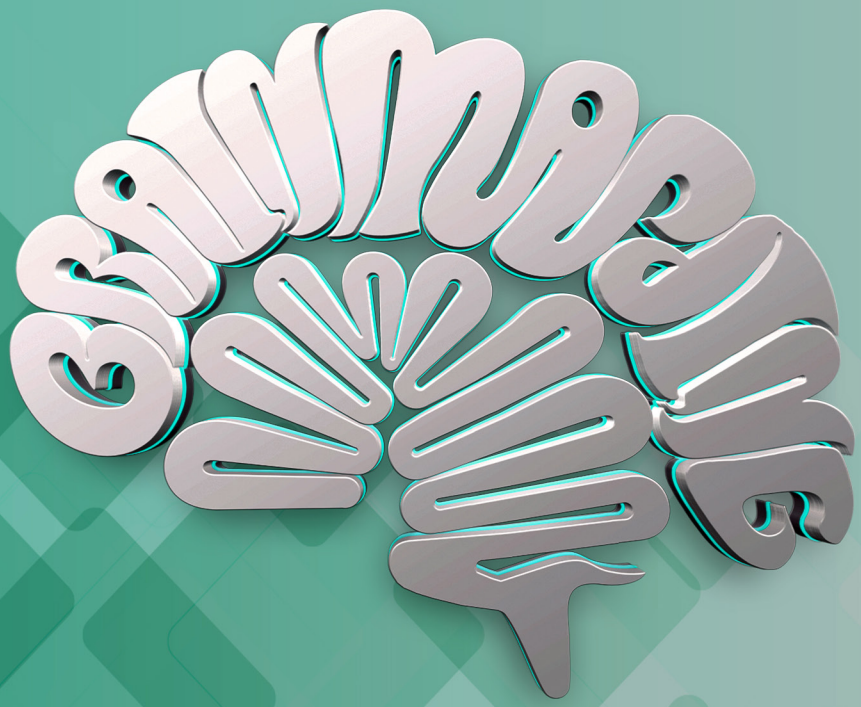
انجمن علوم و فن آوری های شناختی ایران
Iranian Society for Cognitive Science & Technology

دانشگاه شهید بهشتی ۱۳۳۸
Shahid Beheshti University



humanbrainmapping.ir

# 5th Iranian Human Brain Mapping Congress

# پنجمین همایش نقشه برداری مغز ایران

29 September - 1 October 2018 / ۹-۷ مهر ۱۳۹۷

مرکز همایشهای بین المللی ابوریحان-دانشگاه شهید بهشتی

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# WELCOME MESSAGE

**Mojtaba Zarei**
MD, PhD, FRCP (Lond.)

**Dear Brain Mappers,**

It is a pleasure to welcome you to the 5th Iranian Human Brain Mapping Congress, which is held in Shahid Beheshti University from 29th September to 1st October 2018. We hope you can join us!

Shahid Beheshti University is the fastest growing university in Iran with emphasis on human resources and new technologies. SBU is the home for Brain Mapping in Iran. We established the National Brain Mapping Centre in 2013 in this University, which later transformed into a larger institution under the name of Institute of Medical Science and Technology.

Since then, our community has grown considerably, so has our international collaborations and our ambitions to do more.

Given the interdisciplinary nature of brain mapping science, each year we welcome scientists with different backgrounds including neuroscience, medical sciences, bioengineering, mathematics, biophysics, psychology, computer science, etc. It has become the highlight of our activity when students and senior researchers, clinicians and scientists, policymakers and policy users are all getting together to discuss new findings and advanced technologies in the field of brain sciences. Our main endeavor is for the younger generation to get inspired by those who dedicated their lives to the advancement of science in order to alleviate human suffering. This year we continue our slogan: “Brain Mapping: From Molecule to Medicine”.

If brain mapping has taught us only one thing, that would be the importance of networks for optimal functioning. For this reason and many more, we welcome international scientific collaboration. Iran has so much to offer in neuroscience in general, and brain mapping in particular. There is a wealth of talent and energy among our educated youth, which should be put into a good cause with appropriate mentorship and guidance. In recent years, many high quality clinical researches have been published in prestigious medical journals because of access to a wide range of patients and their keen participation in research. We hope that this can be extended further.

I encourage you to engage with our participants to develop your own line of contact and to establish new networks to enhance your research. If there is anything that I can do to help, do not hesitate to contact me. I hope you enjoy the program and the social interaction.

Prof. Mojtaba Zarei
Chairman of IHBM 2018

| (29th September) | Sunday (30th September) | Monday (1st October) |
|---|---|---|
| **7:30-8:30** | | |
| Registration | | |
| **Welcome** | - | - |
| **8:30-8:45** | **9:00-10:00** | **9:00-10:00** |
| ***Mojtaba Zarei (Shahid Beheshti University):*** Introduction | ***Abass Alavi (University of Pennsylvania):*** What Can and What Cannot Be Accomplished with Modern Imaging Techniques, Rectifying Ongoing Misconceptions | ***Martin Walter (University of Tubingen):*** Translational Neuroimaging in Treatment Resistant Depression |
| **Chair: Zarei & Thompson** | **Chair: Aghamiri & Vafaee** | **Chair: Walter & Pouretemad** |
| **9:00-10:00** | **10:00-11:00** | **10:00-11:00** |
| ***Paul Thompson (University of Southern California):*** ENIGMA, Big Data & the Brain: Imaging & Genetics in 50,000 Individuals from 35 Countries | ***Poul Flemming Høilund-Carlsen (University of South Denmark):*** Updates on Molecular Imaging in Medicine | ***Hamidreza Pouretemad (Shahid Beheshti University):*** Updates on Autism research |
| **10:00-11:00** | | **10:00-11:00** |
| ***Simon Eickhoff (University of Dusseldorf & Julich Research Center):*** Integrating Brain-Mapping and Machine-Learning: New Perspectives? | | ***Amir Omidvarnia (University of Melbourne):*** Concurrent EEG-fMRI Analysis for Pre-Surgical Planning of Refractory Epilepsy |
| **11:00-11:30** | ***Break-Time & Poster Presentations*** | |
| **Chair: Eickhoff & Yousefi** | **Chair: Noorzadeh & Ghalei** | **Chair: Mahmoudian & Salamat** |
| **11:30-12:00** | **11:30-12:00** | **11:30-12:00** |
| ***Habib Ganjgahi (University of Oxford):*** ENIGMA, Modelling Genetically-Induced Dependence in Studies of Families and "Unrelated" Individuals | ***Mahdieh Ghasemi (University of Neyshabur):*** Machine Learning Methods on Resting State fMRI Network in Parkinson's Disease | ***Saeid Mahmomoudian (Iran University of Medical Sciences):*** Auditory Change Detection Process Using Speech Stimuli in Children with Cochlear Implant |
| **12:00-12:30** | **12:00-12:30** | **12:00-12:30** |
| ***Nahid Zokaei (University of Oxford):*** Rapid Forgetting in Health and Disease | ***Saman Noorzadeh (Shahid Beheshti University):*** Neurofeedback: Using Technology to Train the Brain | ***Behrouz Salamat (Shahid Beheshti University):*** 3D Electrical Multi Delayed Stimulation of IC to Improve Auditory Perception by Using Auditory Midbrain Implant |
| **12:30-13:00** | **12:30-13:00** | **12:30-13:00** |
| ***Masoud Tahmasian (Shahid Beheshti University):*** Neuroimaging Meta-Analyses of Sleep Disorders | ***MirShahram Safari (Shahid Beheshti University of Medical Sciences):*** Cortical Microcircuit Mapping: Electrophysiological Profiling of Neocortical Neural Subtypes | ***Mehrnaz Mohebbi (Iran University of Medical Sciences):*** The Potential Role of Auditory Prediction in Decompensated Tinnitus: An Auditory Mismatch Negativity Study |
| | | **12:30-13:00** |
| | | ***Samer Mohsen (Iran University of Medical Sciences):*** Top-down Modulation of Tinnitus-related Networks Activity using Transcranial Random Noise Stimulation |
| **13:00-14:00** | ***Lunch*** | |

| Chair: Khosrowabadi & Bigdeli | Chair: Faghihroohi & Haghighi | Chair: Ghassemian & Mahdiani |
|---|---|---|
| **14:00-14:30** | **14:00-14:30** | **14:00-14:30** |
| ***Mohamadreza Bigdeli (Shahid Beheshti University):*** The Impact of MicroRNA-1 on Neuroprotection in Animal Stroke Model | ***Sahar Javaher Haghighi (Shahid Beheshti University):*** Auditory Steady State Response and Other Cerebral Signals in Monitoring Depth of Anaesthesia | ***Hossein Dini (Amirkabir University of Technology):*** EEG Power Spectral Density Investigation in Children with ADHD and Matched Controls |
| | | **14:00-14:30** |
| | | ***Elaheh Hatamimajoumerd (Shahid Beheshti University):*** Neuro-Temporal Signature of Low-Level Features in Human Object Vision: an MEG Study |
| **14:30-15:00** | **14:30-15:00** | **14:30-15:00** |
| ***Reza Khosrowabadi (Shahid Beheshti University):*** Neural Correlates of Intelligence | ***Shahrooz Faghihroohi (Shahid Beheshti University):*** fMRI Image Reconstruction and Localization Using Compressive Sensing | ***Hamidreza Ostadrahimi (Tehran University of Medical Sciences):*** Attention Deficit Relates to White-Matter Disturbances in Schizophrenia |
| | | **14:30-15:00** |
| | | ***Zahra Amirsardari (Tehran University of Medical Sciences):*** Cognitive Dysfunction in Patients with Chronic Migraine |
| **15:00-15:30** | **15:00-15:30** | **15:00-15:30** |
| ***Habib Allah Dadgar (Imam Reza International University):*** $^{[18F]}$FET-PET in Gliomas: Comparison with MRI and CT | ***Sina Salehi (Shiraz University of Medical Sciences):*** Electro-corticography, an Advanced Technic for High Precision Human Brain Mapping | ***Narges PourShahrokhi (Shahid Beheshti University):*** Quantitative Assessment of Parkinson Disease Using Wearable Sensing System |
| | | **15:00-15:30** |
| | | ***Bahareh Ahkami (Amirkabir University of Technology):*** A Comparison Between EOG Artefact Removal from EEG Signals Using Modified ICA-RLS Filtering and ICA-Correlation Method |

**15:30-16:00** — ***Break-Time & Poster Presentations***

| Chair: Ganjgahi & Tahmasian | Chair: Zokaie & Omidvarnia | |
|---|---|---|
| **16:00-16:15** | **16:00-16:15** | **16:00-18:00** |
| ***Zahra Namvarpour (Institute for Cognitive Sciences Studies):*** Quantitative EEG Features For Characterizing Autistic Spectrum Disorder | ***Somayeh Maleki (Shahid Beheshti University):*** Link Between Regional Neuronal Metabolism Impairment and Aberrant Inter-Regional Functional Connectivity in Patients with MCI or AD | ***Iranian Society for Cognitive Science and Technology (General Assembly)*** |
| **16:15-16:30** | **16:15-16:30** | |
| ***Esmail Mohammadi (Tehran University of Medical Sciences):*** Sleep-Disordered Breathing may Alter Grey Matter Volume and Glucose Metabolism of the Default Mode Network in AD and MCI Patients | ***Shahrzad Kharabian Masouleh (Research Centre Jülich):*** Empirical evidence of a replicability crisis in linking psychological variables to brain structure: causes, consequences and recommendations | |
| **16:30-16:45** | **16:30-16:45** | |
| ***Maryam Haghshomar (Tehran University of Medical Sciences):*** White Matter Changes Correlates of Peripheral Neuroinflammation in Patients with Parkinson's Disease | ***Mostafa Mahdipour (Amirkabir University of Technology):*** Comparison Stability and Repeatability Between ICA Algorithms Using ICASSO | |
| **16:45-17:00** | **16:45-17:00** | |
| ***Elham Sadat Seyed Javad Javaheri (Shahid Beheshti University):*** The role of NMDA Receptor in Anterior Cingulate Cortex-Caudate Putamen Circuit Performance Involved in Autistic-Like Behaviors Induced by Maternal Deprivation | ***Ziba Arjoumand (Islamic Azad University-Tehran):*** EEG Signals Analysis Using Non-linear Dimension Reduction Method and Support Vector Machine for Monitoring the Depth of Anesthesia | |
| **17:00-18:00** | **17:00-18:00** | |
| ***Panel Q&A*** (Paul Thompson, Simon Eickhoff, Mojtaba Zarei) | ***Panel Q&A*** (Martin Walter, Behrooz Yousefi, Manouchehr Vafaee, Mojtaba Zarei) | |

# CHAIRS

**Program Chair**

## Mojtaba Zarei MD, PhD, FRCP (Lond.)

Professor of Neuroscience and Neurology
Institute of Medical Science and Technology
Shahid Beheshti University, Tehran, Iran

**Scientific Chair**

## Masoud Tahmasian MD, PhD

Assistant Professor of Neuroscience, Institute of Medical Science and Technology, Shahid Beheshti University, Tehran, Iran

**Executive Chair**

## Behrouz Salamat PhD

Assistant Professor of Neuroscience, Institute of Medical Science and Technology, Shahid Beheshti University, Tehran, Iran

# SCIENTIFIC COMMITTEE MEMBERS

| | |
|---|---|
| Aghamiri, Seyyed Mahmoud | Professor, School of Nuclear Engineering, Shahid Beheshti University, Tehran, Iran |
| Alavi, Abbas | Professor of Nuclear Imaging, Department of Nuclear Medicine and Neurology, University of Pennsylvania, Pennsylvania, USA |
| Alavi, Seyyed Mohammad Mahdi | Assistant Professor, Institute of Medical Science and Technology, Shahid Beheshti University, Tehran, Iran |
| Bigdeli, Mohammadreza | Professor of Physiology, Faculty of Biological Science, Shahid Beheshti University, Tehran, Iran |
| Borhani, Khatereh | Postdoctoral Researcher, Institute of Cognitive and Brain Sciences, Shahid Beheshti University, Tehran, Iran |
| Eickhoff, Simon | Institute for Systems Neuroscience, Heinrich-Heine-Universitaet Duesseldorf, Düsseldorf, Germany |
| Eshaghi Gordji, Madjid | Professor, Department of Mathematics, University of Semnan, Semnan, Iran |
| Faghihroohi, Shahrooz | Post-doctoral Fellow at the Institute of Medical Science and Technologies (IMSAT), Shahid Beheshti University, Tehran, Iran |
| Flemming Høilund-Carlsen, Poul | Professor, Department of Nuclear Medicine, South Denmark University, Denmark |
| Ganjgahi, Habib | Research Scientist, Department of Statistics, University of Warwick and Oxford, United Kingdom |
| Ghalei, Mohammad | Associate Professor of Radiochemistry, Insitute of Medical Science and Technology, Shahid Beheshti University, Tehran, Iran |
| Ghasemian, Mona | Assistant Professor, School of Computer Sciences, Shahid Beheshti University, Tehran, Iran |
| Ghasemi, Mahdieh | Assistant Professor of Bioelectric, Department of Electrical Engineering, University of Neyshabur |
| Gjedde, Albert | Professor of Neurobiology and Pharmacology, University of Copenhagen, Denmark |
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| Kamrani, Ehsan | Assistant Professor, Institute of Medical Science and Technology, Shahid Beheshti University, Tehran, Iran |
| Kashani, Alireza | Assistant Professor, Insitute of Medical Science and Technology, Shahid Beheshti University, Tehran, Iran |
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| Mahdiani, Hamidreza | Assistant Professor, School of Computer Science, Shahid Beheshti University, Tehran, Iran |
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| Mazaheri, Mohammad Ali | Professor, School of Psychology and Education, Shahid Beheshti University, Tehran, Iran |
| Mohammadzadeh, Mohammad | Assistant Professor, School of Nuclear Engineering, Shahid Beheshti University, Tehran, Iran |
| Nejati, Vahid | Associate Professor, Institute of Cognitive and Brain Sciences, Shahid Beheshti University, Tehran, Iran |
| Noorzadeh, Saman | Research Fellow at the Institute of Medical Science and Technologies (IMSAT), Shahid Beheshti University, Tehran, Iran |
| Omidvarnia, Amir | Senior Post-doctoral Researcher, University of Melbourne, Parkville, Australia |
| Pouretemad, Hamidreza | Professor of Clinical Neuropsychology, Institute of Cognitive and Brain Sciences, Shahid Beheshti University, Tehran, Iran |
| Sadeghi, Vahid | Assistant Professor, School of Psychology and Education, Shahid Beheshti University, Tehran, Iran |
| Salamat, Behrouz | Assistant Professor of Neuroscience, Institute of Medical Science and Technology, Shahid Beheshti University, Tehran, Iran |
| Tahmasian, Masoud | Assistant Professor Neuroscience, Institute of Medical Science and Technology, Shahid Beheshti University, Tehran, Iran |
| Thompson, Paul | Professor of Neurology & Psychiatry, Imaging Genetics Center, University of South California, USA |
| Vafaee, Manouchehr | Associate Professor of Nuclear Medicine and Clinical Physiology, Department of Nuclear Medicine And Clinical Physiology, University of Southern Denmark, Denmark |
| Walter, Martin | Department of General Psychiatry and Psychotherapy, University of Tuebingen, Germany |
| Yoonessi, Ali | Assistant Professor, School of Advanced Studies, Tehran University of Medical Sciences, Tehran, Iran |
| Zarei, Mojtaba | Professor of Neuroscience and Neurology, Institute of Medical Science and Technology, Shahid Beheshti University, Tehran, Iran |
| Zokaei, Nahid | Department of Experimental Psychology, Oxford University, London |

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Amirpour, Mohammadreza
Aqakarimi, Zahra
Davoodi, Diba
Ebrahimi, Leila
Esmaeili, Akram
Faghihi, Omid
Farhang, Faeze
Habibi, Sahar
Heydarzadeh Azar, Armin
Karimpour, Mohammad
Mahdipour, Mostafa
Maleki, Somayeh
Moosavi, Taha
Nikbakht, Haniyeh
Razzaghi, Maryam
Sajedi, Afarin
Salili, Narges
Shahmoradi, Negin
Sharifi, Hamidreza
Soltaninejad, Zahra
Soluki, Solmaz

# SPEAKERS

## Alavi, Abbas MD, PhD, DSc

Professor of Nuclear Imaging, Department of Nuclear Medicine and Neurology, University of Pennsylvania, Pennsylvania, USA

## Thompson, Paul MD, PhD

Professor of Neurology & Psychiatry, Imaging Genetics Center, University of South California, USA

## Flemming Høilund-Carlsen, Poul MD

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## B. Eickhoff, Simon MD, PhD

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## Walter, Martin PhD

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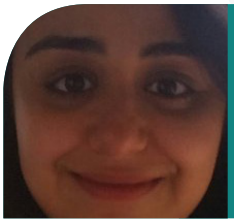
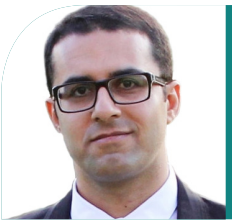


## Zokaei, Nahid

Department of Experimental Psychology, Oxford University, London

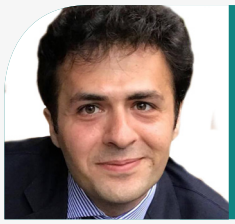
## Zarei, Mojtaba MD, PhD, FRCP (Lond.)

Professor of Neuroscience and Neurology, Institute of Medical Science and Technology, Shahid Beheshti University, Tehran, Iran



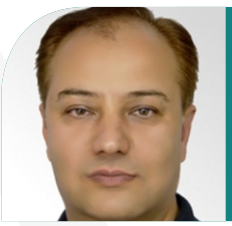
## Omidvarnia, Amir PhD

Senior Post-doctoral Researcher, University of Melbourne, Parkville, Australia



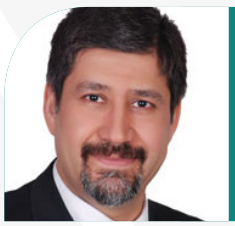
## Ganjgahi, Habib PhD

Research Scientist, Department of Statistics, University of Warwick and Oxford, United Kingdom



## Yousefi, Behrooz PhD

PI Nuclear Medicine and Radiopharmacy, Department of Nuclear Medicine, Technical University of Munich, Munich, Germany



## Pouretemad, Hamidreza PhD

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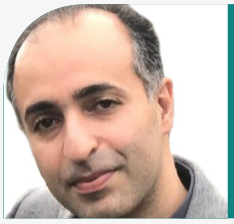

## Faghihroohi, Shahrooz PhD

Post-doctoral Fellow at the Institute of Medical Science and Technologies (IMSAT), Shahid Beheshti University, Tehran, Iran

## Noorzadeh, Saman PhD

Research Fellow at the Institute of Medical Science and Technologies (IMSAT), Shahid Beheshti University, Tehran, Iran

## Safari, MirShahram PhD

Neuroscience Research Center, Shahid Beheshti University of Medical Sciences, Tehran, Iran

# WORKSHOPS

## EEG Workshop

| Date | Lecturer | Location |
|---|---|---|
| 26-27 September 2018 | • Reza Khosrowabadi<br>• Sahar Javaher Haghighi<br>• Saman Noorzadeh<br>• Sepideh Farmani | Shahid Beheshti University, International Conference Center (SBUICC) |

## Neuroimaging Meta-Analysis

| Date | Lecturer | Location |
|---|---|---|
| 28 September 2018 | • Simon B Eickhoff<br>• Masoud Tahmasian | Shahid Beheshti University, International Conference Center (SBUICC) |

## Functional and Structural Magnetic Resonance Imaging

| Date | Lecturer | Location |
|---|---|---|
| 2-4 October 2018 | • Mojtaba Zarei<br>• Masoud Tahmasian<br>• Habib Ganjgahi<br>• Reza Khosrowabadi<br>• Shahrooz FaghihRoohi | Shahid Beheshti University, International Conference Center (SBUICC) |

Shahid Beheshti University

Kermanshah University of Medical Sciences

# EEG Workshop

## Acquisition and Analysis of EEG, ERP, and Neurofeedback

**Reza Khosrowabadi PhD.**
Biomedical Engineering from Nanyang Technological University, Singapore.

**Sahar Javaher Haghighi, PhD.**
Bioelectrical Engineering from University of Toronto, Canada.

**Saman Noorzadeh, PhD.**
Biomedicpal Engineering from University of Grenoble Alpes, France.

**Sepideh Farmani**
Institute for Research in Fundamental Science (IPM)

Iranian Human Brain Mapping Congress

# 5th Congress of the Iranian Human Brain Mapping

## Theoretical and Practical Sessions on Matlab, and EEGLab

More Info and Registration:
Humanbrainmapping.ir
(021)29905801

26 - 27 September 2018
۵-۴ مهر ماه ۱۳۹۷

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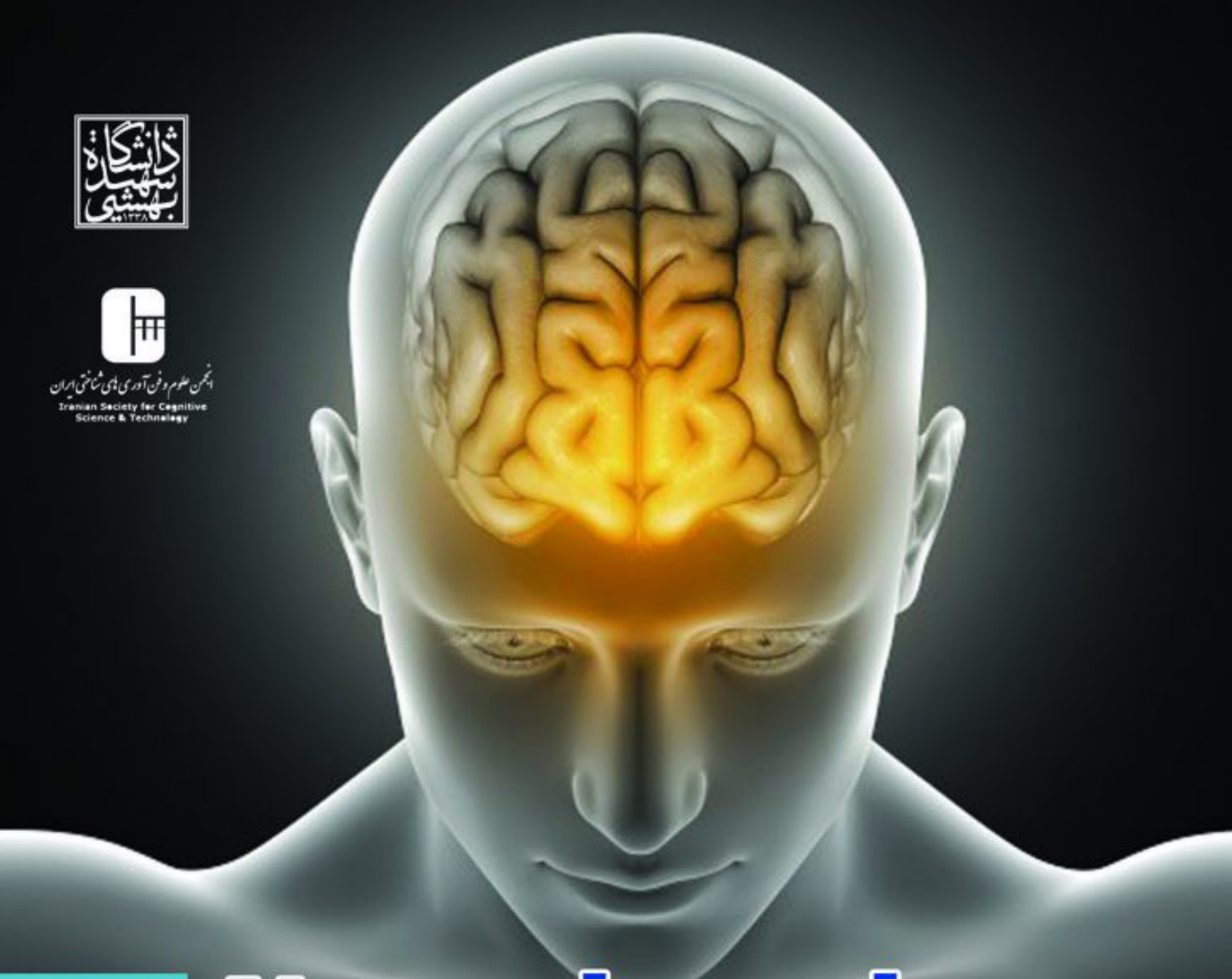

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Iranian Society for Cognitive Science & Technology

# Neuroimaging Meta-Analysis

## Half day Workshop

5Th Iranian Human Brain Mapping Congress
پنجمین همایش نقشه برداری مغز ایران

*Friday 28th September 2018*
*6th Mehr 1397 (14:00-19:00)*

Shahid Beheshti University, Tehran-IRAN

***Speakers:***

**Simon Eickhoff MD, PhD**
Institute for Clinical Neuroscience and Medical Psychology, Heinrich-Heine University Dusseldorf, Germany

**Masoud Tahmasian MD, PhD**
Shahid Beheshti University, Tehran, Iran

Shahid Beheshti University

Kermanshah University of Medical Sciences

Iranian Society for Cognitive Science & Technology

Iranian Human Brain Mapping Congress

# 5th Congress of the Iranian Human Brain Mapping

# Workshop on Functional and Structural Magnetic Resonance Imaging

**Prof. Mojtaba Zarei MD, PhD, FRCP (UK)**
Neuroscience from
King's College London, UK.

**Dr. Masoud Tahmasian MD, PhD**
Neuroscience from
Technische Universität München, Germany.

**Dr. Habib Ganjgahi PhD**
Neuroimaging Statistic from
Universiry of Warwick, UK.

**Dr. Reza Khosrowabadi PhD**
Biomedical Engineering from
Nanyang Technological University, Singapore.

**Dr. Shahrooz Faghih Roohi PhD**
Biomedical Engineering from
University of Tehran, Iran.

More Info and Registration:

Humanbrainmapping.ir

(021)29905801

2 - 4 October 2018

۱۲-۱۰ مهر ماه ۱۳۹۷

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Iranian Society for Cognitive Science & Technology

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# General Assembly – 2018
# Congress and Exhibition

در حاشیه پنجمین همایش نقشه برداری مغز ایران

ثبت نام در همایش از طریق : humanbrainmapping.ir

مرکز همایشهای بین المللی ابوریحان–دانشگاه شهید بهشتی

**دوشنبه ۹ مهر ماه ۱۳۹۷** | ساعت ۱۷:۰۰ الی ۱۹:۰۰

# PRESENTATIONS

| Name | Last Name | Title | Presentation |
|---|---|---|---|
| Bahareh | Ahkami | A Comparison Between EOG Artefact Removal from EEG Signals Using Modified ICA-RLS Filtering and ICA-Correlation Method | Oral |
| Zahra | Amirsarsari | Cognitive dysfunction in patients with chronic migraine | Oral |
| Ziba | Arjoumand | EEG Signals Analysis Using non-linear dimension reduction method and Support Vector Machine for Monitoring the Depth of Anesthesia | Oral |
| Habib allah | Dadgar | $^{[18F]}$FET-PET in Gliomas: Comparison with MRI and CT | Oral |
| Hossein | Dini | EEG Power Spectral Density Investigation in Children with ADHD and Matched Controls | Oral |
| Maryam | Haghshomar | White matter changes correlates of peripheral neuroinflammation in patients with Parkinson's disease | Oral |
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# ABSTRACTS

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# A motor imagery BCI for rehabilitation of phantom limb pain

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## 1. Background

Phantom limb pain (PLP) is a heterogeneous neuropathic pain and observed in 45-85% of amputees. Various treatment methods including pharmacologic, physical mirror therapy (MT), Virtual and augmented reality based MT have been reported to be effective despite their limitations. The AR based method could engage the subject and facilitate the rehabilitation exercise. Objective: In this study, we aim to design an AR based BCI system for rehabilitation of PLP.

## 2. Method

The subjects' intention of moving the amputed-hand will be detected from the EEG signal. Subsequently, a robotic hand will be used to provide an appropriate feedback. A portable EEG recording system will send the data to a laptop through Bluetooth protocol. Then, the motor imagery command will be detected based on the filter-bank common special pattern (FBCSP) algorithm and using the OpenVibe software. and the recognized command will be send to robotic hand using Wi-Fi protocol.

## 3. Results

The proposed system provides an ability to influence the amputee's brain functional laterality using two robotic hands placed on a table in front of the amputee. Maintaining balance between functional brain networks has been shown to reduce the PLP.

## 4. Conclusions

The ongoing project seems to be closer to the reality while engaging the subject will provide wider range of motion that could facilitate the rehabilitation paradigm.

## 5. References

1. Lenggenhager B, Arnold CA, Giummarra MJ, "Phantom limbs: pain, embodiment, and scientifi c advances in integrative therapies", Wiley Interdiscip Rev Cogn Sci. 2014;5(2):221-31.
2. Kuffler DP, "Coping with Phantom Limb Pain",Mol Neurobiol. 2018;55(1):70-84.
3. Ortiz-Catalan M, Sander N, Kristoffersen MB, Hkansson B, Brnemark R, "Treatment of phantom limb pain (PLP) based on augmented reality and gaming controlled by myoelectric pattern recognition: a case study of a chronic PLP patient", Frontiers in Neuroscience, 2014, 8; 24

# A Comparison Between EOG Artefact Removal from EEG Signals Using Modified ICA-RLS Filtering and ICA-Correlation Method

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## 1. Background

Electrooculogram (EOG) is one of the most important artefacts in Electroencephalogram (EEG) signals. These artefacts are barriers between EEG signals and useable cognitive information that can be inferred from brain signals. Various methods have been introduced to reduce these artefacts in the preprocessing stage of signal processing. This step is crucial for making further decisions based on clean signals. Removing artefacts should be accurate since signals with brain information should not be lost; Moreover, todays technology is heading towards online tasks and fast processing is an important factor especially in Brain Computer Interface (BCI) systems. In this work, we are focusing on EOG, as it is a common artefact and can be observed in most EEG signals. Independent Component Analysis (ICA) and its combination with other methods are common ways to reduce EEG artefacts by means of finding and eliminating the EOG components.

## 2. Method

In this paper modified ICA-RLS was used to reduce EOG artefact from EEG signals and the results were compared to the results of ICA-Correlation method which is a common way to remove EOG artefacts. In ICA-Correlation the correlations between EOG channel and all the independent components are calculated, and the components with the correlations higher than a predefined threshold will be removed. Then the remaining components are back projected to channel domain. In contrast, in ICA-RLS method, each independent component is filtered out with respect to EOG channel. As the magnitude of output signal of the adaptive filter gets closer to zero, it is concluded that the component is more similar to EOG channel. As a modification, to overcome the possible effect of variations in magnitudes of every component on the resulting output of RLS filter, a normalization step on the RLS filter output magnitude is introduced. The resulting value is called the Comparison Coefficient (CC). EEG signals of 12 healthy subjects, acquired with a 19 electrode EEG system was used in this research.

## 3. Results

Evaluations showed that CC is a small value for the thought-to-be EOG component and for other components, it is 5 to 20 times larger. In ICA-Correlation, the same comparison coefficient was utilized; however, the same diversity in the CC among different components as in ICA-RLS was not eventuated, so it may not be possible to firmly reject one component. This evaluation is performed once on the entire signal, and once on short, randomly-selected pieces of the entire signal in order to demonstrate the efficiency of these two methods in online scenarios.

## 4. Conclusions

Results show that ICA-Correlation is not a trustworthy method especially when analyzing short-piece signals, and in some points it leads to a wrong selection of the EOG component, while ICA-RLS proves to be an efficient method in all cases. Based on the results, it was shown that the modified normalized ICA-RLS method does better than the classic ICA-RLS one. Furthermore, performance evaluations show that the proposed modified ICA-RLS works 40 percent faster than the ICA-Correlation method.

# Cognitive dysfunction in patients with chronic migraine

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## 1. Background

Migraine is one of the most common headache disorders with a prevalence of 1-3% in the general population, and its prevalence is higher in women than in men (1, 2). Cognitive dysfunctions have been commonly reported in patients with migraine(3, 4); and to our knowledge the most frequently reported domains of impairment among these patients are concentration and thinking ability. Nevertheless the occurrence of cognitive impairments and its association with migraine is still debated. The main aim of the present study is to characterize the cognitive profile in a clinic-based sample of patients with mild migraine headache.

## 2. Method

Cognitive function of patients with migraine was assessed by a battery of neuropsychological tests including Montreal cognitive assessment (MoCA) for assessment of mild cognitive impairment , Auditory verbal learning test (AVLT) for verbal memory evaluation, Digits Span forward and backward tests for attention and working memory, and Digit symbol substitution test (DSST) for assessment of memory.

## 3. Results

So far, we have included 12 patients (10 female/2 male) with the mean age of 28.5 ± 9.2 years, and 10 healthy controls (6 female/4 male) with the mean age of 30.2 ± 9.3. Regarding AVLT scores, group differences on trial 1 (P=0.897) was not significant, while on trial trial 2 (P=0.03), trial 3 (P=0.039), trial 4(P=0.016), trial 5 (P=0.006), recognition trial (P=0.001) and the total score of trials 1-5 (P=0.01) were statistically significant. MoCA test result was abnormal in 33.3% of patients. In terms of DSST, patients performance was significantly poorer than controls (p=0.04); however, no significant differences in Digits Span forward and backward scores were observed between the two groups.

## 4. Conclusions

These preliminary results can represent the existence of a mild cognitive impairment among Iranian patients with mild migraine headache especially in the domains of verbal and working memory and attention.

## 5. References

1. Bigal ME, Edvinsson L, Rapoport AM, Lipton RB, Spierings EL, Diener H-C, et al. Safety, tolerability, and efficacy of TEV-48125 for preventive treatment of chronic migraine: a multicentre, randomised, double-blind, placebo-controlled, phase 2b study. The Lancet Neurology. 2015;14(11):1091-100.
2. Launer LJ, Terwindt GM, Ferrari MD. The prevalence and characteristics of migraine in a population-based cohort The GEM Study. Neurology. 1999;53(3):537-.
3. Santangelo G, Russo A, Trojano L, Falco F, Marcuccio L, Siciliano M, et al. Cognitive dysfunctions and psychological symptoms in migraine without aura: a cross-sectional study. The journal of headache and pain. 2016;17(1):76.
4. Zeitlin C, Oddy M. Cognitive impairment in patients with severe migraine. British journal of clinical psychology. 1984;23(1):27-35.

# EEG Signals Analysis Using non-linear dimension reduction method and Support Vector Machine for Monitoring the Depth of Anesthesia

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## 1. Background

Estimating the depth of anaesthesia (DOA) during surgery is a challenge in anaesthesia research to prevent intraoperative awareness and delayed recovery during anaesthesia. Because the anaesthetic drugs act mainly on the central nervous system, Electroencephalogram (EEG) signal analysis is very useful. This study introduces a new approach for measuring the DoA.

## 2. Method

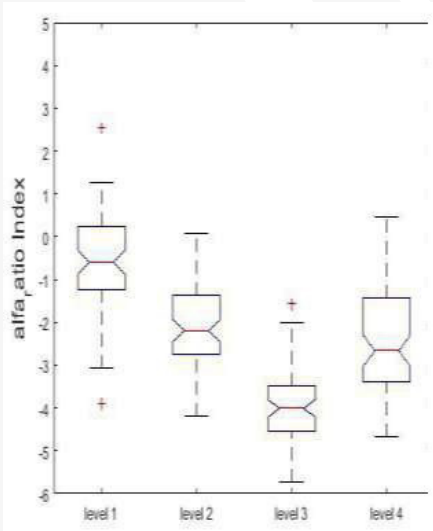
EEG signals of 17 patients were collected during anaesthesia with sevoflurane and their anaesthetic depth levels were divided into four levels of awake, light, general and deep states. Firstly, 12 features including time (Kurtosis, Skewness), frequency (Alpha, Beta, Delta, Theta index, spectral edge frequency, and medium frequency), entropy (sample entropy, shannon permutation entropy) and non-linear features (Lyapunov, de-trended fluctuation analysis) are extracted from EEG signal. Then, by applying an algorithm according to nonlinear dimension reduction method named, Local Linear Embedding (LLE), the best features is extracted. Finally, we feed these extracted features to Support Vector Machine (SVM) classification algorithm.

## 3. Results

The presented method classifies EEG data into four states in 17 patients with accuracy is 98%, and compared to a commercial monitoring system successfully. By using non-linear dimensional reduction method to 8 and classification, we able to improve the classification accuracy. This structure can successfully model systems with nonlinear relationships between input and output, and also classify overlapped classes accurately.

## 4. Conclusions

This method based on best features of spectral, fractal entropy and nonlinear dimension reduction method is potentially applicable to a new real time monitoring system to help the anesthesiologist for continuous assessment of DoA.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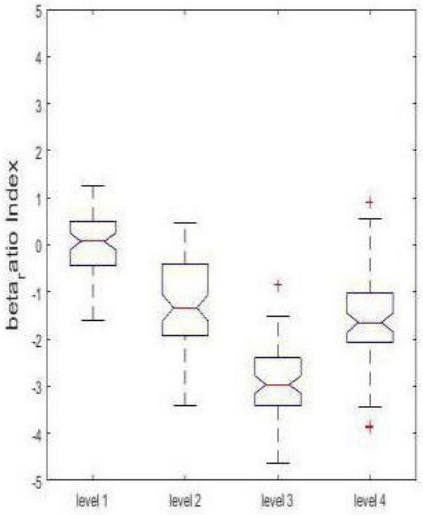
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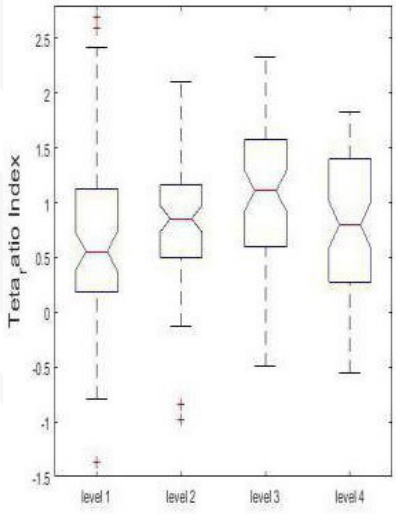
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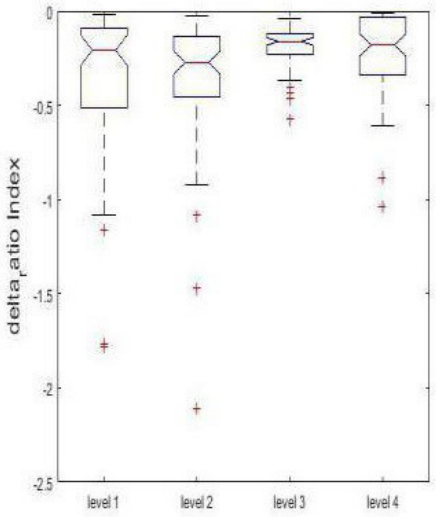
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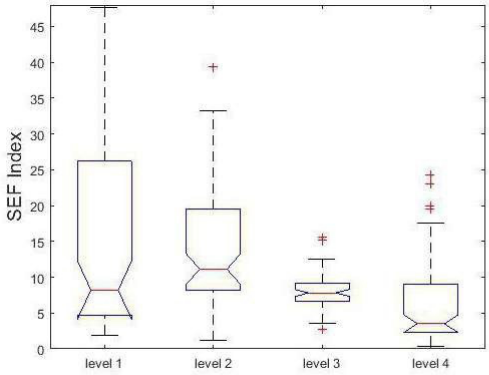
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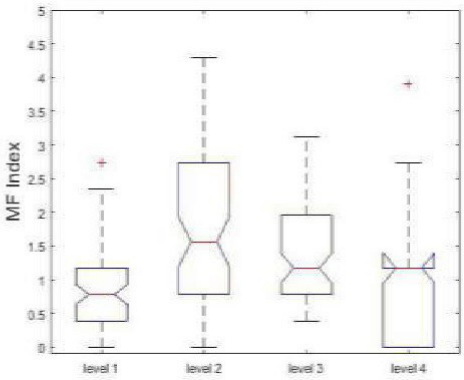
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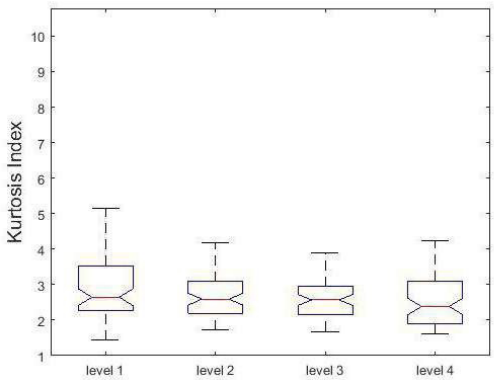
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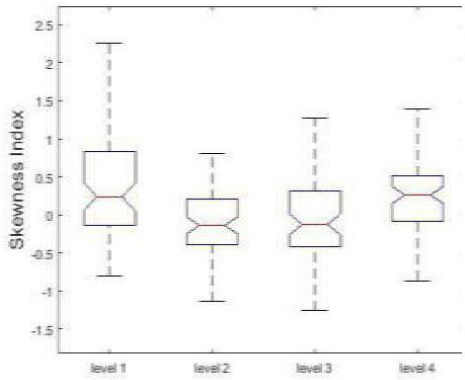
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# [18F]FET-PET in Gliomas: Comparison with MRI and CT

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## 1. Background

”The precise definition margin of high and low-grade gliomas is crucial for treatment. We aimed to assess the feasibility of assessment of the resection legions with post-operative positron emission tomography (PET) using [18F]O-(2-[18F]-fluoroethyl)-L-tyrosine ([18F]FET).

## 2. Method

Four patients with the suspicion of high and low-grade were enrolled. Patients underwent post-operative [18F]FET-PET, pre-operative magnetic resonance imaging (MRI) and CT for clinical evaluations.

## 3. Results

In our study, three patients had negative response to recurrence and progression and one patient indicated positive response after surgery. [18F]FET-PET revealed a legion of increased radiotracer uptake in the dura in the carniotomy site for patient 1. Corresponding to the patient history, the study was negative for recurrence of brain tumor. For patient 2, There was a lesion in the right parieto-temporal with slightly increased uptake in its posterior part with SUVmax=3.79, so the study was negative for recurrence evaluation. In patient 3 there was no abnormal uptake with negative result for recurrence of brain tumor. Intense radiotracer uptake in the left parietal lobe where in the MRI there was a lesion with no change in enhancement in the post-contrast image is indicated in-patient 4.

## 4. Conclusions

Assessment of the resection legions in high and low-grade gliomas with [18F]FET-PET seems to be useful.

# EEG Power Spectral Density Investigation in Children with ADHD and Matched Controls

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## 1. Background

Attention Hyperactivity Disorder (ADHD) is endorsed between 4The difficulty in recognizing the emotions of others leads to an experience of social infertility in the ADHD group. so the recognition of nonverbal symptoms that conveys the feelings of others is important because it helps one to behave in the face of others.

## 2. Method

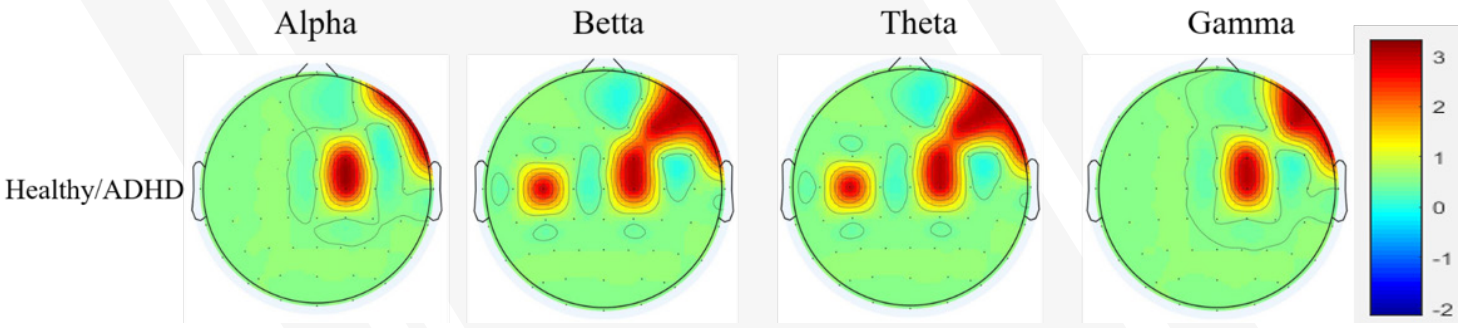
EEG signals used in this research was recorded from 11 ADHD children based on DSM-IV (7-11 years old) and 17 typically developing ones while performing an emotional face recognition task. After preprocessing, Event Related Potentials (ERPs) of each emotion were calculated by averaging its correspondent epochs that were time locked to the stimulus onset. In the next stage, the Power Spectrum Densities (PSD) of the resultant ERPs were calculated using Welch method. (ARNS, 2013, journal of attention disorders). And they were splited into the main EEG signal frequency bands (Alpha, Betta, Theta and Gamma). In the statistical analysis stage, in order to find meaningful differences between two groups (AHDH and Healthy) and four emotions (Angry, Happy, Neutral and sad) , first normality of the data has been verified using the Kolmogorov-simonov method (yurtbasi, 2018,journal of attention disorders). Normality of data led us to use parametric tests. Due to three independent variables (disease, emotion and frequency bands) and one dependent variable (PSD), The Two-way ANOVA test was applied.

## 3. Results

The results of statistical analysis are divided into three categories: first the differences between the healthy group and the patient without considering the emotion, second the differences between the emotions, regardless of the ADHD or healthy, and third, interaction between disease and emotions. The results indicate that there is no significant difference between the emotions (second category), as well as the interaction of emotions and diseases (third category). But in the first category, there was a significant difference between the healthy group and the patient group (At a significant level of 5% and mean and PSD average of ADHD subjects was higher than Healthy subjects). The average of P-Values for Alpha, Betta, Theta and Gamma bands are 0.0292, 0.0266, 0.0273 and 0.0216 respectively. In figure1 we see topo-maps showing the differences (P-values) on the head. (The red regions in the images show an increase in the activity of healthy subject than patients).

## 4. Conclusions

Although there is no significant difference among various groups of emotions was not achieved which needs further investigations but as shown in Figure 1, the most significant difference in all of the frequency bands is observed in the right regions of the forehead. In addition, these differences in the frequency bands of beta and theta are observed in the central and left areas of the head as well. The results showed that ADHD children have a significant increase in their power spectral density in comparison with normal group.


Alpha
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Theta
Gamma
Healthy/ADHD
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-1
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# Evaluation of DLP in Brain CT Scan examinations

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## 1. Background

Absorbed doses in tissues are one of the highest doses received by patients in diagnostic radiological methods with brain CT scan, and these doses are often near or greater than dose levels that increase the probability of cancer[1].Therefore, knowing the amount of dose to reduce and optimize the dose to reduce the risks of radiation, including cancer, is very important[2,3,4].For this purpose, the DTC or CTDIw and the dose along the Dose Length (DLP) or the Volume CT dose index are suggested quantities for assessing the patient's dose rate.The purpose of this study was to evaluate the amount of DLP in brain CT scan examinations using the scaling volume index.

## 2. Method

The DLP calculation algorithm using the scan length for CT scan examinations and the CTDIvol associated with the scan are as follows: DLP = CTDIvol ScanLength (1-1).

## 3. Results

A protocol of 300 male and female patients who had undergone brain CT scans with a Phillips 6-slice braille model. And according to the average irradiation conditions, patients were classified in different age ranges (Table 1-1 and 1-2).DLP is a very good quantity for expressing the total amount of radiation that hits a patient's body. Therefore, the amount of DLP calculated with the product of the CTDIvol value and the length of the scan area (Equation 1-1) are described in Tables 1-3.

## 4. Conclusions

DLP values indicate that, in addition to the amount of doses that are most affected by the intensity of the voltage tube and the intensity of the current tube in the age range of 5 years and above for male and female patients (Tables 1.1,1.2) with the same radiation conditions, the parameter The direct impact on the amount of DLP or the patient's total dose is the length of the scan.As a result, in order to optimize the patient's dose rate (DLP), the length of the scan should be limited to the anatomical range and the Effective Diameter [1,2,3,4,5] of the patient's body should be considered in the age range expressed as well as the radiation protection guidelines and the use of dose optimization techniques is suggested.

# Machine Learning Methods on Resting State fMRI Network in Parkinson's disease

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## 1. Background

The study of the brain network on magnetic resonance imaging (RS-fMRI) has yielded significant results in evaluating functional changes in different regions of the brain in pathologic and psychological illnesses. In this study, we employ the resting state network with machine learning methods to examine changes in the functional networks of the brain in Parkinson's disease[1].

## 2. Method

Our data included 25 Parkinson's patients: 11 women and 14 men, mean age 61.6 ± 10.4 years, the age range of 40-77 years and 18 healthy group 4 women and 14 men, mean age 64.2 ± 9.8 years, range Age 45-83 years old have been recorded in the Siemens 3T MRI system. The data used in this article is derived from the PPMI database[2]. All clinical patients were treated according to the Hoehn and Yahr scale. Pre-processing of functional images includes: removal of five primary frames, time filtering, head movement correction, skull removal, scan time correction, spatial filtering, normalization of the intensity of images, register to structural images, register to MNI atlas have done. Independent component analysis (ICA) was applied using melodic[3]. To extract Resting State Networks (RSNs), we spatially correlated ICs with 70 reference maps introduced by
[4] with threshold 0.3Afterwards, the temporal correlation between the time series of ROIs was calculated. Then, a t-test was used for statistical analysis and the significant correlation parameters with P-value <0.05 were selected. The algorithm for selecting a fisher property and support vector machine (SVM) and kmeans were used to discover the ability to graph actions to detect PDs[5].

## 3. Results

We extracted 137 ICs for the PD group and 99 ICs for the NC group. By comparing with resting networks, for each group, 41 resting networks (RSN) were extracted. The anatomical regions of the extracted RSNs in PD and NC has shown in Table 1 and 2, respectively. The correlation matrix showed in Fig. 1. We extracted (41 * 40) /2 = 820 parameters from correlation matrix. The optimized feature was derived by ttest and corrected p-value < 0.05. Finally the result of classification by selected feature using SVM and kmeans classifiers, represented in table 3. As the results showed, because of limitations in training data set, kmeans classifier had the better result than SVM.

## 4. Conclusions

Differences between PD and NC groups are very significant with machine learning methods in resting state data. In this study, it was shown that the RSNs time series has the most significant connectivity parameters rather than the usual ROI time series to differentiate the healthy group and Parkinsonism with the machine learning approaches.

# White matter changes correlates of peripheral neuroinflammation in patients with Parkinsons disease

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## 1. Background

The evolving paradigm shift in the role of neuroinflammation in neurodegenerative disorders has led to observations that proved neuroinflammation to be a pivotal part of pathogenesis in Parkinson disease (PD). Neutrophil-lymphocyte ratio (NLR) has been a popular marker to measure peripheral inflammatory response. As CNS inflammation can only be proved through biopsy, studies have addressed NLR to differentiate between PD patients and controls or different subtypes of PD. Connectometry is a statistical approach based on diffusion tensor imaging with the ability to reveal white matter tracts with statistical significance to a variable of interest. Herein we implemented connectometry to find tracts in with decreased/increased ”quantitative anisotropy” in patients with early Parkinson disease compared to controls.

## 2. Method

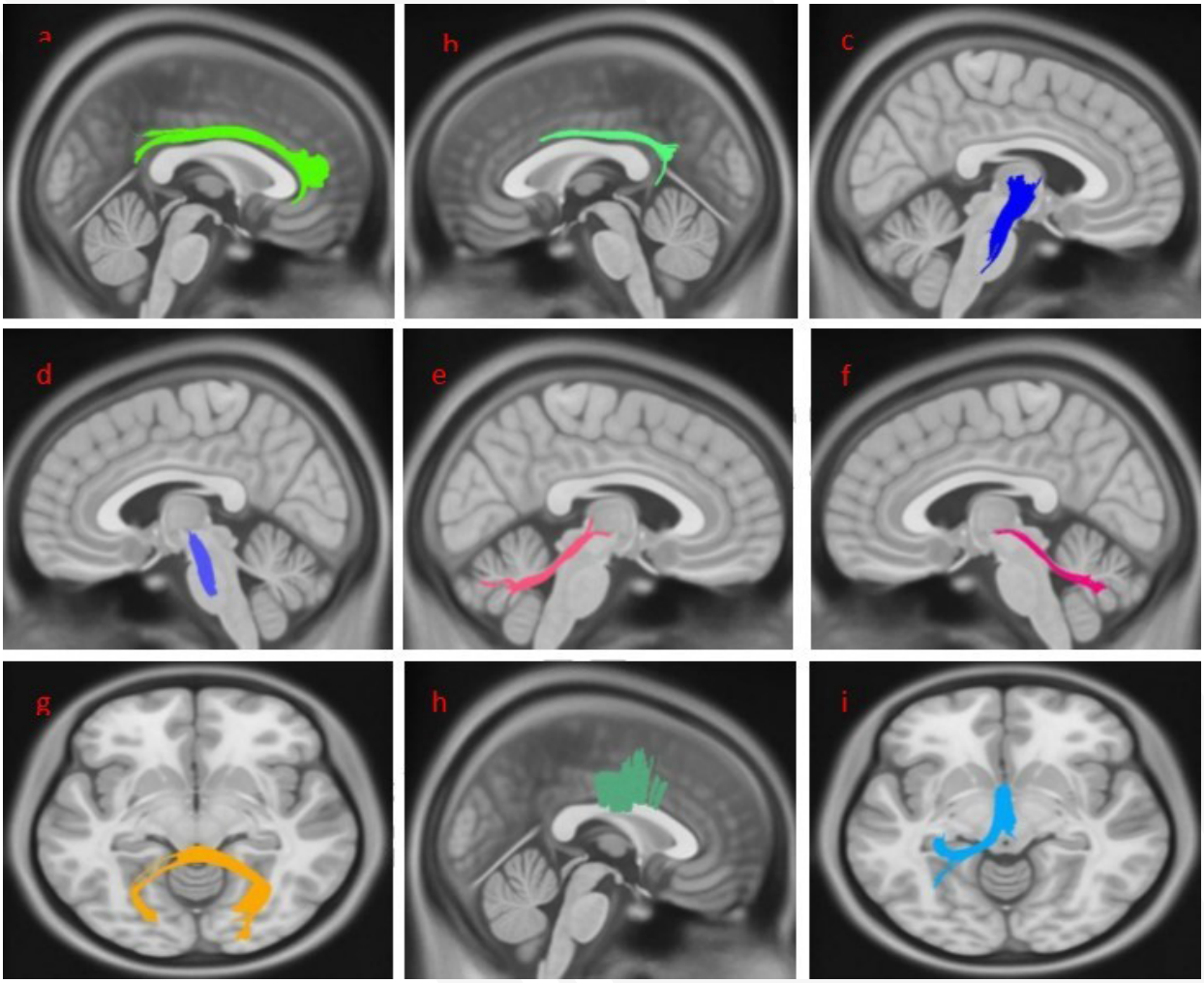
Participants involved in this research were recruited from Parkinson’s Progression Markers Initiative (PPMI) (www.ppmi-info.org/data/). The diffusion data were reconstructed in the MNI space using q-space diffeomorphic reconstruction to obtain the spin distribution function. Diffusion MRI connectometry was used to study the effect of NLR. A multiple regression model was used to consider sex, age, H&Y, and NLR in a total of 39 subjects. The analysis was conducted using DSI Studio (http://dsi-studio.labsolver.org). Neutrophil and lymphocyte counts were determined using autoanalyser device on fresh whole blood samples of patients, preserved with EDTA.

## 3. Results

The connectometry analysis identified splenium of corpus callosum, bilateral cingulum, bilateral inferior longitudinal fasciculi (ILF), bilateral fornixes and right uncinate fasciculus with decreased connectivity related to NLR (false discovery rate=0.0554238).

## 4. Conclusions

Neuroinflammatory processes are proposed to contribute to PD. Activated microglia accumulate in areas of neurodegeneration, months before the onset of motor symptoms and CD4+ T-cells infiltrate the substantia nigra and cytokine levels increase in the affected areas in the substantia nigra. Neuroinflammation is now believed to be the common pathway by which mitochondrial dysfunction, environmental toxins and perhaps infections, i.e. peripheral inflammation, culminate to result in dopaminergic specific neural death. Our study revealed reduced white matter integrity in areas previously reported to be affected in PD, with NLR as a marker of peripheral inflammation. Cingulum is implicated in cognitive functions and is known to be implicated in PD loss of executive function and dementia. The ILF has an integrative function is visuospatial tasks and is disturbed in PD patients with visual hallucinations and fornix is mandatory for preservation of memory and attention is these patients. Our observations suggest that white matter degeneration is early PD might have pathological instems in peripheral inflammation.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# Neuro-temporal signature of low-level features in human object vision: an MEG study

Elaheh Hatamimajoumerd[1], Alireza Talebpour[1], Yalda Mohsenzadeh[2]
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## 1. Background

Object recognition occurs in a fraction of second in human brain requiring a complex neural structure that processes low-level to high level semantic information. Despite of this human feat, object recognition is still a challenge in machine vision. Here, we studied the neuro-temporal trace of low-level features in human vision. We extracted three low-level features including Gabor, canny edges and Hough descriptors from the stimuli presented to participants during MEG recoding. The time courses resulted from spearman correlation between each of the visual features and MEG decoding accuracy RDMs estimated by multivariate pattern analysis (MVPA) demonstrates that although all the features are sustained, Hough descriptor have higher peak value and explains the neural data better than other two visual features.

## 2. Method

The MEG data for this study is provided by a research previously done and published (Cichy, Pantazis et al., 2014). During this MEG recording, 92 real-world images of six categories (human and non-human bodies and faces, natural and artificial images) presented for 500 ms every 1.5-2 seconds to the participants (N=16).

***Multivariate pattern analysis (MVPA)***: To decode the neural information from MEG data, we trained a linear support vector machine (SVM) classifier to discriminate each pair of stimuli regarding MEG data at each time point. to reduce noise, we permuted the trials randomly and combined them to K=4 groups of 10 trials then averaged the trials in each group. We used Leave one out policy for training and testing SVM classifier. The accuracy of classifier is used as a measure of dissimilarity between the pair of the stimuli and used to populate a 92 × 92 representational dissimilarity matrix (RDM).

***Visual features***: We extracted three low-level features commonly used in image processing from the stimuli. We estimated edges and lines using Canny edge detection and Hough transform MATLAB functions. Gabor descriptors are extracted based on (Haghighat, Zonouz et al., 2015) in which Gabor filter bank is created by a 5 by 8 cell whose elements are a Gabor filter represented by 39 by 39 matrices. Applying these filters on each stimulus provides a column vector, consisting of the Gabor features of the image.

***Statistical testing***: All the significant time points are found with non-parametric permutation statistical tests using cluster defining threshold $P < 0.05$, and corrected significance level $P < 0.05$ ($N = 16$).

## 3. Results

we used MVPA on MEG data and calculated low-level features RDMs. Fig1 shows the time courses resulted from performing spearman correlation between MEG RDM at each time point and visual features RDMs. Color-coded solid lines above the time courses demonstrate the significant time points for each curve. As it shown, among all three features Hough features contains more neural information. Since Hough transform is done on edges, it captures the overall shapes and some semantic and categorical content than other mentioned features.

## 4. Conclusions

Using MVPA, we captured and compared the neurodynamic signature of three popular features in human vision. Our results confirmed that due to the more semantic information encoded in Hough transform, it can better explain the neural data.

## 5. References

Cichy, R. M., et al. (2014). ”Resolving human object recognition in space and time.” Nature neuroscience 17(3): 455.

Haghighat, M., et al. (2015). ”CloudID: Trustworthy cloud-based and cross-enterprise biometric identification.” Expert Systems with Applications 42(21): 7905-7916.

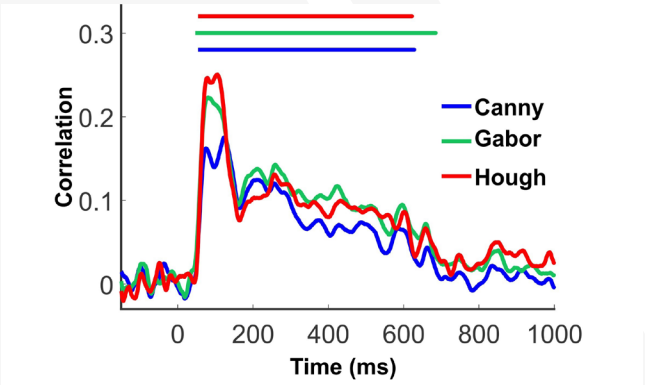


**Figure1: Low level information decoded in MEG signal**

# Functional neural alterations in acute sleep deprivation: An activation likelihood estimation meta-analysis

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## 1. Background

Adequate sleep during night is recommended about 7-9 hours by National Sleep Foundation. In modern life, however, many individuals complain from neuropsychological conditions due to sleep deprivation (SD) including cognitive and emotional impairments such as attention, memory, decision-making, and emotion dysregulation, which is particularly an important issue in some occupations. In addition, it has been demonstrated that SD is an important comorbid condition in neuropsychiatric disorders e.g. schizophrenia, Alzheimers disease and anxiety disorder. Recently, numerous neuroimaging studies have been performed to find neural correlates of SD. These studies found functional alterations in various brain regions and their findings are inconsistent. Thus, we applied Activation estimation likelihood (ALE) meta-analysis to identify potential convergent regional findings across previous neuroimaging studies in SD.

## 2. Method

Following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement, we used PubMed to retrieve the task/resting-state functional magnetic resonance imaging (fMRI) and positron emission tomography (PET) studies in acute SD (22-48 hours). Stereotactic data from the included studies were extracted from 31 studies, and subsequently tested for convergence using the ALE method. The identified regions were defined as seeds for further task-based and resting-state functional connectivity (FC) analyses. In addition, behavioral decoding analyses of the identified areas have been conducted using the BrainMap database. All analyses have been corrected for multiple comparisons using the cluster level family-wise error ($P < 0.05$).

## 3. Results

ALE analyses indicated decreased activity in the right intraparietal sulcus (IPS) due to SD, which is mainly related to cognitive function such as visual perception, memory and reasoning. Task-based FC analyses of the IPS demonstrated co-activation with the left superior parietal lobule, IPS, Left and right lateral occipital cortex, left fusiform gyrus, and bilateral thalamus. Resting-state FC analyses reveled coactivation of the IPS with cerebellum, bilateral Broadmann area 44, and left middle orbital gyrus. Conjunction of task-based and resting-state FC analyses depicted connectivity of this region and left Broadmann area 44, left lateral occipital cortex, left fusiform gyrus.

## 4. Conclusions

Our findings pointed to consistent reduced activity within the right IPS in acute SD, which is the main hub of the frontoparietal network. The functional characterization of the IPS using the BrainMap database suggested associated dysfunction of visual perception, memory and reasoning. Assessment of task-based and resting-state co-activation patterns indicated a joint network comprising the IPS, left Broadmann area 44, left lateral occipital cortex, left fusiform gyrus.

# The investigation of semantic memory in decompensated tinnitus indexed by N400 response

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## 1. Background

Memory deficit and its supporting role in the persistence of tinnitus and in the increase in associated distress of tinnitus have been revealed through several studies. Semantic memory is another aspect of memory which is not investigated in tinnitus population. The N400 as a negative-going voltage deflection at 400 msec is an electrophysiological tool surveying semantic memory. Accordingly, the main purpose of the present study was to investigate the semantic memory in decompensated tinnitus using N400 response.

## 2. Method

The experimental groups consisted of 15 tinnitus subjects experiencing chronic tinnitus more than 6 months and 15 control comparison (NC) subjects having been matched in aspect of sex and age. The N400 response was recorded from 29 scalp electrodes in response to the semantic priming paradigm. The amplitudes, latencies, N400 effect, and the reaction times (RTs) were obtained in the region of interests (ROIs).

## 3. Results

ERP analyses revealed that the N400 amplitude in response to semantically unrelated pairs and N400 effect were significantly larger in normal subjects than the tinnitus group. In addition, RTs as a behavioral indicator of processing efficiency showed significant differences between the two groups. However, any significant difference was not founf for N400 latency.

## 4. Conclusions

Our study provides evidence that decompensated tinnitus has effect on the semantic memory. Indeed, tinnitus subjects had poor performance in using meaningful context to activate semantic memory.

## 5. References

Council, N.R. (1982), National Academies Press)
Laureano, M.R., et al (2014), PLoS One)
Kutas, M., K.D. Federmeier (2000), Trends in cognitive sciences)

# Empirical evidence of a replicability crisis in linking psychological variables to brain structure: causes, consequences and recommendations

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## 1. Background

Linking interindividual differences in psychological phenotype to interindividual variations in brain structure stands as an old dream for psychology and a crucial question for cognitive neurosciences. Evidence of co-variations with brain structure, specifically gray matter volume (GMV), have been brought for a range of psychological measures. Nevertheless, in line with the recent concerns regarding reproducibility of findings in social and psychological sciences 13, studies raised questions regarding the replicability of the findings in the so-called structural brain behavior (SBB)-association studies 4,5. Here we address the question of replicability of SBB-associations among heathy adults using an empirical investigation.

## 2. Method

Participants consisted of 466 healthy adults from the enhanced NKI Rockland cohort 6 with structural MRI and scores on broad range of psychological measurements (cognitive and personality scores). All T1-weighted scans were processed with CAT12 7 (modulated nonlinear only). Replicability of association of each psychological score with GMV is assessed using two approaches. 1) 100 random subsamples were drawn from the main cohort (discovery samples). In each sample, structural associations of each psychological score were assessed using GLM. Inference was made at cluster level using TFCE 8 (P ¡ 0.05; ¿ 100 voxels). Spatial overlap of these findings over 100 subsamples, characterizes replicability of morphological associations of the respective score using the exploratory approach. 2) For each of the 100 discovery subsamples, an age- and sex-matched test sample was generated from the main cohort. For each psychological variable, the significant clusters from the exploratory approach were used as a-priori ROIs. Association between the score and mean GMV within each ROI was compared between each discovery and its paired test sample, providing means to assess ROI-based SBB replicability rates. To study the influence of sample size, replicability rates are also compared between subsamples of three different size. We further compared SBB-findings in healthy adults with SBB-associations in a clinical cohort.

## 3. Results

when probing a range of psychometric variables with an exploratory approach, significant associations between psychological phenotype and GMV are found rarely within healthy cohort. Where significant associations were found, these associations showed a poor replicability and high spatial variability (Fig1), which is further negatively influenced by decreased sample size. ROI-based approach also confirmed low rate of replicated as- sociations in the independent samples and highlighted over-estimation of effect size in the exploratory analyses (Fig2). Within the clinical cohort more stable SBB-associations were detected (Fig3).

## 4. Conclusions

Considering the publication bias 9 our results of low likelihood of significant SBB in healthy individuals are alarming. High spatial variability of significant exploratory results, also suggested high number of spurious associations and higher false negatives, specifically among smaller subsamples. ROI-based approach confirmed low rate of SBB-replicability and highlighted over-estimation of effect size from the exploratory studies. Specifically, such inflated effect size estimates, showed no association with size of the effects in the replications samples and resulted in an unrealistic power estimation. Finally our results in the clinical cohort suggested that, within populations with clear variations in structural and psychological measurements, SBB-correlations could be relatively reliably characterized.

## 5. References


1. Open Science Collaboration OS. Estimating the reproducibility of psychological science [Internet]. Science 2015;349(6251):aac4716.[cited 2018 Jun 25 ] Available from: http://www.ncbi.nlm.nih.gov/pubmed/26315443

2. Camerer CF, Dreber A, Holzmeister F, et al. Evaluating the replicability of social science experiments in Nature and Science between 2010 and 2015 [Internet]. Nat. Hum. Behav. 2018;1.[cited 2018 Aug 29 ] Available from: http://www.nature.com/articles/s41562-018-0399-z

3. Ioannidis JPA. Why most published research findings are false [Internet]. PLoS Med. 2005;2(8):06960701. [cited 2018 Jun 29] Available from: http://www.ncbi.nlm.nih.gov/pubmed/16060722

4. Boekel W, Wagenmakers EJ, Belay L, et al. A purely confirmatory replication study of structural brain-behavior correlations [Internet]. Cortex 2015;66:115133.[cited 2017 Oct 24 ] Available from: http://www.sciencedirect.c

5. Genon S, Wensing T, Reid A, et al. Searching for behavior relating to grey matter volume in a-priori defined right dorsal premotor regions: Lessons learned [Internet]. Neuroimage 2017;157:144156.[cited 2017 Oct 23 ] Available from: http://www.ncbi.nlm.nih.gov/pubmed/28552730

6. Nooner KB, Colcombe SJ, Tobe RH, et al. The NKI-Rockland Sample: A Model for Accelerating the Pace of Discovery Science in Psychiatry. [Internet]. Front. Neurosci. 2012;6:152.[cited 2017 Dec 11 ] Available from: http://www.ncbi.nlm.nih.gov/pubmed/23087608

7. Gaser C, Dahnke R. CAT - A Computational Anatomy Toolbox for the Analysis of Structural MRI Data. HBM Conf. 2016 2016;32(7):7743.

8. Smith SM, Nichols TE. Threshold-free cluster enhancement: Addressing problems of smoothing, thresh- old dependence and localisation in cluster inference [Internet]. Neuroimage 2009;44(1):83-98.[cited 2018 May 16 ] Available from: https://ac.els-cdn.com/S1053811908002978/1-s2.0-S1053811908002978-main.pdf?tid=bb431556-fec9-4fc2-b24f-946f4a006dd1&acdnat=1526466648 d7bb1193e109afcba5d4bb2048e54b59

9. Dwan K, Gamble C, Williamson PR, Kirkham JJ. Systematic Review of the Empirical Evidence of Study Publication Bias and Outcome Reporting Bias - An Updated Review [Internet]. PLoS One 2013;8(7):e66844. [cited 2018 Jun 5 ] Available from: http://dx.plos.org/10.1371/journal.pone.0066844

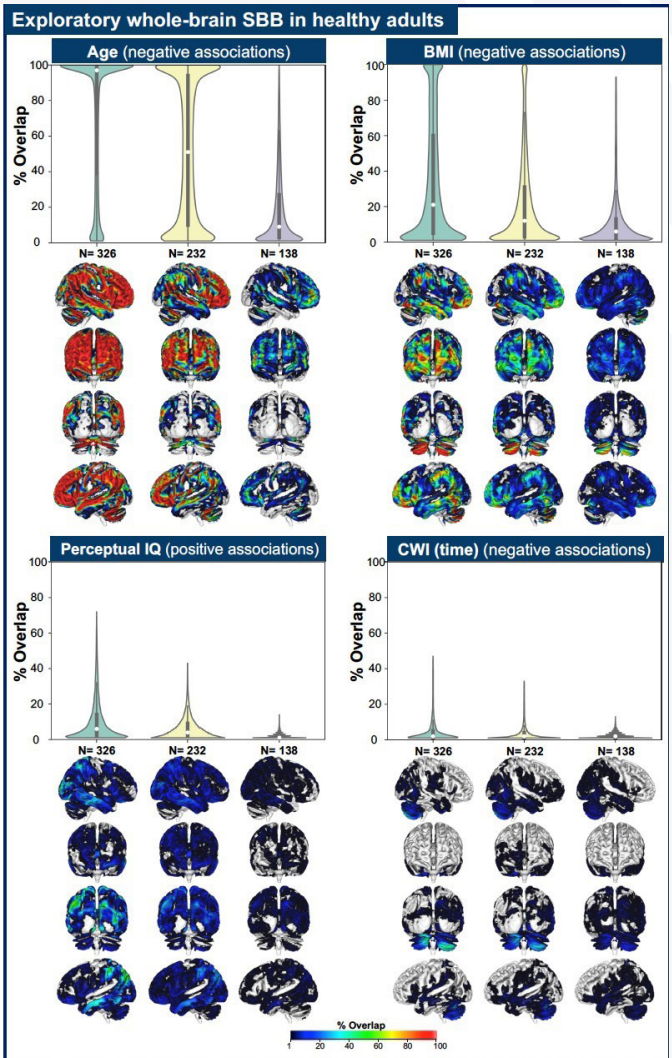


Fig1. Frequency of spatial overlap (density plots and aggregate maps) of significant findings from exploratory analysis over 100 random subsamples, calculated for three different sample sizes (X-axis). Here perceptual IQ and interference time in color-word-interference (CWI) task are shown as the top two behavioral scores with the highest frequency of overlapping results for all tested sample sizes.

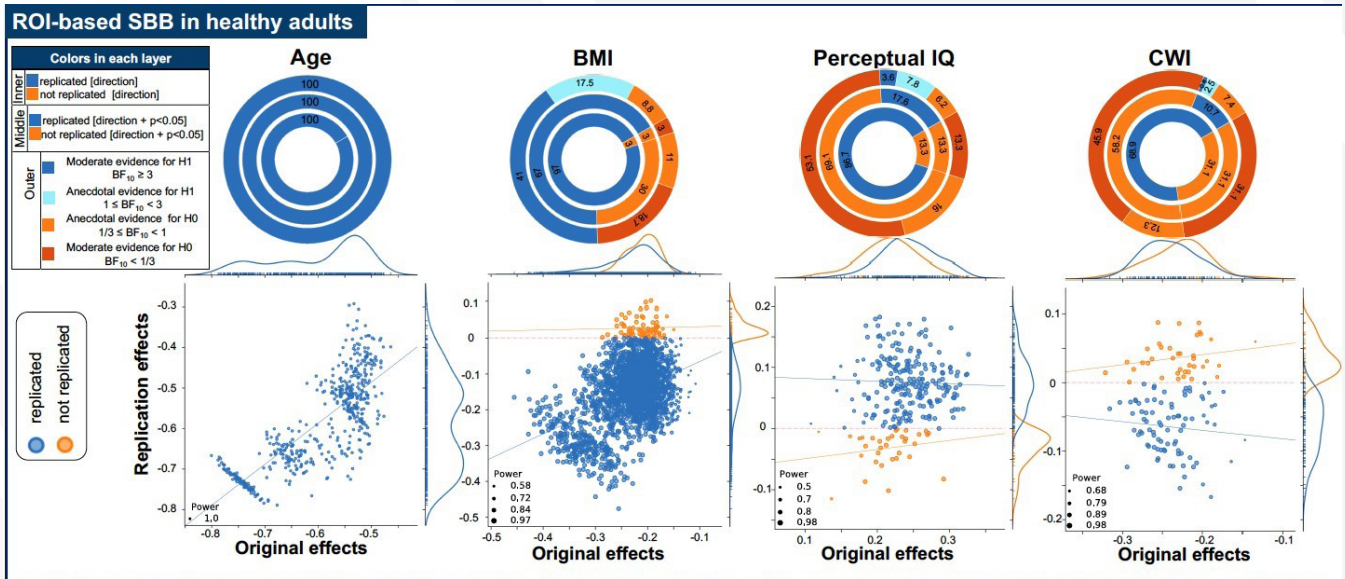


Fig2. Upper row: Summary of ROI-based SBB-replication (% of ROIs) *using three different criteria: Inner layer: "**direction**". Middle layer: **direction** + **Significant**. Outer layer:* $BF_{10}$. Lower row: Original versus replication effects sizes for all ROIs from 100 splits*; (replication defined using "**direction**" only) and size of each point is proportional to the power of replication. Original and replication samples have equal size(n = 232).*

# Comparison and calculation of absorbed dose rate in the brain by the Mammosite and Mammosite-ML (Contura) applicator in breast cancer brachytherapy with MCNP

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## 1. Background

Brachytherapy is one of the ways to treat breast cancer. In brachytherapy treatments, high-dose sources are used in interstitial placement. Here, Iridium-192 is used. In this project, breast cancer treatment applicators called Mammosite and Mammosite-ML (Contura) are modeled by the Monte Carlo simulation code. The absorbed dose is calculated by the brain. An application that can produce asymmetric doses and provides less doses to the brain is introduced.

## 2. Method

MCNPX: is the based on the Monte Carlo method. The code, with input file information, solves the problem and produces results in an output file. MIRD phantom: To calculate the dose, a model of the human body is required as a phantom. Mammosite applicator: This device has a catheter that can be attached to the high dose rate afterloading machine that connects to the source. Mammosite-ML applicator: is almost identical to Mammosite, The difference is that the Mammosite has a central duct But the Mammosite-ML model has 3, 4 or 5 additional ducts around the central duct, in this project we use model that has 5 lumens.

## 3. Results

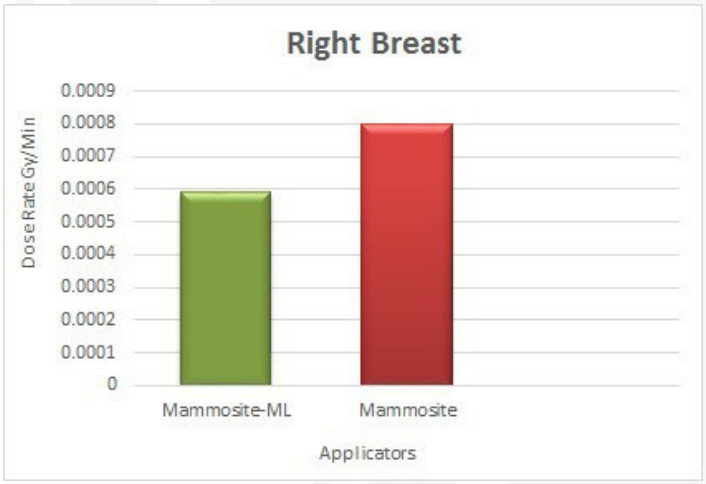
In Mammosite applicator: when the breast is treated right or left, When the tumor is in the right breast and the right breast is being treated the absorbed dose by the brain is constant, dose rate of: Brain= 7/98 × 10−4 Gy/min, But when the breast is treated left, the absorbed dose in brain =7/95×10−4 Gy/min. In Mammosite-ML applicator: when the breast is treated right, the absorbed dose in Brain=5/91 × 10−4 Gy/min, when the breast is treated left, the absorbed dose in Brain=5/88 × 10−4 Gy/min.

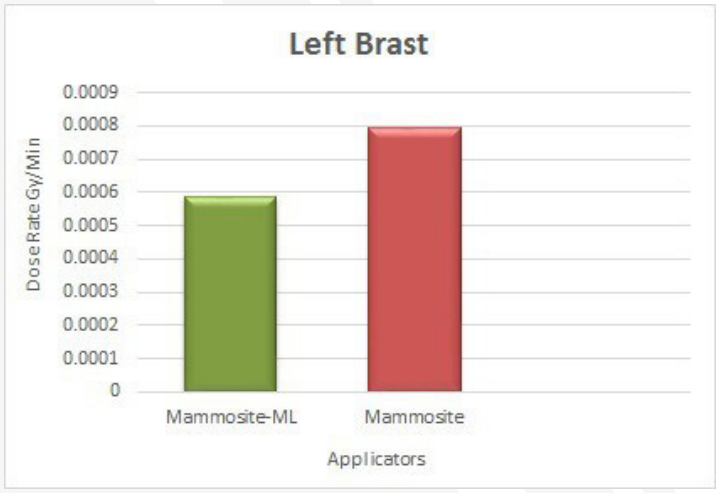
## 4. Conclusions

The amount of absorbed dose in the brain when used with a Mammosite-ML applicator is much less than that used by the Mammosite applicator. So, it can be concluded that the multivariate applicator is capable of producing asymmetric doses and the brain is exposed to less radiation exposure and can provide a better quality and safe treatment.

## 5. References

1. Peter Hoskin, DR Catherine Coyle, 2011,Radiotherapy in Practice Brachytherapy


Right Breast
Dose Rate Gy/Min
0.0009
0.0008
0.0007
0.0006
0.0005
0.0004
0.0003
0.0002
0.0001
0
Mammosite-ML
Mammosite
Applicators


Left Brast
Dose Rate Gy/Min
0.0009
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0.0002
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Mammosite-ML
Mammosite
Applicators

# Comparison Stability And Repeatability Between ICA Algorithms Using ICASSO

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## 1. Background

ICA is a data-driven method that separates mixed observations to sources that are in highest statistically independency. In 1998, McKeown et al introduced spatial ICA for fMRI analysis. After getting more acceptances, ICA was developed in many aspects (e.g. subject/group level, back-reconstruction, algorithms, the optimum number of estimated components, etc.) and various scenarios (e.g. temporal concatenation or tensorial ICA). In early observations, Hui et al (2004) demonstrated that GICA has better performance due to the highest spatial detection power and relatively more accurate estimation of time-courses. ICA has many algorithms (INFOMAX, FAST, ERICA etc.) and some of these algorithms results depend on their parameter setting and initial starting points. So repeatability and stability of the optimization problem are unneglectable issues. Himberg et al (2004) performed ICASSO to validate for comparing ICA algorithms in terms of reliability and stability. Therefore, this study investigates the reliability of ICA estimates using ICASSO.

## 2. Method

ICASSO iterates ICA many times and clusters all results. The basic idea is that a tight cluster of estimates is considered to be a candidate for including a ”good” estimate. Our study is evaluated on ADHD 200 dataset (Oregon Health and Science University). To access the reliable results, raw data was first pre-processed. All the cleaned data were analyzed by GIFT toolbox and tested by 4 GICA algorithms(FAST, INFOMAX, JADE, COMBI). Each algorithm was iterated 30 times and estimated 30 ICs in each iteration. After that, All results were clustered in 30 clusters. ICASSO measured cluster quality index (Iq) for each IC that says how much that cluster is integrated. Finally, average IC maps in each cluster were correlated with resting state networks (RSNs) template for goal of additional validation.

## 3. Results

After clustering, each cluster was expected to have 30 members but it happened only for INFOMAX. Best Iq averages belong to INFOMAX (0.98) and FAST (0.91) respectively. Moreover, ICASSO projected ICs to the first two PCA directions in dimension reduction stage and showed Iq of each IC corresponds with the integrity of that IC; In fig.1 and fig.2, results of ICASSO for INFOMAX (a) and FAST (b) are shown. The results of spatial correlation with RSNs template were almost equal for all algorithms but for INFOMAX we observed higher correlations (e.g. 26th IC correlated 91.

## 4. Conclusions

Stability and repeatability of the ICs were investigated in 4 different algorithms; Our finding in the analyzed dataset verified several previous studies like Schpf et al (2010) and Soldati et al (2013) that shows INFOMAX and FAST have the best performance respectively. Based on our results, we suggest to utilize these two mentioned algorithms as recent studies took advantage of them e.g. Dash et al (2018).

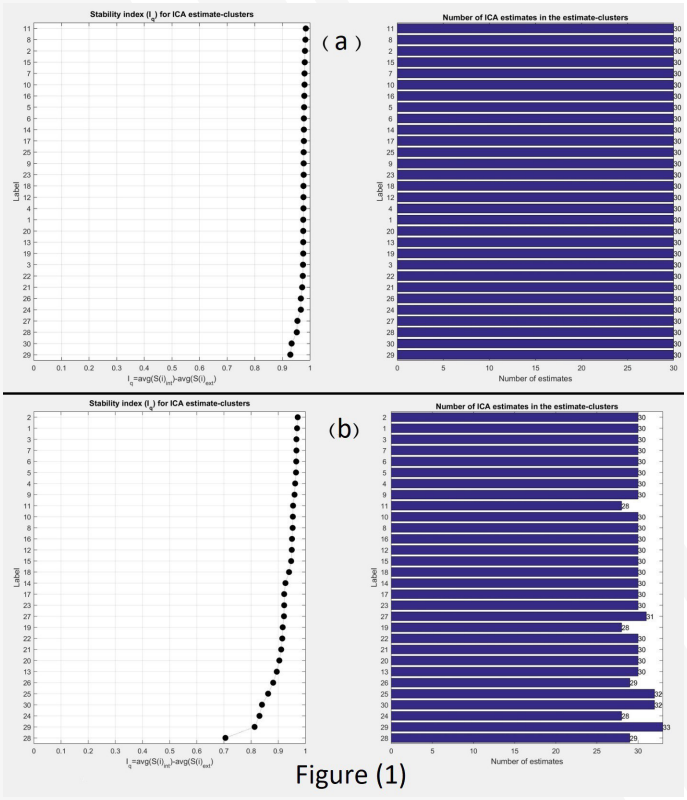


Figure (1)

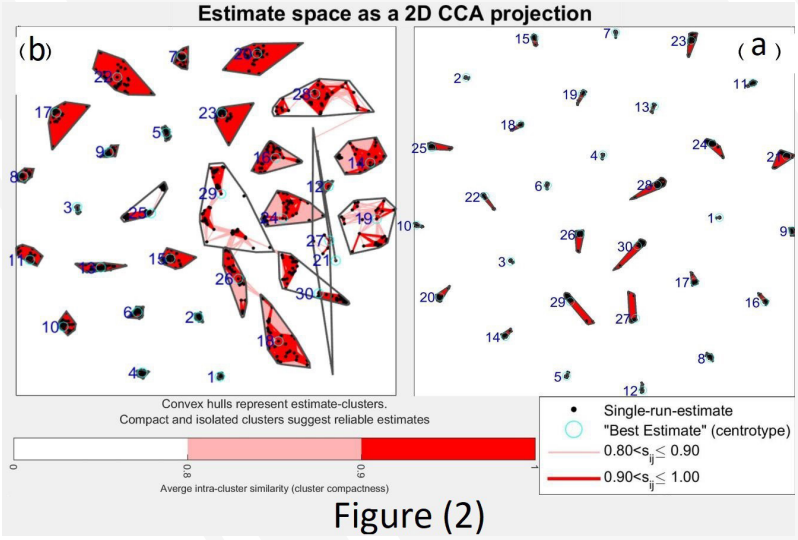


Figure (2)

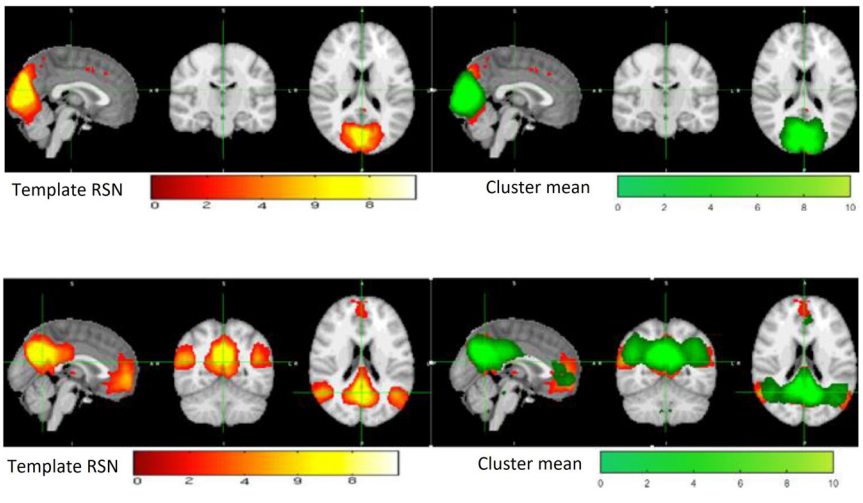


Figure (3)

# Auditory Change Detection Process Using Speech Stimuli in Children with Cochlear Implant

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## 1. Background

This study aimed to investigate change detection of speech stimuli by means of topographical maps of MMN responses in normal and cochlear implant (CI) Persian-speaking children.

## 2. Method

Twenty subjects with CI and ten right-handed matched subjects, without visual acuity and neurological disorders, participated in the study. A new auditory paradigm by 64 channels EEG machine was used with three deviant stimuli (/gam/, /jam/, and /tam/) which differed in the first consonant from a repeated standard word (/dam/).

## 3. Results

The results showed that MMN observed in 375-395 ms in fronto-central scalps (ROIs) in all stimuli. A positive mismatch response appeared before MMN only in /tam/ stimuli in 253 ms. In good cochlear implants (CI), A p-MMR instead of MMN observed in /gam/ stimuli in 219 ms after the onset of stimuli. Also, the coexistence of p-MMR and MMN acquired in 227 and 375 ms in /tam/ stimuli. In poor cochlear implants, no significant p-MMR and MMN was found in /gam/ stimuli. MMN observed only in /jam/ stimuli. P-MMR observed only in /tam/ in 242 ms. MMN was delayed in this group. The correlation between electrophysiological indexes and behavioral tests was statistically significant.

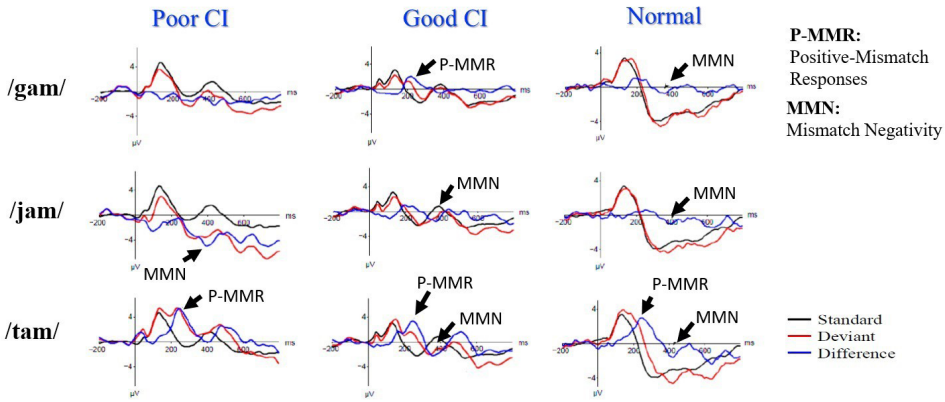
## 4. Conclusions

MMN and p-MMR can be used as a powerful electrophysiological index for objective assessment of phonological auditory discrimination. The existence of p-MMR in CI children shows immature brain pattern and/or excessive neural activation to stimuli. In poor CI, MMN shows the involvement of somatosensory processing sites in the processing of complex lingual stimuli.

# Results

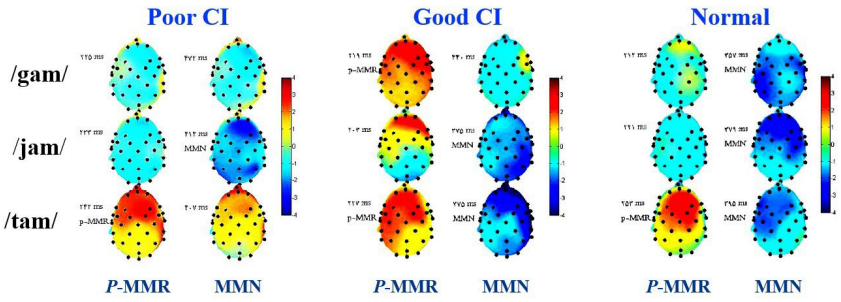
Ziatabar & Mahmoudian, 2016

**Ground Average of ERP Waveforms in Children with CI & Normal children**



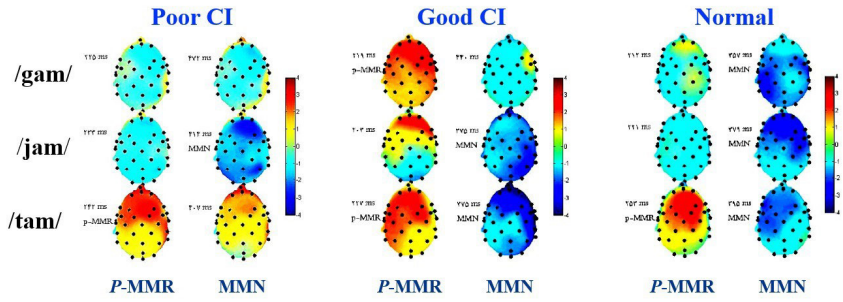

# Results

Brain Topographical Maps Elicited by Initial Consonant of CVC Stimuli in 5-7 Year-old CI & Normal Children (Ziatabar & Mahmoudian, 2016)




# Results

Brain Topographical Maps Elicited by Initial Consonant of CVC Stimuli in 5-7 Year-old CI & Normal Children (Ziatabar & Mahmoudian, 2016)



# An Implementation Study of a Portable Wearable Stress Measurement System

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## 1. Background

Stress is a pervasive part of the modern fast-paced life. Additionally, there is a growing body of scientific research indicating that the elevated, semi-permanent stress levels many of us are leading to a variety of health problems. The term stress, as it is currently used was coined by Hans Selye in 1936, who defined it as the non-specific response of the body to any demand for change.

Stress is a response to particular events. It is the way our body prepares itself to face a difficult situation with focus, strength and heightened alertness. When we perceive a threat, our nervous system responds by releasing a flood of stress hormones, including adrenaline and cortisol. These hormones rouse the body for emergency action. In some cases it is necessary to collect feedback in order to control this symptom because it can become dangerous in certain situations. Therefore, it is necessary to build a device to detect stress. For this objective, we have explored the use of a Galvanic Skin Response (GSR) device in order to detect the variation of conductance of the skin when a person is under stress [1].

There are studies which indicate that stress increases the risk of cardiac problems and even changes the experience of individual from an event [2]. In this study we have designed and built a stress sensor based on GSR, and communication unit based on LoRa module.

## 2. Method

We present a prototype of a micro-controller based stress detection system that uses heart rate, respiratory rate, and skin conductance to detect stress. Heart rate is been detected by a constant current green LED and a detector that is placed on the patients finger. Detection of respiratory rate is done by a SpO2 module emitting and receiving red and IR lights. The novelty for measuring the stress is using 4 sets of electrodes on different parts of body and with the help of differential measurement, making it more precise. One electrode is placed on finger, two of them are placed on forehead and the last one is placed on auricular area Fig. 1.

In order to check the device performance, we have collected data 16 case studies (eight women and eight men) that completed different tests requiring a certain degree of physical or mental activity, such as mathematical operations or breathing deeply. By using a wireless communication system, the user is provided with a certain degree of freedom when using the device and we choose LoRa as the main module for communication due to the low power consumption and the efficiency for low data rate considering the heath data application Fig. 2.

We place 4 sets of GSR sensors to left hand fingers, post auricular and forehead areas as parts of the lymphatic system and an Infiniti Biograghs GSR sensor on right hand fingers as a gold standard to validate the collect data while users participating in a standard stress test of Biograph system Fig. 3.

## 3. Results

In the article, we propose an implementation of stress measurement device to track level of stress for an individual in order to detect emotional state Fig. 4. The module uses 4 sets of electrodes to collect differentiated skin conductivity data and compensate it to detect stress levels of the individual. The electrodes are placed on different part of body: finger, forehead and auricular area to give more precise measurement.

## 4. Conclusions

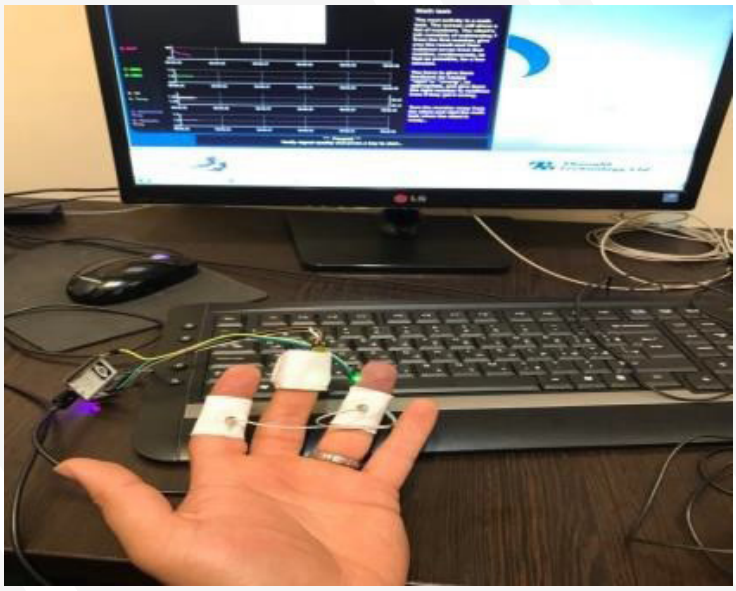
In conclusion, the collected stress level measurement shows to be useful to detect an individuals emotional state and this can be done with the proposed wearable in a comfortable condition for the patient.

5. ***References***

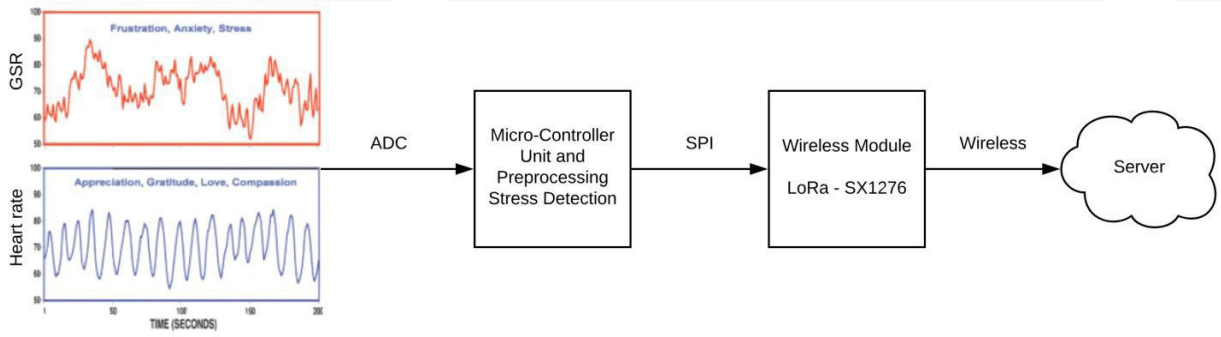
1. Carter Mundell, Juan Pablo Vielma and Tauhid Zaman, ”Predicting Performance under Stressful Conditions Using Galvanic Skin Response”, In Human-Computer Interaction in https://arxiv.org/abs/1606.01836v1, Jun 2016.

2. Maria Viqueira Villarejo, Begona Garcia Zapirain, and Amaia Mendez Zorrilla, ”A Stress Sensor Based on Galvanic Skin Response (GSR) Controlled by ZigBee”, In IEEE Sensors (Basel), pp 6075-6101, May 2012.

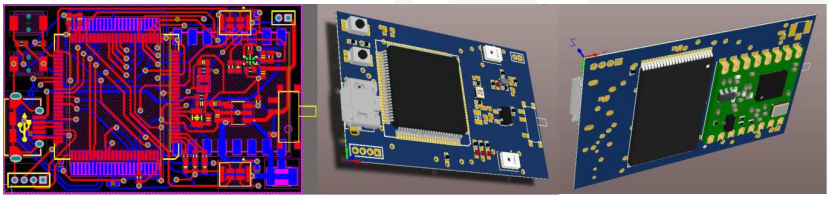
3. Mingyang Liu, Di Fan, Xiaohan Zhang and Xiaopeng Gong, ”Human Emotion Recognition Based on Galvanic Skin Response Signal Feature Selection and SVM”, In International Conference on Smart City and Systems Engineering (ICSCSE), Nov 2016.



(o) Fig. 1




(p) Fig. 2



(q) Fig. 3

# Link between regional neuronal metabolism impairment and aberrant inter-regional functional connectivity in patients with MCI or AD

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## 1. Background

Alzheimers disease(AD) is the most prevalent neurodegenerative disorder being characterized by both decreasing regional neuronal activity and increasing inter-regional dysconnectivity. However, the relationship between them is poorly understood. Of note, FDG-metabolism is a proxy of regional neuronal activity, degree centrality (DC) is a proxy for global inter-regional functional connectivity (FC), and clustering coefficient (CC) is a proxy for local inter-regional FC. The purpose of this study was to investigate the link between FDG-metabolism and DC/CC using simultaneous FDG-PET and rs-fMRI measurements in patients with mild cognitive impairment (MCI) or AD, as well as healthy controls.

## 2. Method

Thirty-three patients with mild AD, 20 patients with MCI, and 26 healthy controls underwent simultaneous PET/MRI measurements on an integrated PET/MR scanner. Firstly, FDG-metabolism and DC/CC data was extracted from 112 regions that were defined by anatomical parcellation of the whole brain using Harvard-Oxford atlas. Then, we performed three sets of analysis of variance (ANOVA) across groups to define brain regions that revealed FDG-metabolism and global/local inter-regional dysconnectivity alterations in patients with MCI or AD compared to controls. All the results were corrected for false positive correction for N-region statistical comparison which was applied using 1 / (amount of regions) = 1 / 112 = 0.009 as significance threshold. Afterwards, post-hoc analyses were conducted to identify the group differences in FDG-metabolism, DC, and CC. Finally, to assess the link between aberrant changes in local neuronal activity and inter-regional FC across groups, we performed partial correlation analysis between FDG-metabolism and DC/CC, while we controlled for covariates of no-interest including age and gender.

## 3. Results

Regional FDG-metabolism analysis demonstrated hypo-metabolism in several regions in the parietal and temporal cortices. Hyper-metabolism was also observed in the frontal, temporal, and occipital lobes, as well as the brain stem. Regional topological metrics analysis demonstrated that CC is decreased in a several cortical regions and DC is also decreased in a several cortical regions but increased in the bilateral temporal fusiform, right brain stem and left pallidum. Partial correlation analysis identified significant positive association between FDG-metabolism and CC in the right angular gyrus ($r_{CC\&FDG} = 0.317$, $p = 0.005$) and right lateral occipital cortex ($r_{CC\&FDG} = 0.252$, $p = 0.028$). However FDG-metabolism and CC were negatively correlated in the right temporal occipital fusiform cortex ($r_{CC\&FDG} = -0.248$, $p = 0.031$), and right sup- plementary motor cortex ($r_{CC\&FDG} = -0.230$, $p = 0.046$). In addition, FDG-metabolism and DC of left and right precentral gyrus were negatively correlated ($r_{DC\&FDG}$ (left precentral gyrus) $= -0.268$, $p = 0.019$; $r_{DC\&FDG}$ (right precentral gyrus) $= -0.282$, $p = 0.014$).

### *4. Conclusions*

Results provide evidence that in patients with MCI or AD impairment of neural metabolism within the right angular gyrus, right lateral occipital cortex, right temporal occipital fusiform cortex, right supplementary motor cortex, and left and right precentral gyrus are linked with global and local inter-regional FC dysconnectivity.

# Population-based classification of autism from resting-state fMRI using a long short term memory network

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## 1. Background

Resting state functional magnetic resonance imaging (rs-fMRI) can be used to characterize the pathophysiology of brain disorders such as autism spectrum disorders (ASD). In general, the connectivity pattern extracted from rs-fMRI is used as the input features of learning algorithms such as logistic regression and support vector machines. Considering complex pattern of connectivity changes in autism, it is believed that using deep learning approach could potentially improve the classification accuracy.

## 2. Method

In this study, a long short term memory (LSTM) architecture with a graph convolutional network (GCN) was used to discriminate multi-site rs-fMRI data of ASDs from healthy controls. In the proposed method, instead of precomputed measures of functional connectivity, the rsfMRI time-series was dirrectly used as the input features of classification algorithm. We hypothesized that time-series of rs-fMRI represent dynamics of the brain activities, so, it will carry more useful information than static pattern observed in the functional connectivity measures. Therefore, a type of deep neural network based on LSTM was designed to handle long sequence of rs-fMRI data. In addition, for multi-site classification of the rs-fMRI data, phenotypic features including subjects' gender, age and site of data gathering should also be considered. Several approaches could be used for this purpose that a graph caculated from population representations and their similarities was used in this study. In this paradigm, imaging feature vectors are derived from rs-fMRI data using a LSTM network and then are fed into a graph of subjects' phenotipic similarities.

## 3. Results

Rs-fMRI data were downloaded from 1100 subjects included in autism brain imaging data exchange (ABIDE) [1] that iclude data of ASD and HC individuals from 17 sites of imaging. A classification accuracy of 75% was achieved to discriminate ASDs from HCs which is 6% higher than previously reported methods [2,3]. The reliability of the results were evaluated using a 10-fold cross validation strategy.

## 4. Conclusions

A new classification paradigm for population-based disease prediction was proposed based on a deep learning approach. As a proof of concept, the method was tested on the challenging ABIDE data that include a heterogeneous database of ASD subjects as well as HCs. The high accuracy of the proposed learning algorithm confirmed our initial hypothesis about the importance of contextual pairwise information for population-based classification of the disease.

## 5. References

1. http://fcon 1000.projects.nitrc.org/indi/abide/
2. Parisot, Sarah, et al. "Spectral graph convolutions for population-based disease prediction." International Conference on Medical Image Computing and Computer-Assisted Intervention. Springer, Cham, 2017.
3. Dvornek, Nicha C., et al. "Identifying autism from resting-state fMRI using long short-term memory networks." International Workshop on Machine Learning in Medical Imaging. Springer, Cham, 2017.

# Sleep-disordered breathing may alter grey matter volume and glucose metabolism of the Default Mode Network in AD and MCI patients

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## 1. Background

The sleep-disordered breathing (SDB) describes a group of disorders characterized by abnormal respiratory patterns or insufficient ventilation during sleep. It has been demonstrated that SDB is linked with an earlier age at cognitive decline onset with intermittent brain hypoxia and sleep fragmentation as possible underlying pathophysiology. Neuroimaging studies have shown evidence of gray matter atrophy in subjects with SDB. However, the exact pathophysiology in the brain has not been investigated among subjects with concurrent mild cognitive impairment (MCI) and Alzheimers Disease (AD).

## 2. Method

Data were downloaded from Alzheimers Disease Neuroimaging Initiative (ADNI) database. The SDB grouping was inferred from the self-reported medical history of subjects. Using 1:1 propensity score matching, SDB+ and SDB- subjects were included considering several covariates: age, sex, education years, handedness, body mass index, use of continuous positive airway pressure (CPAP) or surgery as treatment, and subjects cognitive status (AD/MCI/NL), as well as protocol and field strength of T1 images. MR images with 1.5 & 3 Tesla T1 MPRAGE/SPGR and 1.2 × 1.2 × 1.2 mm voxel size were preprocessed considering field distortion, and correction for subjects motion, normalized to MNI space and analyzed using Statistical Parametric Mapping (SPM) version 12 Voxel-based morphometry (VBM) to assess grey matter (GM) volume in the whole brain and within the DMN. Amygdala/hippocampus and insula masks were separately implemented to evaluate regional GM volume, as previously proposed involved regions. Results were corrected for multiple comparisons using the FDR method.

## 3. Results

In the whole brain and DMN masking analyses, total DMN size between SDB+ and SDB- subjects was not significantly different; regardless of subjects cognitive status. The DMN size was dramatically decreased in demented subjects compared to NL patients. Areas of DMN mostly being affected were bilateral amygdala, hippocampal and entorhinal cortices. In AD/MCI SDB+ vs. NL SDB+ comparison, both amygdala and hippocampus sizes were diffusely decreased. While, in AD/MCI SDB- patients compared with NL SDB- ones, only small regions of the left amygdala showed significant volume change. No significant difference could be extracted from any single cognitive condition with sleep-disordered breathing compared to its SDB-negative counterparts, which is in contrast with previous findings on subjects without cognition deficits. This finding may suggest an acceleration of amygdala atrophy in the context of SDB.

## *4. Conclusions*

Lack of difference in brain volume between SDB+ and SDB- subjects was in contrast with previous evidence. This may be due to the low sample size of the study, while the diminished effect of SDB in GM volume between subjects who had already diagnosed with AD and developed brain atrophy is possible. However, the difference in brain volume between MCI/AD and NL subjects were considerably higher in SDB+ subjects, especially in hippocampi and amygdala as regions involved in SDB pathophysiology. This may be indicative of an underlying interaction or synergism between SDB and AD course in brain atrophy. Investigation of causal inference and the exact role of SDB in AD brain atrophy remains to be investigated in longitudinal designs studies and larger sample sizes.

# The Potential Role of Auditory Prediction in Decompensated Tinnitus: An Auditory Mismatch Negativity Study

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## 1. Background

Some tinnitus subjects habituate to their tinnitus but some others do not and complain of its annoyance so much. Normal sensory memory and change detection processes are needed for detecting the tinnitus signal as a prediction error and habituating to tinnitus. Purpose: The purpose of this study was to compare MMN as the index of sensory memory and change detection among the studied groups to search for the reason why some tinnitus subjects habituate to their tinnitus but some others do not.

## 2. Method

EEG was recorded from 29 scalp electrodes in three groups of subjects consisting of 20 compensated tinnitus, 20 decompensated tinnitus and 20 normal hearing without tinnitus as the control group. The oddball paradigm was used to obtain MMN. In this paradigm, the standard stimuli consisted of three sinusoidal tones with frequencies of 7500, 8000 and 8500 Hz and three types of deviates including frequency, duration, and silent gap. After noise removal and determining epochs, MMN waveforms were extracted by subtracting responses to the standard stimuli from responses to each type of deviant. MMN amplitude, latency and area under the curve compared among the studied groups.

## 3. Results

The results showed that MMN amplitude and area under the curve for the higher frequency deviant and for the silent gap deviant were significantly larger in decompensated tinnitus group compared to normal control and compensated tinnitus group.

## 4. Conclusions

These results suggested that the auditory processing in habituated tinnitus subjects works similar to normal controls at the level of MMN processing but deficits of sensory memory and prediction error prevents habituating to tinnitus in decompensated tinnitus subjects. Sensory memory is occupied by the intrinsic tinnitus signal, so the change detection mechanism is not able to retain the incoming signal to use it for comparison and detect the changes and results in constant updating of tinnitus percept from memory and prevents habituation.

## 5. References

Friston, K. (2010). The free-energy principle: a unified brain theory? Nature Reviews. Neuroscience, 11(2), 12738.

Hallam, R. S., Jakes, S. C., & Hinchcliffe, R. (1988). Cognitive variables in tinnitus annoyance. British Journal of Clinical Psychology, 27(3), 213222. https://doi.org/10.1111/j.2044-8260.1988.tb00778.x

Joos, K., Gilles, A., Van de Heyning, P., De Ridder, D., & Vanneste, S. (2014). From sensation to percept: the neural signature of auditory event-related potentials. Neuroscience & Biobehavioral Reviews, 42, 148-156.

Mahmoudian, S., Farhadi, M., Najafi-Koopaie, M., Darestani-Farahani, E., Mohebbi, M., Dengler, R., Lenarz, T. (2013). Central auditory processing during chronic tinnitus as indexed by topographical maps of the mismatch negativity obtained with the multi-feature paradigm. Brain Research, 1527, 161173.

Walpurger, V., Hebing-Lennartz, G., Denecke, H., & Pietrowsky, R. (2003). Habituation deficit in auditory event-related potentials in tinnitus complainers. Hearing Research, 181(12), 5764.

# Top- down Modulation of Tinnitus-related Networks Activity using transcranial Random Noise Stimulation

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## 1. Background

Tinnitus is a common distressful disorder in which auditory and non-auditory areas are involved as a network. Therefore, the multisite protocol of brain stimulation (tRNS) seems effective in relieving tinnitus symptoms. This study aimed to verify the modulatory effects of multisite tRNS on the tinnitus network.

## 2. Method

Thirty-two tinnitus-suffering patients received two consecutive sessions of tRNS (SHAM+ REAL) applied over the T3, T4 (auditory cortex group) and F4, FP1 followed by auditory cortex (multisite group). Each session lasted 20 min and the current was set at 2 mA. 3-min of resting-state EEG were recorded before and immediately after each session. Oscillatory power changes were investigated using the Two-way repeated measure ANOVA.

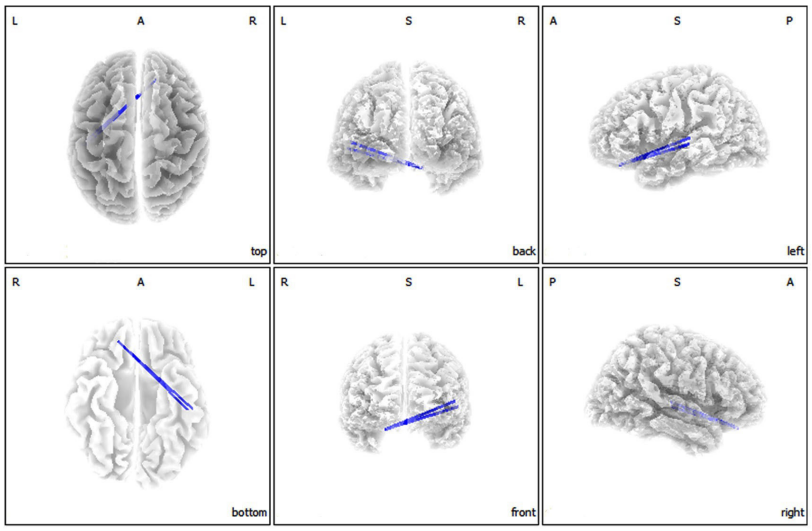
## 3. Results

After the multisite-tRNS real session, there was a significantly increased power in the alpha-1 band at the auditory and prefrontal cortex accompanied by decreased power in the delta and beta-2 bands in the prefrontal cortex. Standardized low-resolution brain electromagnetic tomography (sLORETA) was used for source anal- ysis and functional connectivity study. sLORETA showed a significant decrease in beta-2 activity in the prefrontal cortex, anterior cingulate cortex, and the parahippocampus and decreased alpha connectivity be- tween the right prefrontal cortex and the left auditory cortex. No significant effects were noticed for the sham session.

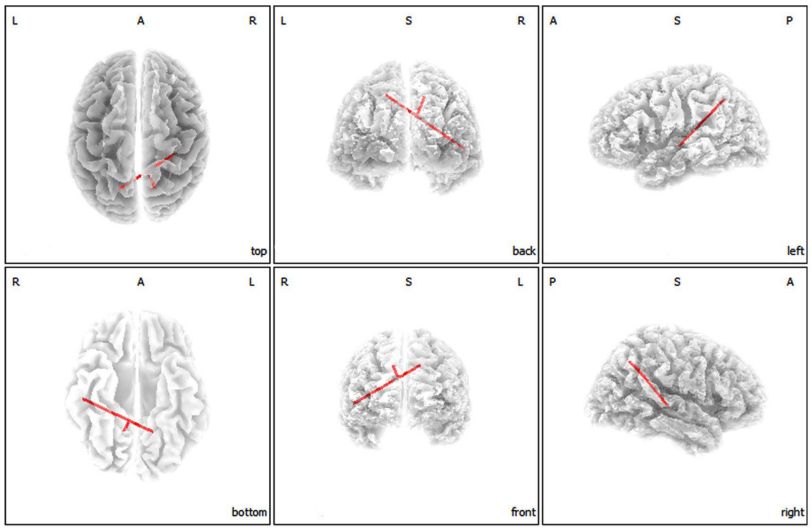
## 4. Conclusions

This study showed that tRNS has modulatory effects on the electrical activity of the brain and that targeting prefrontal and auditory areas in sequence could modulate the distress network and multiple hubs in the tinnitus network.

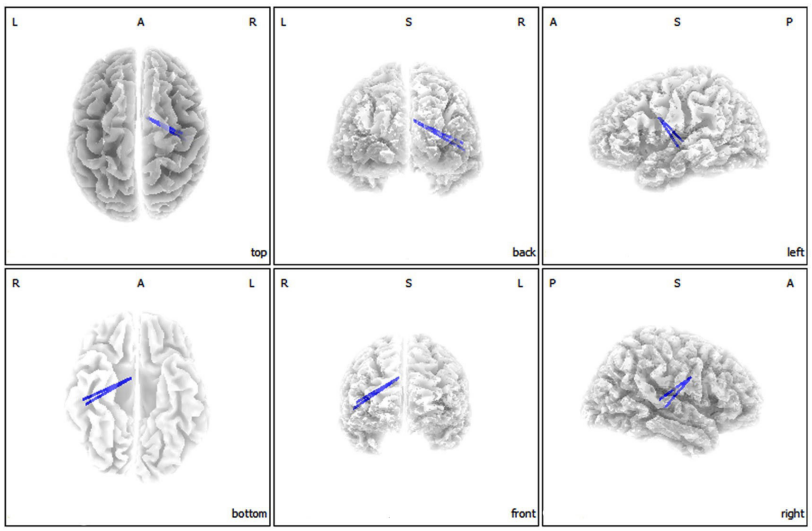
Alpha1
(Coherence)




Alpha1
(Phase-
synochronization)




Gamma
(Coherence)



# Quantitative EEG Features For Characterizing Autistic Spectrum Disorder

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## 1. Background

Autism or autistic spectrum disorders (ASD) is a complex neurodevelopmental disorder, which described by impairments in social interactions, insufficiencies in verbal and nonverbal communication and stereotyped, repetitive behaviors and interests. The aim of the present study was investigating quantitative electroencephalographic (QEEG) profile for children with autistic spectrum disorder (ASD).

## 2. Method

Five-minute QEEG data were obtained from 10 normal controls (NCs) and 10 children with ASD.

## 3. Results

Outcomes for Q-EEG displays increased delta-theta activity in frontal lobe of brain. results revealed that ASD children showed significantly less relative alpha than NC , and also children with ASD show over focused/ over aroused pattern in high Beta. these investigation revealed that ASD have troubles of neural connectivity.

## 4. Conclusions

Children with neurological and developmental disorders such as ASD shows generally increased delta-theta activity and over focused pattern in high Beta but less Alpha power which is linked to poor cognitive abilities. Prognosis of ASD depends on the intellectual capacities.

# Attention deficits relate white-matter disturbances in Schizophrenia

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## 1. Background

Despite the great importance they have for being addressed by researchers, Attention deficits remained as a fundamental problem in patients suffering schizophrenia (1). Considering broad aspects attention has, multiple brain structures seems to be affected in schizophrenic patients and resulting impaired attention could be investigated by different imaging studies. White matter tracts probably play a significant role in such a complicated and multi-regional task and investigating their structural changes may lead to a better understanding of underlying impaired attention in schizophrenia. This study addressed structural white matter tracts in schizophrenia and their probable relation with different aspects of attentional deficits detected with common standard attention measuring tests.

## 2. Method

84 native English speaker were selected from participants of Mind Clinical Imaging Consortium (MCIC) (2) which all were aged between 18 and 60, with no history of disorder than schizophrenia. Patients were met DSM- IV criteria for Schizophrenia and all were scanned with a 1.5 Tesla MR scanner to obtain diffusion weighted images (DWIs) and were assessed about attention with Trail Making Test (TMT) and California computerized Assessment Battery (CalCAP). Acquired DWI images were analyzed using exploreDTI. All images were corrected for eddy current and subject motion distortion. Robust Estimation of Tensors by Outlier Rejection (RESTORE) algorithm was used on previously registered images. Whole brain atlas based tractography were performed and based on prior knowledge (3) 8 tracts of interests were selected for investigations (right and left Superior Longitudinal Fasciculus (SLF), right and left Cingulum, and Splenium and Genu of corpus callosum). Mean fractional anisotropy (FA) and Mean Apparent Diffusion Coefficient (ADC) of mentioned tracts were extracted for statistical analysis. To check for any associations between mean FA and ADC of the fiber tracts, a general linear model was used. Attention test results were assessed separately in a general linear model and FA and ADC of each fiber were the predicting variables. Age, years of education, illness duration, and ethnicity were all included as covariates. Bonferroni and Benjamini-Hochberg method was used for each group of regression models for multiple comparison correction.

## 3. Results

In primary analysis, 6 of selected tracts were found to have changes related to different attentional functions ( $p < 0.05$). After Multiple comparison correction of results, 4 of observed relations still stayed statistically significant. TMT-A scores seem to be related with changes in ADC of Genu of carpus callosum (CC) and right cingulum and mean Fractional anisotropy (FA) of Spelenium and TMT-time scores were also related to FA of Genu of carpus callosum, respectively ($p = 0.04563214, 0.04563214, 0.44652134$ and $0.07182423$ in respect).

## 4. Conclusions

Our study investigated Diffusional changes in patients with schizophrenia considering attention for the first time. Our data sample were statistically big enough to show reduction in FA and ADC of mentioned tracts, which could be interpreted as fiber integrity reduction, is related with worsening of attention in patients. It seems that structural changes in carpus callosum are occurring which is detectable with Diffusion tensor Imaging of the brain in patients suffering schizophrenia with attention deficit.

## 5. References

1. Barbara A. et al., (1994)

# Emotional Profile Assessment for Safe Driving

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## 1. Background

The Internet of Things (IoT) aims to integrate technology into everyday lives. In a desirable IoT scenario, technology would take peoples context into account to simplify their lives and improve health and safety by offering services that work according to users emotions and preferences. Such services can be offered to users in line with the emerging platform which we called IoET. Safe driving is an application which is needed to be taken seriously due to life risks and can take the advantages of IoET. Strong emotions can be a source of distraction and a number of studies link highly aroused stress states with impaired decision making capabilities, decreased situational awareness and degraded performance which could impair driving ability [1]. Therefore, it is important while drivers experiencing strong emotions, a driver assistance system (DAS) notice them, before they decide to react on the road.

## 2. Method

Based on psychophysiology findings, emotions and physiology are closely related. Hence, measurement of physiological parameters generated by the activation of the sympathetic nerves of Autonomous Nervous System (ANS) can be helpful to decide the emotive status of human being. In this way, to understand the drivers state for using in a DAS, physiological signals are useful metrics which collected by body mounted sensors without interfering with the drivers task performance. A project by Healey and Picard to determine a driver's relative stress level by using ECG, EMG, skin conductance (SC) and respiration sensors shown in Fig1[2].

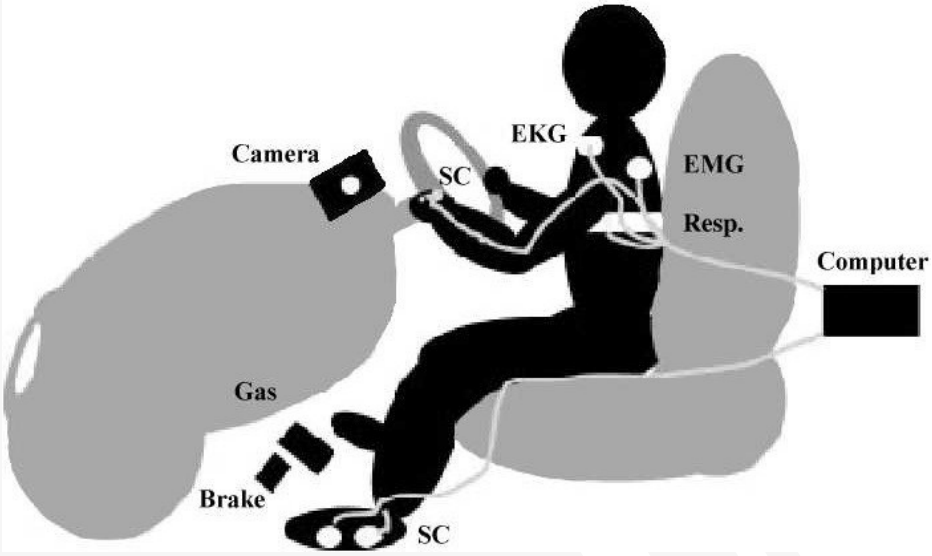
But among all of the measurable physiological signals, which are suggested for stress detection, we identified the SC as a better marker since it does not affect by users motions and activities. The Galvanic Skin Response sensor (GSR) allows us to measure the stress level of users, hence to evaluate the measurement accuracy and to find an appropriate placement based on concentration of eccrine sweat gland [3] (Fig. 2) for unobtrusive data collection, we conduct a series of tests. We attached three sets of GSR sensors to left hand fingers, post auricular area and forehead area as parts of the lymphatic system and an Infiniti Biograghs SC sensor on right hand fingers as a gold standard and collect data while users participating in a standard stress test of Biograph system.

## 3. Results

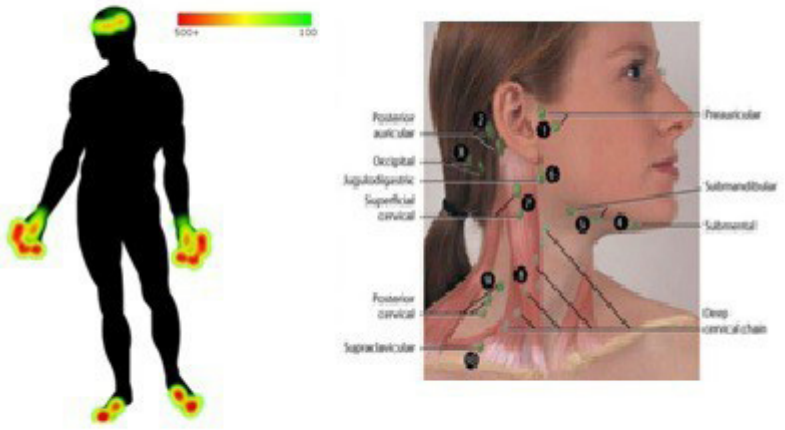
In this paper, we present methods and tools required to measure stress level and address challenges such as data collection, communication, and user experience in our implemented testbed. The results of our primary tests from 15 subjects over 14 minutes stress test have verified our collected data from GSR sensors and show that the SC could be measured from post auricular area and forehead. A sample of the results is depicted in Fig. 3. In the full paper, we demonstrate how collected GSR data in a vehicle can lead to DAS to alert a driver.

## 4. Conclusions

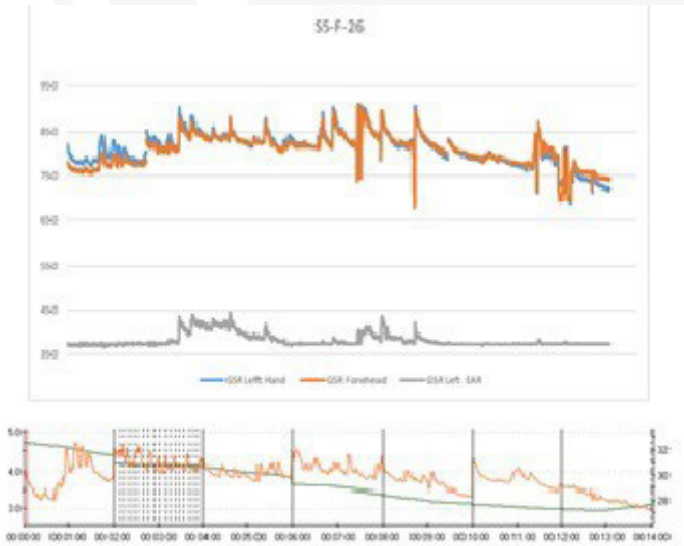
In general, the results suggest that stress level of users can be detected and measured using GSR biosensors placed over different body areas resulting different accuracy.




(s) Fig. 1



(t) Fig. 2



(u) Fig. 3

# Quantitative assessment of Parkinson disease using wearable sensing system

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## 1. Background

Parkinson's Disease (PD) is the second most common neurodegenerative disorder. It presents with characteristic and disabling motor symptoms, such as tremors, muscular rigidity, postural instability, Bradykinesia and Hypokinesia, caused by a loss of brain dopaminergic neurons. Currently, for the assessment of movement disorders, a neurologist uses a visual examination of motor tasks and semi-quantitative rating scales, such as the Hoehn-Yahr (HY) Scale and the Movement Disorder Society -Unified Parkinsons Disease Rating Scale (MDSUPDRS). The most accurate objective testing for PD consists of specific brain scanning techniques (e.g. SPECT DATSCAN) that can measure the dopamine level and brain metabolism.

## 2. Method

Although there is clinical demand for new technology that can accurately measure Parkinsonian tremors, automatic scoring of Parkinsonian tremors using machine-learning approaches has not yet been employed. This study aims to fill this gap by proposing measurement system which is capable of objective and quantitative analysis of movements of the upper and lower limbs using an Inertial Measurement Unit (IMU). This system is also used machine learning algorithms as a way to predict the UPDRS, which mimic how neurologists rate scores in actual clinical practice. In this study, the tremor signals of 20 patients with PD are measured using a wrist-watch-type wearable device consisting of an accelerometer, a gyroscope and a magnetometer. The displacement and angle signals are calculated from the measured acceleration and angular velocity, and the acceleration, angular velocity, displacement, and angle signals are used for analysis. We also aim to differentiate PD patients from healthy controls, on the basis of features derived from plantar vertical ground reaction force (VGRF) data during walking at normal pace using dataset collected 29 PD patients.
Nineteen features are selected to be extracted from each signal, and the pairwise correlation strategy is used to reduce the number of feature dimensions. With the selected features, a decision tree (DT), support vector machine (SVM), discriminant analysis (DA), random forest (RF), and k-nearest-neighbor (kNN) algorithm are explored for automatic scoring of the Parkinsonian tremor severity and UPDRS estimation. The performance of the employed classifiers is analyzed using accuracy, recall, and precision, and compared to other findings in similar studies.

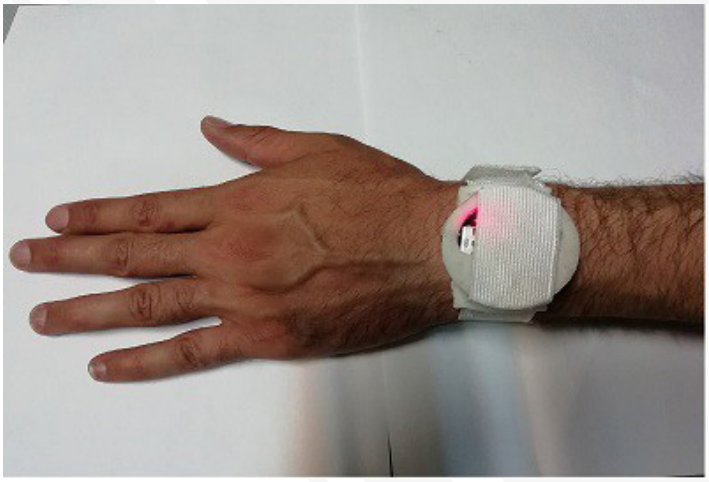
## 3. Results

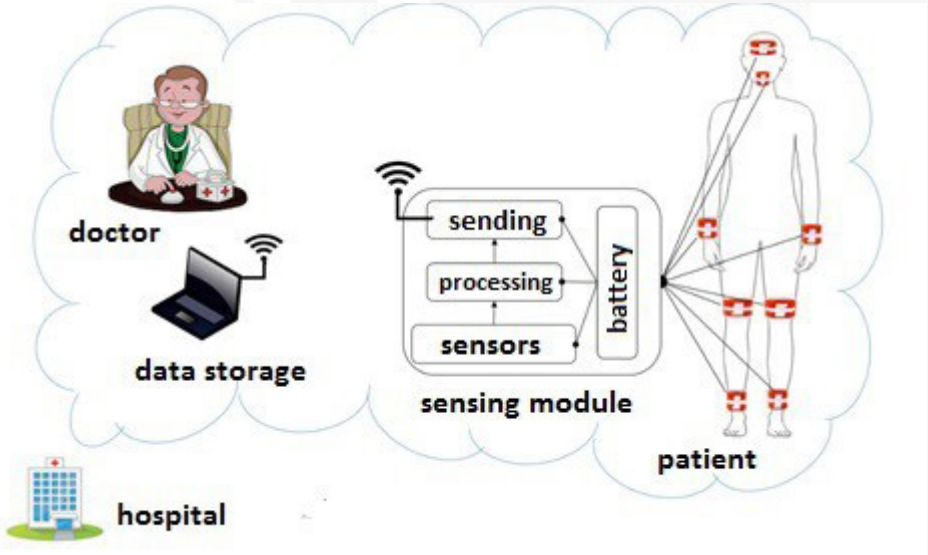
Our results show that SVM with cubic kernel outperformed other classifiers with an accuracy of 93.6%, the sensitivity of 93.1%, and specificity of 94.1%. In comparison to other studies, considering same dataset, our designed prediction system improves the classification performance by approximately 10%.

## 4. Conclusions

Implementation of the proposed solution in this project investigates the accuracy of disease detection and the subtypes over different machine learning algorithms where the results show a 73% accuracy of disease detection and 85.55% accurate subtype detection.

| Classifier | TP[2] Rate | FP[1]rate | Precision | Recall | F-measure | Class |
|---|---|---|---|---|---|---|
| Decision tree | 0.819 | 0.569 | 0.653 | 0.819 | 0.726 | PD |
| | 0.431 | 0.181 | 0.646 | 0.431 | 0.517 | NOT PD |
| | 0.651 | 0.401 | 0.605 | 0.651 | 0.653 | Average |
| Random Forest | TP Rate | FP rate | Precision | Recall | F-measure | Class |
| | 0.734 | 0.389 | 0.711 | 0.734 | 0.723 | PD |
| | 0.611 | 0.266 | 0.638 | 0.611 | 0.624 | NOT PD |
| | 0.681 | 0.336 | 0.679 | 0.681 | 0.680 | Average |
| SVM | TP Rate | FP rate | Precision | Recall | F-measure | Class |
| | 0.777 | 0.347 | 0.745 | 0.745 | 0.777 | PD |
| | 0.653 | 0.223 | 0.691 | 0.691 | 0.653 | NOT PD |
| | 0.723 | 0.294 | 0.722 | 0.722 | 0.723 | Average |
| kNN | TP Rate | FP rate | Precision | Recall | F-measure | Class |
| | 0.862 | 0.833 | 0.574 | 0.862 | 0.689 | PD |
| | 0.167 | 0.138 | 0.480 | 0.167 | 0.247 | NOT PD |
| | 0.521 | 0.518 | 0.039 | 0.498 | 0.560 | Average |





# Functional connectivity in brain regions during negative emotion generation

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## 1. Background

Spontaneous responses to various endogenous and exogenous emotional stimuli play a substantial role in human daily life. In fact, in addition to external factors, internal thoughts, feelings or sensations may drastically affect the physiological bases of emotional responses. Several experimental, behavioral and physiological studies have been previously conducted to address the involved brain networks may be activated during negative emotional tasks. In the present study, we aimed to extract related functional network activated during negative emotion generation using fMRI images.

## 2. Method

A total of thirty healthy adults were recruited for the experiment. The designed task consists of 6 functional runs with 18 randomized trials for each run. Therefore, each participant completed 108 trials in total. There are two types of images in experiment (aversive and neutral) which were shown to participants in two conditions, namely Look Negative and Look Neutral. To identify brain regions that support the generation of emotional responses, ICA analysis was used, which is a useful method for decomposing activation during complex cognitive tasks in which multiple operations occur simultaneously After appropriate preprocessing stage, spatial ICA conducted using GIFT Toolbox for fMRI data in order to extract task related component. The number of independent components estimated using MDL criteria was 20 and one of the components was correlated with Look Negative>Look Neutral contrast using MLR method.

## 3. Results

Responding naturally to negative stimuli during the task recruited brain regions involved in both emotional and sensory processing including the amygdala, Anterior insula, Superior temporal gyrus, middle occipital gyrus, ventral striatum, and ventromedial Prefrontal Cortex (vmPFC).

## 4. Conclusions

Mentioned network demonstrates a certain kind of functional connectivity strengthened during emotion generation. Amygdala and ventral striatum are responsible for perception of stimuli and learning which cues are associated with appropriate responses, respectively. As well as this, vmPFC integrates evaluations of relevant stimuli made by amygdala striatum, and other brain regions. This area tracks also the positive or negative valuation of stimuli. All the related regions activate during the task and our final results show that their activities correlate with each other, which means that increasing activity in one region leads to a rise in activity in other regions.

# Age and Gender Dependency of Cerebral and Cerebellar Glucose Metabolism

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## 1. Background

Knowledge of gender-related changes in cerebral and cerebellar glucose metabolism in healthy adults is an important factor for differentiation between pathological and physiological brain conditions. We aimed to test the practical applicability of a commercially available, semi-automated program for cerebral segmentation of the uptake of PET tracers hypothesizing an age-dependent decline in FDG uptake metrics by PET/CT imaging.

## 2. Method

Forty-two healthy subjects, 15 women (57.8±10.9 years) and 27 men (50.1±16.2 years) underwent FDG PET/CT as part of a prospective study. Scans were acquired 180 min. post tracer injection (4 MBq/kg) and analyzed using ROVER™ software. FDG uptake metrics were reported in standardized uptake value per body weight (SUV). The brain was divided into 4 volumes of interest: left and right cerebral hemispheres (Ce_L and Ce_R) and left and right cerebellar hemispheres (Cb_L and Cb_R). Each volume of interest was segmented using liver SUVmean as the lower threshold within each subject. For each hemisphere, the following variables were recorded: Volume, SUVmean, SUVmean-total, SUVmax, SUVpeak and partial volume corrected SUVmean-total.

## 3. Results

Qualitative analysis confirmed the negative correlation between volume and age in cerebral hemispheres (Ce_L: rho = -0.33, p = 0.03; Ce_R: rho = -0.41, p = 0.01). The SUVmean values of cerebral hemispheres also decreased significantly with increasing age (Ce_L: rho = -0.31, Ce_R: rho = -0.31, p = 0.04). Volume and SUVmean of the cerebellar hemispheres did not significantly associate with age. There was also a significant age-related loss of SUVmean-total in both cerebral hemispheres. The average SUVmean-total decline per age decade in cerebral area was more rapid in females than males: Ce_L, Female: -7%, Male: -4%; Ce_R, Female: -7%, Male: -5%. Healthy men had significantly higher volumetric values in the four brain regions, without meaningful higher metabolic activity, $p < 0.05$.

## 4. Conclusions

Using ROVER software, which was easily applicable, we found a significant age-related decline in volume, SUVmean, and SUVmean-total in cerebral hemispheres, but not cerebellar hemispheres. All male hemispheres were larger than corresponding female hemispheres both in cerebral and cerebellar regions. We did not find a significant gender difference in cerebral and cerebellar glucose metabolism.

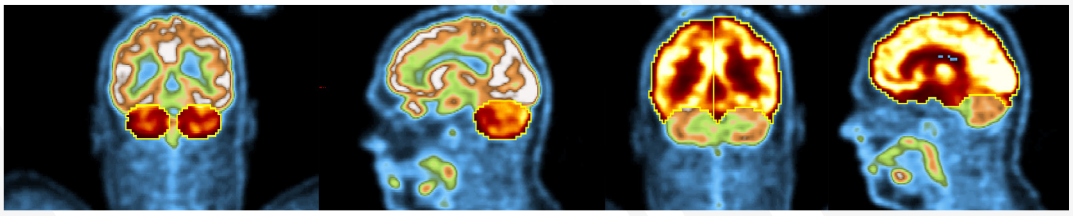

Figure 1 - Segmented brain regions using ROVER software

# The role of NMDA receptor in anterior cingulate cortex-caudate putamen circuit performance, Involved in autistic-like behaviors induced by maternal deprivation

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## 1. Background

Epigenetic agents, such as maternal deprivation during neurodevelopmental period of life, can result in changes in various regions of the brain and induced psychological disorders such as autistic-like phenomena. This study investigated the alteration of NMDAR1 density in caudate putamen (CPu) as a main behavior regulator region of brain in adult autistic-like after chronic stimulation of anterior cingulate cortex (ACC) via optogenetic technique.

## 2. Method

In order to make an animal model of autism, neonates were deprived from their mothers for 10 days (PND1-PND10, 3h/day). Subsequently in PND50, they bilaterally received (pLenti-CaMKIIa-hChR2 (H134R)-mCherry-WPRE) virus in ACC area via stereotaxic surgery. After 22 days, these regions were exposed to blue laser (473 nm) for six consecutive days (15min/day). In the following day, autistic-like behaviors were tested and compared with control group. The animals were immediately killed and their brains were prepared for tissue processing.

## 3. Results

This study showed that maternal deprivation stress causes autistic-like behaviors via overexpression of NMDAR1 in the CPu regions of adult rats compare with control group. Chronic optogenetic stimulation of ACC neurons (ChR2+) led to significant reduction in the appearance of stereotypical behavior and fear of strangers in autistic-like adult rats. The amount of NMDAR1 expression in CPu were reduced after this treatment.

## 4. Conclusions

elevation of NMDAR1 levels, enhanced the effect of ACC projection on CPu, a contributing factor in the occurrence of autistic-like behaviors. This is improved autistic-like behavior a day after the duration of opto-stimulation of ACC neurons via reduction of these protein density.