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Sommario/riassunto	Research on the human brain development has seen an upturn in the past years mostly due to novel neuroimaging tools that became available to study the anatomy and function of the developing brain. Magnetic Resonance Imaging (MRI) and Diffusion Tensor Imaging (DTI) are beginning to be used more frequently in children to determine the gross anatomy and structural connectivity of their brain. Functional MRI and Near-Infrared Spectroscopy (NIRS) determine the hemodynamics and electroencephalography (EEG) the electrophysiological functions of the developing human brain. Magnetoencephalography (MEG) complements EEG as the only other technique capable of directly measuring the developing brain electrophysiology. Although MEG is still being used relatively rarely in pediatric studies, the recent development in this technology is beginning to demonstrate its utility in both basic and clinical neurosciences. MEG seems to be quite

attractive for pediatric use, since it measures the human brain activity in an entirely passive manner without possessing any conceivable risk to the developing tissue. MEG sessions generally require minimal patient preparation, and the recordings are extremely well tolerated from children. Biomagnetic techniques also offer an indirect way to assess the functional brain and heart activity of fetuses in humans in utero by measuring the magnetic field outside the maternal abdomen. Magnetic field produced by the electrical activity in the heart and brain of the fetus is not attenuated by the vernix, a waxy film covering its entire skin. A biomagnetic instrument specifically designed for fetal studies has been developed for this purpose. Fetal MEG studies using such a system have shown that both spontaneous brain activity and evoked cortical activity can be measured from outside the abdomen of pregnant mothers. Fetal MEG may become clinically very useful for implementation and evaluation of intervention programs in at-risk populations. Biomagnetic instruments have also been developed for specifically measuring the brain activity in newborns, infants and older children. MEG studies have shown the usefulness of MEG for localizing active regions in the brain and also for tracking the longitudinal maturation of various sensory systems. Studies of pediatric patients are beginning to show interesting functional pathology in autism spectrum disorder, cerebral palsy, epilepsy and other types of neurological and psychiatric disorders (Down syndrome, traumatic brain injury, Tourette syndrome, hearing deficits, childhood migraine). We propose to compile the state of the art MEG studies focused on pediatric population in both health and disease ... We believe a review of the recent studies of human brain development using MEG is quite timely, since we are witnessing advances not only in the instrumentation optimized for the pediatric population, but also in the research based on various types of MEG systems designed for both human fetuses in utero and neonates and older children.
