10 YEARS OF BREAKTHROUGHS A HEALTHIER FUTURE

EU-AIMS Autism Research in Europe

51

Developmental changes in resting state power spectrum and functional connectivity in autism spectrum disorder

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Facts & Figures

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EFPIA in kind:	9 773 543 €
Other:	7 216 089 €
Total cost:	37 480 613 €
Project website:	www.eu-aims.eu

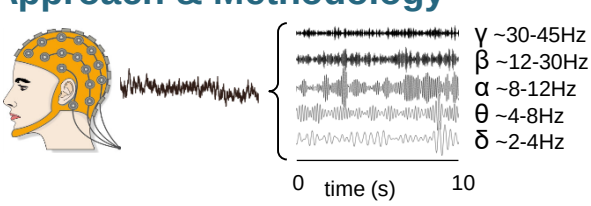
The **LEAP** (Longitudinal European Autism Project) is part of **EU-AIMS.** It is to date the largest multi-centre, multi-disciplinary observational study worldwide that aims to identify and validate stratification biomarkers for ASD. LEAP includes **multimodal biomaker** assessments. In this poster, we report on **Resting state EEG**, a non-invasive measure of the spontaneous brain activity.

Challenge

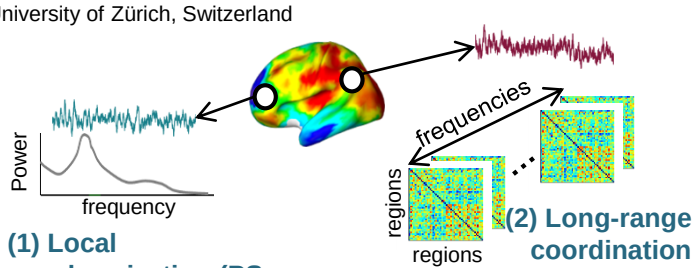
Understanding the differences in brain function between individuals with Autism Spectrum Disorder (ASD) and typically developing (TD) controls to derive robust biomarkers is crucial for developing effective treatments.

- Resting state EEG is a **promising technique to derive biomarkers** for ASD
  - Direct and non-invasive measure of neuronal function
  - Capture spontaneous local and long-range synchronization
  - Deployable (cost + availability + feasibility) across broad range of age and IQ
- Lots of candidates but **no validated biomarkers** derived from resting state EEG exist to date:
  - >50 publications
  - Contradictory results
  - Small sample sizes
  - Need for unbiased evaluation in a well-powered and well-controlled dataset, considering potential confounding effects of IQ, age and gender.

Approach & Methodology



Resting state EEG was acquired for **212 high functioning ASD** and **199 TD** (2 min eyes open, 2 min eyes closed in alternating blocks of 30 sec) in 5 European sites. After a careful data homogeneization and cleaning process, two types of measures were extracted:



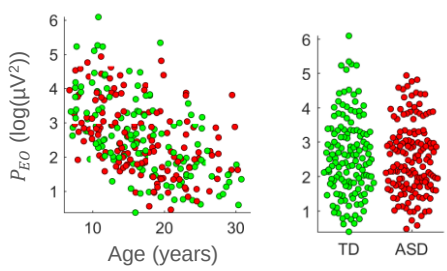
(1) Local synchronization (PS: power spectrum)

(2) Long-range coordination (FC: Functional Connectivity)

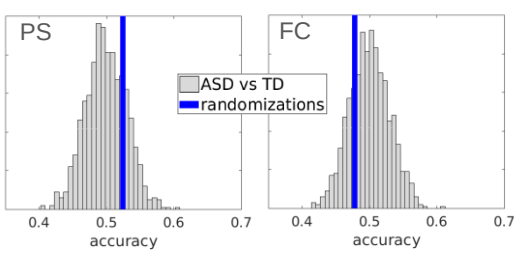
Results

- Power spectrum and functional connectivity evolved from childhood to adulthood following patterns previously described in typical development.
- **No significant effects of ASD diagnosis were found** in mean or variance for PS of FC (p>0.05)

PS: Absolute alpha power - eyes open



Classifier ASD vs TD



Value of IMI collaboration

- We have leveraged the largest comprehensive resting state EEG dataset in high functioning ASD to evaluate the developmental trajectories of ASD PS and FC.
- We demonstrated the quality of the dataset and pre-processing by **reproducing well-known age dependencies** in TDs.
- The maturation of spontaneous local and long-range synchronization in ASD closely follows a typical development trajectory through childhood, adolescence and early adulthood

Impact & take home message

- **No robust alterations ASD vs TD were found**. This disconfirms patterns of alterations reported in previous small sample studies.
- This work demonstrates that resting state EEG PS and FC do not hold potential as biomarkers of idiopathic high functioning ASD
- This **differentiates the physiology of high functioning ASD from genetically defined syndromes** associated with ASD which have a clear resting state EEG phenotype.

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