## Abstract

This theoretical thesis covers the issues of Autism Spectrum Disorders (ASD) in relation to the brain connectome research. ASD belong to the group of neurodevelopmental syndromes and are characterized by deficits in communication skills, social interaction and stereotypic behaviors. The prevalence of ASD increases, its etiopathogenesis is very likely multifactorial. Within the ASD syndrome, precise differential diagnostic algorithms are difficult to implement in the absence of objective biomarkers. Extensive neuroscientific research, including the connectome projects, might improve the diagnostic and therapeutic procedures in the field of Psychiatry, including ASD.

The individual´s connectome profile might well serve as a new biomarker in psychiatric diagnostic and therapeutic approaches. The brain connectome represents the net of all neuronal connections in the brain. Mapping of the connectome across all ages, in health and in disease, is the main goal of the Human Connectome Project (HCP). The first HCP data show great interindividual variability with the environmental factors playing a crucial role. Extensive neurobiology research data on mechanisms of memory support the vital role of environmental stimulation in compensating for behavioral symptoms in ASD. Applied behavior analysis (ABA) is an effective therapy in ASD patients. ABA interventions are intense and based on the specific behavioral profile of each individual. The ABA behavior-modifying procedures efficiently implement scientifically based behavioral principles. Research on music therapy, a type of complementary intervention for ASD individuals, has demonstrated a modifying effect of music on brain functions and brain connectome, including the language skills.

The brain connectome data confirm the fundamental role of teaching, as an environmental factor, in modifying behavior, developing new skills and compensating for memory and learning deficits in individuals with ASD. Basically, an adequate environmental stimulation has the potential to alter gene expression, brain connectivity and therefore the brain connectome through epigenetic mechanisms (chemical changes of DNA and histones). Changes in the brain connectome manifest as changes in behavior, which defines learning. Advances in the field of connectomics might help to objectify the etiopathogenetic mechanisms, diagnostic strategies and therapeutic algorithms in people with ASD and other neurodevelopmental syndromes. Translating the connectome research into clinical practice will improve the quality of life of these individuals and their families.

**Keywords:** Autism Spectrum Disorders, neurodevelopmental syndromes, The Human Connectome Project, epigenome, mechanisms of memory and learning, individualized therapy