

ЛЕКЦИИ

PSYCHOPHYSIOLOGY OF BRAIN PLASTICITY, LEARNING ABILITIES, LEARNING DISABILITIES AND ADHD

Constantine A Mangina

*President, International Organization of Psychophysiology, Associated with the United Nations
(New York) Director, Montreal Research and Treatment Center for Learning Abilities and
Disabilities, Cognitive Psychophysiology Laboratory, Montreal, Canada.*

Research over the years with the Mangina Diagnostic Tool of Visual Perception (Mangina-Test) has shown that increasing degrees of «analytical-specific perceptual skills» are fundamental for learning new and more complex tasks (Mangina, 1981, 1986, 1989, 1991, 1994 a, b, c, 1998; Mangina and Beuzeron-Mangina, 1988, 1992a, b, 2004a, b, 2006; Mangina et al., 1998, 2000; Mangina and Sokolov, 2006). Moreover, Functional Magnetic Resonance Imaging (fMRI) investigations were undertaken in young healthy adults and revealed the neural correlates underlying «analytical-specific visual perception» in terms of task difficulty and specificity of the stimuli (Mangina et al., 2008 a, b, 2009 a, b, (in press)).

With large samples of children and adolescents, we had also identified and standardized the bilateral electrodermal parameters of learning disabled subjects and those with normal neurocognitive abilities (Mangina and Beuzeron-Mangina, 1992a). The intracerebral representation of neural modulators of human electrodermal phenomena was investigated for the first time with the direct electrical stimulation of the brain and the concomitant recording of bilateral electrodermal activity (Mangina and Beuzeron-Mangina, 1996). It was found that, among the 32 sites investigated, the anterior cingulate gyri, the amygdalae and the anterior and posterior hippocampi are potent ipsilateral modulators of bilateral electrodermal responses as opposed to neocortical sites such as the mid-regions of the second temporal gyri (Mangina and Beuzeron-Mangina, 1996). Manipulations of bilateral electrodermal activity coupled with stimulation using «analytical-specific perceptual tasks» (derived from the Mangina-Test), have been applied within a complex psychophysiological treatment methodology for learning disabilities and the improvement of neurocognitive abilities (Mangina, 1986, 1989, 1991, 1997; Mangina and Beuzeron-Mangina, 1988, 1992 a, b, 1998, 2004 a, b). During this psychophysiological treatment procedure, manipulation and maintenance of bilateral electrodermal activation within the identified and standardized range of 6.5 – 8.5 μ mhos simultaneously combined with «analytical – specific perceptual stimulation» contribute to the enhancement of pre-frontal and frontal N450 event-related brain potentials (ERPs) in treated learning disabled /ADHD subjects after eight consecutive months of treatment (Mangina and Beuzeron-Mangina, 2004 a, b). In contrast, learning disabled / ADHD subjects who were not treated, exhibited the same ERP irregularities at baseline and eight months later in spite of having received special education interventions within the same time interval (Mangina and Beuzeron-Mangina, 2004 a, b). Thus, those results suggested that time and / or maturation per se did not play a role in improving ERP

topography and neurocognitive abilities. Rather, brain plasticity as expressed in ERP topographic mapping is involved in the improvement of treated learning disabled / ADHD subjects due to the direct impact of specific methodological intervention which alters the functional neuroanatomy and electrophysiology of the human brain (Mangina and Beuzeron-Mangina, 2004 a, b; Mangina and Sokolov, 2006).

Furthermore, Mangina-Test performance differences and Topographic Mapping of Event -Related Brain Potential indicants along with bilateral electrodermal parameters were found to delineate normal subjects, «pure» learning disabled, «pure» ADHD and comorbid ADHD with learning disabilities (Mangina and Beuzeron-Mangina, 2006, 2008, 2009 -in press). Thus, enhanced prefrontal and frontal negativities (N450) to our Memory Workload Paradigm seem to be robust markers of normal learning abilities. In contrast, reduced negativities (N450) over these regions are associated with «Pure» ADHD. On the other hand, «Pure» learning disabled pre-adolescents exhibited small positivities (P450) over prefrontal and frontal regions. Further research with fMRI indicants of the Mangina-Test investigating these four groups is currently being conducted.

The results will also be discussed within a brain plasticity model of inhibitory control, the normal development of learning abilities and the psychophysiological treatment of learning disabilities. All these aspects lead to the conclusion that school / academic learning abilities reflect increasing degrees of neurocognitive skills necessary for the acquisition of new and more complex knowledge. In contrast, learning disabilities are composed of persisting specific impairments in the complete acquisition of age – appropriate mathematics, reading / comprehension, written expression, or any other subject of cognitive endeavor despite «normal» or «quasi- normal» intelligence. Moreover, very subtle learning disabilities, which may go undetected, are very frequent in the general population. In recent years however, another equally serious problem, namely Attention Deficit Hyperactivity Disorder (ADHD) attracted most emphasis. Although learning disabilities and ADHD are two distinct pathologies, they may co-exist in the same person. As such, the understanding and differentiation of a «pure» learning problem from a «pure» ADHD is of paramount importance as is the detection of these two pathologies when both are present. Hence, a methodological framework taking into account the differences and the complexity of overlapping similarities of symptoms, is pivotal in helping those suffering from either one of the two or from both of these conditions.

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ФУНКЦИОНАЛЬНОЕ РАЗВИТИЕ МОЗГА, ПОЗНАВАТЕЛЬНАЯ ДЕЯТЕЛЬНОСТЬ И ОБУЧЕНИЕ В ПРЕДШКОЛЬНОМ И МЛАДШЕМ ШКОЛЬНОМ ВОЗРАСТЕ

Безруких М.М.

*Институт возрастной физиологии РАО, Москва, Россия
ivfrao@yandex.ru*

Последние десятилетия являются периодом повышенного интереса к изучению мозга ребенка, интереса к его развитию, функционированию, особенностям мозговой