat stress induced by exposure to an aggressive ICR mouse for 1, 5, or 10 consecutive days. We assessed social behaviors, serum glucocorticoid levels, and hippocampal neurogenesis in mice exposed to social defeat stress. Mifepristone, a glucocorticoid receptor antagonist, was administrated 15 min prior to each social defeat stress trial for 10 consecutive days.