BabyMindReader: a multivariate NIRS-EEG neural decoder to decipher newborns' inital representations of speech prosody

Infants are born with a wide range of broad and universal perceptual abilities that allow them to start learning any language immediately. Findings that emerged over the last decades suggest that the acquisition of language starts already before birth, and lead to the hypothesis that the main feature of speech that humans learn prenatally is prosody. According to this proposal, prosodic information acts as a bootstrap, preparing the newborn to first recognize the relevant sound patterns of their native language, and then supporting him/her during the first year of life in learning its grammar and lexicon . Although this compelling idea is supported by considerable amount of evidence, a direct test that infants are born with a clear neural representation of prosody is still missing. The BabyMindReader project aims at casting light on this matter with an innovative interdisciplinary approach that brings together experimental methods in infant language research with technical advancements in the artificial intelligence (AI) field: infants' brain responses to stimuli characterized by different prosody will be measured in two different experiments, by means of co-registered NIRS and EEG, two of the most employed neuroimaging techniques in the infant research. Hemodynamic correlates of electrical activity in response to auditory stimuli will be characterized; based on this step, features will be selected and used to develop a multivariate classifier, by means of machine-learning methods, that will be employed to decode newborns' initial neural representations of prosody. The BabyMindReader project will on one hand introduce methodological innovations for NIRS-EEG coregistration and analysis that will be of great impact for the whole developmental community and beyond; second, it will provide a direct characterization of the role of prenatal learning of prosody, thus contributing to theoretical advancements in the research on the basis of language acquisition.

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Total EU Contribution: Euro 183.473,28

Call ID: H2020-MSCA-IF-2020

Project Duration in months: 24

Start Date: 01/01/2022

End Date: 31/12/2023

Find out more: https://cordis.europa.eu/project/id/101031716