DESCRIPTION FOR GENERAL PUBLIC (IN ENGLISH)

Learning new skills is essential for being able to meet the challenges of everyday life. We learn to use of new hardware, software, playing musical instruments or speaking a second language. Without learning new skills we would not be able to stay up to date in an ever-changing world. However the learning process might be different depending on the type of skill we want to acquire. At the same time all changes in human behavior are reflected in the brain. These changes on the brain level are called neuroplasticity, that is the ability of the brain to undergo reorganization. In the last two decades the predominant view that neuroplasticity takes place early in life and becomes largely reduced in adulthood has been challenged. Contemporary research provided evidence for experience and practice-dependent neuroplasticity also in the adult human brain. Yet a lot remains to be discovered about how the adult brain changes in response to learning. When can we observe changes in brain function and structure while acquiring new skills? Are they irreversible or do they fade away when we do not use these skills? Is the time course of neuroplasticity similar for learning different skills? For complex skill learning do changes first occur at the level of sensorimotor cortex and later in more advanced higher order brain regions? What are the neuronal predispositions for learning a specific skill?

The main aim of the current research project is uncovering the dynamics of adult human brain neuroplasticity in response to learning new skills. We have recently shown that the first 3 months of second language or script learning are critical for functional neuroplasticity. On the other hand, studies on instrumental musical training suggest neuroplastic changes after only few weeks of training. To reveal detailed time-course of brain reorganization we will examine two groups of subjects, where one will learn tactile Braille reading and the other to play piano/keyboard. These two types of skills require multisensory training, involving the components of sensorimotor systems together with higher-order cognitive processes. The trainings will last for 6 months with 90-minutes classes twice a week. During this time using non-invasive neuroimaging methods we will capture with unprecedented detail the functional and structural neuroplastic changes in the brain in response to learning. Subjects will participate in 6 neuroimaging sessions: before training, after 1 week, 6 weeks, 3 moths, 6 months and 12 months (i.e. 6 months after finishing the training). During functional brain imaging participants will perform tasks related to different aspects of tactile Braille reading or keyboard playing. We will also invite skilled Braille readers and professional piano players to perform these tasks in the MR scanner. This will allow us to directly compare if brain activation to new skill in late learners is becoming more similar to the one of experts in the course of learning. The current project will shed light on the understanding of the dynamics of functional and structural training-induced neuroplasticity. Due to the longitudinal design of the project we will also have the opportunity to reveal what are the neuronal predispositions for learning new multisensory skills.