

“Determinants of learning and neural plasticity: From mice to men” - an interdisciplinary project on Healthy Ageing

The overarching aim of this interdisciplinary project is the investigation of learning processes and neural plasticity across the life-span and their dependency on different internal and external factors. Researchers from (Cognitive) Neuroscience, Cellular Biology, Psychology, and Sport Science, and from different universities and research institutes are involved in this project.

Human ageing is associated with deficits in goal-directed learning and reduced (but enhanceable) neural plasticity. Age-related learning impairments have been attributed to changes in the integrity of the prefrontal cortex and its connectivity to other brain areas. Yet, our understanding of the underlying computational and neural mechanisms remains inconclusive as most age-comparative human studies rely on correlational designs. It is thought that external (e.g. environmental enrichment) and internal, e.g. (epi-)genetic factors as well as interventions (cognitive and/or physical training) influence the capacity of learning and neural plasticity in ageing.

After establishing species-comparative paradigms and methods for the analysis of learning strategies and neural plasticity, we will conduct parallel human experiments and behavioral studies on mice using cutting-edge monitoring systems (e.g., IntelliCage). These will examine the effects of environmental conditions/lifestyle, motivation to learn, learning strategies and training interventions as well as their interaction with age and genetic background. Based on the aggregated data we will develop a cognitive model of age-related changes in learning and neural plasticity and identify critical factors/time points for preserving/stimulating plasticity and learning. Finally, these findings will be applied in the development of training, pharmacological and stimulation interventions aimed at improving cognitive flexibility in older adults, based on the variety of expertise from the involved research areas.

The workshop will give an introduction to the project and its interdisciplinary challenges. Further on the participants will develop a management schedule for the project. They will discuss the study design, will search for funding opportunities and for possibilities to publish interdisciplinarily generated results. This way the workshop will give a quite practical experience in the challenges of interdisciplinary research on the basis of a current project in the Leibniz Research Alliance Healthy Ageing.