Are people ready for personalized brain health?

Isabelle Budin-Ljøsne

Maintaining a healthy brain is critically important to live a healthy and productive life. However, we still know very little about people’s perceptions of brain health. If we knew more, we could potentially develop policy recommendations to help people take care of their brain in a way that fits their daily life.

This presentation will summarize main results from a qualitative study conducted among healthy adults participating in Lifebrain research studies in Europe. The study investigated the participants’ views on brain health, intention to learn more about their brain health, for instance by using brain health tests, and willingness to maintain a healthy brain. The study revealed that more concise, practical, personalized, and evidence-based information about the brain is needed to promote brain health. Further, this presentation will introduce the Global Brain Health Survey available in 12 languages and aiming to investigate people’s views on brain health around the world.
Promoting healthy brain ageing: What do we know and where are we going? Example from the large European project Silver Santé Study

Gaël Chételat

Memory problems, dementia (e.g. Alzheimer’s disease (AD)), sleep disturbances and depression – all related to psychological distress and anxiety – are significant causes of reduced quality of life in older adults. An estimated one-third of AD cases are thought to be attributable to risk factors arising from lifestyle choices or treatable conditions, such as heart disease, depression and lack of physical and mental activity. Current large-scale preventive trials tend to focus on tackling each specific risk factor. However, emotional aspects of mental health such as stress and depression are not directly targeted. Mental training for the reduction of stress, the regulation of attention and the cultivation of positive emotions through meditation practice appears to have potential for improving the emotional dimension of ageing. Thus, meditation practice has the potential to reduce several of the risk factors cited above and, thereby, to have a positive impact on mental health and well-being – notably in the ageing population. This talk will illustrate why there is interest in the use of meditation to improve mental health and well-being in ageing populations by showing preliminary evidence from previous studies. We will also present the design of a European project – the Silver Santé Study – aiming to assess the effects of meditation on mental health and well-being in the ageing population. Eleven partners from 6 countries (France, Spain, Germany, UK, Switzerland and Belgium) are involved in this collaborative project including two clinical trials sponsored by Inserm. Results are expected to foster the development of preventive strategies in ageing, reducing the negative impact of mental conditions and disorders on both individuals and society.
Episodic memory in pre-clinical Alzheimer’s disease

Emrah Düzel

Amyloid and Tau pathology progress along distinct anatomical networks before they overlap in the course of Alzheimer’s disease. As a consequence, both pathologies are likely to affect different functional brain networks and related cognitive functions in the early course of AD. To dissect pathology-specific impact on cognition, we utilize recent insights into the fine-grained architecture of functionally and anatomically separated pathways that support episodic memory, notably different hippocampal-cortical pathways for the mnemonic discrimination of object and scene information. I will give an overview of the early network distribution patterns of amyloid and tau pathology in pre-clinical Alzheimer’s disease and will present recent biomarker and neuroimaging data from fMRI and PET studies (German Center for Neurodegenerative Diseases, DZNE and UC Berkeley) and will relate pathology to object- and scene-pathway dysfunction. I will also present data on how the vascular supply of the hippocampus impacts on episodic memory. Finally, I will discuss how these types of insights could benefit early assessment, trajectory monitoring and interventional stratification in pre-clinical Alzheimer’s disease.
Depressive illness: difficult to recognize, but easy to treat

Peter Falkai

In strikingly mainly young adults, depression belongs to the most severe disabling conditions in humans and therefore to the costliest illnesses world-wide. Depression has a lifetime risk of about 20-25%. Despite tremendous efforts in psychopharmacological and psychotherapeutic treatment approaches, the neurobiological background of depression remains elusive, and due to lacking biomarkers an early diagnosis and reliable prognosis is difficult. Epidemiologic and GWAS studies revealed a genetic risk for depression, but further powerful risks are environmental factors like stress and emotional trauma during the vulnerable episodes of brain development. Smaller volumes of brain regions such as the hippocampus have been detected in major depression. The presence of alterations in first-episode depression is consistent with a neurodevelopmental hypothesis of early stress experience, since the hippocampus plays a major role in inhibiting stress response, providing inhibitory feedback to the hypothalamic-pituitary-adrenal (HPA) axis. In patients with major depression, a dysfunction of the HPA axis was detected. Epigenetic mechanisms altering chromatin structure such as histone acetylation and DNA methylation may link effects of environmental factors such as stress to transcriptional regulation of specific genes. Precision medicine tools may pave the way to the development of biomarkers, which improve diagnostic understanding and could augment therapeutic strategies.
Cognitive training and non-invasive brain stimulation in aging and neurodegenerative disease

Agnes Flöel

Combination of cognitive training protocols with noninvasive transcranial brain stimulation (NIBS) techniques may constitute a promising means for cognitive enhancement in older adults (Perceval et al., Neurosci Biobehav Rev 2016). Given decline of cognitive function even in healthy aging, modulation of brain plasticity with transcranial direct current stimulation (tDCS) concurrent to intense task practice over multiple days holds promise to induce sustained improvements of trained and untrained functions.

In this contribution, I will present own work on the impact on single-day and multiple-day training and constant current tDCS on learning and memory formation as well as functional networks in older adults with and without cognitive impairment (Antonenko et al, NBA 2018; Antonenko et al, Scientific Rep 2019; de Sousa et al, work in progress). Moreover, I will present recent work on slow oscillatory tDCS on sleep-related memory consolidation in these populations (Ladenbauer et al, J Neurosci 2016, 2017)

Finally, I will outline further future strategies to improve on this approach, with the ultimate goal to transfer this intervention into clinical practice.
How and why our lifestyle shapes the brain in healthy ageing and disease

Gerd Kempermann

How people lead their lives has a massive influence on the structure and function of the brain across the course of life. Lifestyle factors of risk and resilience are thus potent targets for strategies of ‘successful aging’. But the scope of factors that fall under this umbrella is vast and it is not clear, how such factors influence cognition.

At the same time, these factors show a great communality, in that they are not independent of each other, yet their combination is highly individual. This fact raises interesting fundamental questions about the underlying, shared biological principles. The neurobiology underlying lifestyle-based resilience is far from clear. The classical experimental paradigm of ‘environmental enrichment’ can be used to address these questions in a reductionistic setting. As a primary readout in animal studies we use adult hippocampal neurogenesis as a trait that can be captured from the molecular bases to its behavioral consequences. By applying a longitudinal and multivariate design to the paradigm new questions can be asked and novel insights be extracted. A key example is the observation how cognitive behaviors correlate with longitudinal activity trajectories and changes in brain plasticity.
Does video gaming affect the brain?

Simone Kühn

Video gaming is a popular leisure activity for individuals across all age groups nowadays. Within the scope of the presentation research will be highlighted that investigates the brain structural and functional effects of playing video games. We have investigated habitual video gamers and used longitudinal intervention studies to draw conclusions on the causal effects of video gaming on brain plasticity. Data will be presented on the effects of commercially available video games as well as of custom made games. Likewise different groups of participants were researched ranging from healthy participants to patients with mental diseases.
Cognitive ageing: A lifespan perspective

Ulman Lindenberger

Human cognitive aging differs between and is malleable within individuals. In the absence of a strong genetic program, it is open to a host of hazards, such as vascular and metabolic risk, but also open to protective and enhancing factors, such as experience-dependent cognitive plasticity. Longitudinal studies suggest that leading an intellectually challenging, physically active, and socially engaged life may mitigate losses and consolidate gains, but results need to be interpreted with caution, as individuals are not randomly assigned to lifestyles. In my presentation, I will focus (i) on the role education in adult cognitive development; (ii) the degree to which cognitive changes in adulthood generalise across abilities; and (iii) brain maintenance as a putative cause of preserved cognition in old age.
Meditation-based interventions in the elderly

Antoine Lutz

There is increasing acknowledgment for the benefit of lifestyle-based approach in reducing the risk for dementia and improving mental health and well-being in ageing populations. Amongst those, mental training approaches based on meditation practice are expected to directly target the emotional dimension of ageing and reduce stress, anxiety, depression and possibly sleep difficulties, which are risk factors for dementia. Previous studies offer preliminary evidence for the positive impact of various meditation practices on brain structure and function, psycho-affective factors and cognition. Overall, we argue, more specifically, that the regular practice of mindfulness meditation and loving-kindness and compassion meditations constitutes a protective lifestyle not only on Alzheimer disease but also more generally on cognition, mental health, and wellbeing in the aging population. Large scale randomized clinical trials are needed to test this hypothesis and investigate the underlying mechanisms.
Sticks and stones may break my bones, but can words hurt my brain? How our style of thinking may affect risk for dementia.

Natalie Marchant

In recent decades, a number of psychological risk factors for cognitive decline and Alzheimer’s disease have been identified. The Cognitive Debt hypothesis proposes that repetitive negative thinking, a modifiable style of thinking that is frequently involved in many of these psychological risk factors, may itself increase risk for Alzheimer’s. Dr Marchant will present empirical findings showing that in a large sample of older adults at risk of developing Alzheimer’s, higher repetitive negative thinking was associated with more rapid decline in cognitive domains affected early in Alzheimer’s (i.e. memory), and with global amyloid and regional tau deposition in the brain. Given that repetitive negative thinking is responsive to treatment she proposes that future research could investigate whether modifying this style of thinking reduces risk of developing Alzheimer’s.
What will memory ageing look like for our grandchildren?

Lars Nyberg

There is strong scientific evidence that some older adults display well-preserved cognitive abilities. Thus, although the average pattern is one of cognitive decline, there is marked heterogeneity in onset and rate of cognitive decline. Much focus of current research is on trying to identify the genetic and lifestyle factors that explain this heterogeneity, and some progress has been made. In particular, there is converging evidence that individual lifestyle choices can, to some significant degree, modulate cognitive aging. This opens up for positive trends in the future, such that the proportion of older adults that displayed well-preserved cognition may in fact increase. In view of global population aging, this would be crucial. In this presentation I will provide a brief overview on what the future of cognitive aging might look like.
Burden and challenges of brain disorders

Alfons Schnitzler

Over the last decades, neurological and mental disorders have steadily progressed to become the leading causes of disability-adjusted life years and the second leading cause of death worldwide. According to the European Brain Council, brain disorders affect more than one in three European citizens during their lifetime. Every year, treating brain conditions accounts for 35% of Europe’s total disease burden with a yearly cost of €798 billion, of which 60% are related to direct costs. Brain disorders are threatening not only the quality of life of millions of European citizens but also represent an enormous socio-economic challenge to our societies. The prevalence of brain disorders is growing due to the increase in life expectancy, the epidemiological transition from acute to chronic diseases and because of a number of socio-economic, environmental and behavioural health determinants.

Symptomatic treatment has continuously been developed but there is still no cure for most brain disorders; hence, it is necessary to focus on risk reduction, preclinical and early detection and diagnosis, and timely intervention. Primary and secondary prevention strategies remain essential. More research is needed to understand the causes but also the progression of brain disorders and to develop new treatments that do not only symptomatically improve the condition but may modify or even stop their course.