

MASSAGE AND GROWTH OF THE BRAIN, ANALOGY WITH KMC

Dr Andrea Guzzetta

Department of developmental Neuroscience, Stella Maris Scientific Institute, Pisa, Italy

Preterm birth is associated with long-term neurodevelopmental abnormalities, including motor disability, reduced cognitive performance and behavioral problems. The severity of the deficits is

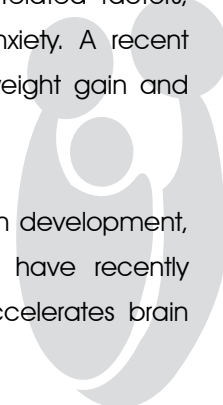


related to the degree of prematurity and the presence of brain damage, however neurodevelopmental abnormalities can be also observed in low-risk preterms (e.g. late preterm infants, appropriate for gestational age and without detectable brain injury). The neurobiological mechanisms underlying the developmental disabilities related to preterm birth are not entirely understood. However, there is increasing evidence suggesting that exposure to the ex-utero environment significantly affects brain development from the first days/weeks of life. Magnetic Resonance (MR) imaging studies in term-born infants and preterm infants at term-equivalent

age have shown how preterm birth alters development of regional brain volume, white matter, cortex, deep gray matter and vascular organization. Electrophysiological studies have also found significant differences in spectral EEG measures between healthy term and preterm infants. Cerebral alterations are generally related to the degree of immaturity at birth or to concomitant WM injury, but they can be also found in low-risk preterm infants.

Although some differences between term infants and preterm infants at term equivalent age are explained by the effect of minor complications associated with preterm birth, both the experience of a highly stressful environment and the lack of tactile stimulation, otherwise experienced in the womb, may exert detrimental effects on the immature brain. Early interventions based on the manipulation of extra-utero environment, and among them infant massage therapy, have been used in preterm infants with the aim of optimizing infant's sensory experience and thus potentially improving their overall functional outcome. Infant massage can be defined as a form of systematic tactile stimulation by human hands, consisting in a gentle, slow stroking of each part of the body in turn. Infant massage was recently shown to have several positive effects in preterm and low-birth weight (LBW) infants, including weight gain acceleration, pain attenuation, reduction of stress and stress-related factors, reduction of late-onset sepsis and reduction of mother's depressed mood and anxiety. A recent systematic review, confirmed the effects of preterm infant massage on increasing weight gain and reducing length of stay in the NICU.

Very little is known on the effects of early intervention on more direct measures of brain development, such as the maturation of brain electrical activity and/or of brain structure. We have recently shown that an early intervention in preterm newborns based on infant massage accelerates brain



Dr Andrea Guzzetta

PhD in Basic and Developmental Neuroscience at the University of Pisa, in 2005

Thesis entitled: "Development of the human nervous system after early brain damage: maturation and integration of motor and visuo-perceptual functions".

Head of the Infant Neurology Section, Responsible for the Laboratory of Child Neuro-ophthalmology and, for the Laboratory of Infant Electrophysiology, and Head of the clinical section of the Laboratory of Neuroimaging. Full time researcher at the Department of Developmental Neuroscience of the Stella Maris Scientific Institute in Pisa since 2005.

Spend 50% time in Research and 50% time in Clinical Work as a Child Neurologist.

The Stella Maris hosts Italy's largest child neurology unit with the largest register of patients with congenital brain damage in the country.

Worked at various centers Hammersmith Hospital and the Visual Development Unit in London (Great Britain) and the Department of Child Neurology in Tuebingen (Germany) since 2005 intermittently on Study Leave. Received scholarship from the Queensland Cerebral Palsy Research and Rehabilitation Center (QCPRRC), to work full-time research as a Senior Research Fellow at the University of Queensland for 18 month in 2009 to 2010.

Research activity and impact in field

Dr Guzzetta main research has focused on the effects of early brain damage on the development of different functions and the underlying neuroplastic mechanisms, with the final aim to improve early intervention paradigms and outcomes

His major scientific contributions have been achieved in the following areas.

1. Early prediction of functional outcome in infants with brain damage using neonatal brain imaging. He demonstrated a consistent correlation between some indexes of early brain damage on neonatal MRI and later fine motor and visual outcome.
2. The early assessment of visual functions and diagnosis of cerebral visual impairment. Part of his research interest has been on the early assessment of visual functions in infants and children at neurological risk, resulting in two review papers and some book chapters on the topic.
3. The early neurological assessment in infants at neurological risk. He is one of the few researchers with a comprehensive knowledge of the two main approaches in the field, the traditional neurological examination and the assessment of General Movements.
4. Brain plasticity in congenital lesions. In the last few years, Dr Guzzetta became increasingly

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interested in the mechanisms of plastic reorganization following early brain damage..

5. The effect of neurodevelopmental interventions on brain maturation. One of the last fields of interests of Dr. Guzzetta has been early intervention in premature infants.

Dr. Guzzetta current research focus builds upon these contributions, and includes: Advanced brain imaging focused on the study of structural differences in brain reorganization between subjects with congenital brain damage and those with acquired lesions (e.g. DTI, cortical connectivity, etc.). A better understanding of causal pathways to functional impairment is essential for improving early therapies.

- New early interventions, based on the stimulation of the mirror neuron system to activate the motor cortex and thus influence the pattern of cortical reorganization. The theory of mirror neurons can have the power to revolutionize the field of early motor rehabilitation, although the field is still completely unexplored.
- New early interventions, based on the environmental enrichment of preterm born infants. Reducing the risk for neurodevelopmental complications of preterm birth might have enormous social and economical positive consequences.

