Exploring electrophysiological markers of auditory processing in Autism Spectrum Disorder during the odd-ball task: evidence from the EU-AIMS LEAP cohort.

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Facts & Figures

- Start date: 1/04/2012
- End date: 31/03/2018
- Contributions
  - IMI funding: 20 490 981 €
  - EFPIA in kind: 9 773 543 €
- Other: 7 216 089 €
- Total Cost: 37 480 613 €
- Project website: www.eu-aims.eu
- Social media: Twitter @euaims

The LEAP (Longitudinal European Autism Project) is part of EU-AIMS. It is the largest multi-centre, multi-disciplinary observational study in the world to date, aiming to identify and validate stratification biomarkers for ASD. This poster presents the MMN EEG data from LEAP.

Challenge

One core symptom domain of ASD is ‘repetitive behaviours’, under which falls sensory processing abnormalities. One potential explanation for these abnormalities has been reduced habituation/attenuation of sensory information. This process can be indexed by the mismatch negativity (MMN) EEG component. As hypothesised in the predictive coding account of ASD (Lawson, Rees & Friston, 2014), reduced habituation should be associated with a smaller MMN. Yet, previous finding are mixed, likely due to small sample sizes and the heterogeneous nature of ASD (see Uljarević et al, 2011). The MMN has been termed a candidate endophenotype for autism (Gomot, 2011)

Aims: 1) To conduct a systematic review of the literature, to identify the range of sample sizes used, the effect size, and to test for publication bias. 2) To test these effects empirically in a large heterogeneous cohort of individuals with ASD (LEAP sample).

Approach & Methodology

Meta-analysis: 1327 studies were identified and reviewed. 15 studies were classified as relevant (auditory oddball task, with case-control design). EU-AIMS LEAP analysis: A total of 1400 trials of four different stimuli were used in the auditory mismatch negativity task: Standard (1066); Frequency deviants (78); Duration Deviants (78); Combined frequency & duration deviant (78). Eye blinks and saccades were removed with ICA. A -100 to +100 threshold was used to remove artefacts. The baseline period was -100 to 0ms.

Value of IMI collaboration

We have collected and analysed the largest comprehensive MMN EEG dataset in ASD to evaluate MMN as a potential biomarker.

We demonstrated the quality of the dataset and pre-processing by within-condition experimental effects. We provide evidence against the utility of the MMN as a biomarker for ASD.

Impact & take home message

The Meta analysis suggests an absence of a case-control difference between the ASD and TD groups in terms of an auditory MMN at frontal central electrodes. Most prior studies had small sample sizes.

This was corroborated by analysis of the LEAP dataset (large sample size: 464) at Fz where neither the amplitude or latency of the MMN differed at a case-control level.

Normative modelling demonstrated that the large percentage of ASD/ID participants fell within 1SD of the TD mean. Data driven analysis is needed to examine topographic effects, as well as trial by trial patterns in the MMN response.

The research leading to these results has received support from the Innovative Medicines Initiative Joint Undertaking under grant agreement n° 1153500, resources of which are composed of financial contribution from the European Union’s Seventh Framework Programme (FP7/2007 - 2013) and EFPIA companies in kind contribution.