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Magnetoencephalography as a tool to study speech perception in awake infants

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Magnetoencephalography (MEG) provides a safe, noninvasive method for studying the developing brain by offering reliable localization of the brain regions activated during speech processing. However technical challenges make recording awake infants difficult. The small size of the infant head in the adult-sized helmet results in a low signal-to-noise ratio. Head and limb movement, which is typical of young infants, produces signal artifact that is difficult to overcome during signal processing. This study used MEG to study phonetic processing in awake, non-sedated typically developing infants from 5-to-16 months. The recordings were made using the Elekta Neuromag® 306-channel instrument at BioMag Laboratory, Helsinki University Central Hospital, Finland. Infants listened to speech syllables produced by a loudspeaker inside the magnetically shielded room. Newly developed signal processing methods and behavioral entertainment greatly improved the quality of the data, producing 29 successful infant recordings out of 35 attempts. We describe the methods, as well as removal of movement-modulated artifacts, efficient interference suppression, and movement compensation during data analysis. Whole-head MEG recordings in awake babies a few months old are now feasible.