Thursday May 3 (5:15 pm – 6:45 pm)

Symposium: **Risk and Protective Factors for Cognitive Decline: New Insights from Longitudinal Studies**

Overview Speaker

Presenter: Anja Soldan, *Department of Neurology, Johns Hopkins University School of Medicine*

Abstract: This symposium will present new findings from longitudinal cohort studies that have followed middle-aged and older cognitively normal individuals over time in order to identify potential risk and protective factors for future cognitive decline and impairment. The risk factors that will be examined in this symposium include brain amyloid and tau aggregations (the two hallmarks of Alzheimer's disease), neurodegeneration (as measured by atrophy on MRI), genetic variants, depressive symptoms, and cardiovascular risk factors, including obesity, hypertension, and cholesterol levels. Potential protective factors that will be discussed include proxy measures of cognitive reserve, such as years of education, literacy, and vocabulary knowledge, and self-reported engagement in social, cognitive, and physical activities. The symposium will begin with a discussion of seminal findings from the Harvard Aging Brain Study (N=247, mean baseline age=74, mean follow up=4 years). This presentation will focus on the role of amyloid and tau, as measured by PET imaging, as well as the role of brain atrophy in determining future cognitive trajectories in multiple cognitive domains among individuals with normal cognition. The second presentation will discuss initial findings from the Preclinical Alzheimer's Disease Consortium, a collaboration of 5 longitudinal studies that have collected cognitive, biomarker, and lifestyle data among individuals who were cognitively normal when first enrolled (WRAP, ACS, BIOCARD, AIBL and BLSA). Following a brief overview of the Consortium, the presentation will focus on the association between cerebrospinal fluid markers of amyloid, tau, and neurodegeneration (N=585, mean baseline age = 59, mean follow-up =7 years) and future rates of cognitive decline using the recently proposed amyloid/tau/neurodegneration (ATN) classification system. The third talk will present findings from the Baltimore Longitudinal Study of Aging (N=622, mean baseline age = 71, mean follow-up = 4 years). The focus here will be on the association between cardiovascular and genetic risk factors, education, sex, and depressive symptoms and rates of brain atrophy among individuals who remain cognitively normal over time and those who develop cognitive impairment. Lastly, the symposium will turn to a discussion of potential protective factors, as examined in the BIOCARD study (N=189, mean baseline age = 57, mean follow-up = 12 years). This presentation centers on the degree to which self-reported engagement in lifestyle activities is associated with current cognitive performance, prior longitudinal cognitive trajectories, and baseline levels of cognitive reserve, as measured by years of education, literacy, and vocabulary.

Thursday May 3 (5:15 pm – 6:45 pm)

Symposium: **Risk and Protective Factors for Cognitive Decline: New Insights from Longitudinal Studies**

Cognitive Decline in Preclinical Alzheimer's Disease

Presenter: Elizabeth Mormino, *Neurology & Neurological Sciences, Stanford University*

Abstract: Work across multiple research groups has shown that clinically normal (CN) individuals with abnormal levels of beta-amyloid (Aβ+) show cognitive decline and risk of progression to Alzheimer's disease (AD) dementia compared to Aβ- CN. To further categorize CN individuals along the AD trajectory, preclinical staging criteria have been proposed to combine Aβ status with neurodegeneration (ND) markers. In this framework, Aβ-/ND- are considered Stage 0, Aβ+/ND- are Stage 1, and Aβ+/ND+ are Stage 2. In a study of 247 older CN, we have shown that Stage 2 (Aβ+/ND+) shows cognitive decline over time compared to all other groups. The ability to measure the other pathological hallmark of AD, the aggregation of Tau, has recently become available and integrated into studies of CN. In addition to higher levels of Tau in the Aβ+ CN compared to Aβ- CN, we have shown that elevated Tau in the medial temporal lobe and inferior temporal cortex is predictive of memory decline among the Aβ+ CN group. Overall, studies investigating the pathophysiological processes of AD have found elevated risk of future decline in Aβ+ CN, providing an opportunity to test whether disease-modifying treatments applied during the preclinical stage of AD will prevent clinical symptoms.

Thursday May 3 (5:15 pm – 6:45 pm)

Symposium: **Risk and Protective Factors for Cognitive Decline: New Insights from Longitudinal Studies**

Amyloid/Tau/Neurodegeneration (ATN) Profiles among Cognitively Normal Individuals and their Cognitive Outcomes

Presenter: Anja Soldan, *Department of Neurology, Johns Hopkins University School of Medicine*

Anja Soldan, *Department of Neurology, Johns Hopkins University School of Medicine*; Anne Fagan, *Department of Neurology, Washington University School of Medicine*; Suzanne Schindler, *Department of Neurology, Washington University School of Medicine*; Abhay Moghekar, *Department of Neurology, Johns Hopkins University School of Medicine*; Christopher Fowler, *Florey Institute, The University of Melbourne*; Qiao-Xin Li, *Florey Institute, The University of Melbourne*; Cynthia Carlsson, *Department of Medicine, University of Wisconsin School of Medicine and Public Health*; Corinne Pettigrew, *Department of Neurology, Johns Hopkins University School of Medicine*; Colin L. Masters, *Florey Institute, The University of Melbourne*; Sterling Johnson, *Department of Medicine, University of Wisconsin School of Medicine and Public Health*; John C. Morris, *Department of Neurology, Washington University School of Medicine*; Marilyn Albert, *Department of Neurology, Johns Hopkins University School of Medicine*

Abstract: This study compared the rate of cognitive decline among eight groups of cognitively normal individuals divided on the basis of their cerebrospinal fluid (CSF) biomarker profiles. Three CSF biomarkers associated with Alzheimer's disease (AD) were examined: amyloid, phosphorylated tau (a marker of neurofibrillary tangle pathology), and total tau (a marker of neurodegeneration). The analysis included 800 middle-aged and older participants (mean baseline age 59.5 years, mean follow-up 7.1 years), from four different cohort studies of preclinical AD. Cognitive performance was measured using a previously validated factor score reflecting global cognitive performance across multiple cognitive domains. Within each cohort, participants' baseline levels of the CSF biomarkers were first dichotomized as normal vs. abnormal; participants were then classified into one of 8 distinct amyloid/tau/neurodegeration (A/T/N) groups. The greatest cognitive decline was evident among the group with abnormal levels of all three biomarkers (A+/T+/N+, N=69, slope=-0.31, p=0.021). The rate of decline for the group with abnormal levels of amyloid and neurodegeneration only was similar, but did not reach significance, likely reflecting the small sample size (A+/T-/N+, N=19, slope=-0.26, p=0.2). Our results demonstrate that cognitively normal individuals with abnormal CSF biomarkers of amyloid, tau, and neurodegeneration are at greatest risk of cognitive decline.

Thursday May 3 (5:15 pm – 6:45 pm)

Symposium: **Risk and Protective Factors for Cognitive Decline: New Insights from Longitudinal Studies**

Predictors of Neurodegeneration in Cognitively Healthy and Subsequently Impaired Older Adults

Presenter: Nicole Armstrong, *Laboratory of Behavioral Neuroscience, National Institute on Aging, National Institutes of Health, Baltimore, MD*

Nicole M. Armstrong, *Laboratory of Behavioral Neuroscience, National Institute on Aging, National Institutes of Health, Baltimore, MD*; Yang An, *Laboratory of Behavioral Neuroscience, National Institute on Aging, National Institutes of Health, Baltimore, MD*; Jimit Doshi, *Section of Biomedical Image Analysis, Department of Radiology, University of Pennsylvania, Philadelphia, PA*; Guray Erus, *Section of Biomedical Image Analysis, Department of Radiology, University of Pennsylvania, Philadelphia, PA*; Luigi Ferrucci, *Translational Gerontology Branch, Longitudinal Studies Section, National Institute on Aging, National Institutes of Health, Baltimore, MD*; Christos Davatzikos, *Section of Biomedical Image Analysis, Department of Radiology, University of Pennsylvania, Philadelphia, PA*; Susan M. Resnick, *Laboratory of Behavioral Neuroscience, National Institute on Aging, National Institutes of Health, Baltimore, MD*

Abstract: Background: Known risk factors of dementia may accelerate neurodegeneration among persons vulnerable to having subsequent impairment (SI) among nondemented, community-dwelling older adults. Methods: There were 622 cognitively health and 78 SI Baltimore Longitudinal Study of Aging participants with dementia risk factors and brain volumes from 1994 onward. Linear mixed effects models were used to examine associations of dementia risk factors with annual rates of regional volumetric change, and evaluate effect modification of sex and SI on these associations. A stepwise backward approach was used to select predictors of neurodegeneration. Only acquired scans while participants were cognitively healthy were included in the analysis. Results: Age, sex, low educational level, ApoE4 allele, hypertension, obesity, and low HDL cholesterol were predictors of neurodegeneration. Sex and SI modified the association of predictors with accelerated annual rates of decline in regional brain volumes. Men experienced greater volumetric loss than women. Predictors of neurodegeneration had a larger effect on annual declines in brain volumes among SI, compared to cognitively healthy. Conclusions: SI brains could be more vulnerable to the presence of predictors of neurodegeneration than the cognitively healthy brains, suggesting that cross-sectional samples of nondemented individuals could be heterogeneous.

Thursday May 3 (5:15 pm – 6:45 pm)

Symposium: **Risk and Protective Factors for Cognitive Decline: New Insights from Longitudinal Studies**

Relationship Between Self-Reported Lifestyle Activities and Longitudinal Cognitive Change

Presenter: Corinne Pettigrew, *Department of Neurology, Johns Hopkins University School of Medicine*

Corinne Pettigrew, Anja Soldan, Yi Shao; Maura Grega; Yuxin Zhu; Michelle Carlson; Marilyn Albert

Abstract: We examined the relationship between current engagement in various lifestyle activities and both current cognitive performance and prior longitudinal cognitive trajectories, and whether these relationships were independent of levels of cognitive reserve (CR). Participants (n=189) were cognitively normal at baseline and have been prospectively followed with annual assessments as members of the BIOCARD study (M=12y); 27 participants developed MCI over time. Self-reported engagement in physical, cognitive, and social activities was measured by the CHAMPS questionnaire. Cognitive performance and CR were both measured by composite scores. Cross-sectionally, better cognitive performance was associated with higher engagement in cognitive activities among all subjects. Longitudinally, the relationships between current activity engagement and prior cognitive trajectories differed by diagnosis. Among MCI subjects, higher engagement in physical and cognitive activities, and higher total engagement, was associated with less decline in prior cognitive performance ($p < .05$), and some of these effects were independent of baseline CR. Among cognitively normal subjects, lifestyle activities were not associated with prior cognitive trajectories. Greater engagement in lifestyle activities may modify the rate of cognitive decline among those who develop symptoms of MCI, independent of CR. Prospective longitudinal evaluations are needed to confirm these findings.

Thursday May 3 (6:45 pm - 7:45 pm)

Keynote: **2018 Cognitive Aging Conference Keynote Address**

From Satisficing to Optimizing: The Future of Cognitive Aging

Presenter: Neil Charness, *Department of Psychology, Florida State University*

Abstract: Given rapid advances in technological capability, particularly in ready access to computational power (e.g. smartphones), we are moving from a world where people must satisfice when making decisions to one where they may be able to optimize when goals are clear. There are profound implications for compensation for age-related decline in cognitive abilities, through directly modifying cognitive abilities with tailored training, to augmenting or substituting for human cognitive capabilities via external computation. Augmented decision-making cognitive prostheses may help older adults manage declining cognitive resources, and replacement decision-making tools may become possible for IADL tasks that will enable them to remain independent longer (e.g., robotics, such as autonomous vehicles for driving). I will focus on prospects for designing for and training older adults to use computational tools that can compensate for age-related decline in cognition and circumventing barriers to technology adoption.

Friday May 4 (10:30 am – 12:30 pm)

Symposium: **Cognition and the Aging Brain: Maintenance, Reserve and Compensation**

Overview Speaker

Presenter: Maria Natasha Rajah, *Department of Psychology, McGill University*

Abstract: The advent of neuroimaging methods has contributed significantly to our understanding of how healthy aging impacts the brain and cognitive abilities, and has informed our models of cognitive aging. Functional neuroimaging findings have shown that the aging brain is not passive but shows considerable plasticity and may actively resist age-associated anatomical and physiological deterioration. One goal of ongoing research in the cognitive neuroscience of aging has been to better understand the neural basis of successful cognitive aging. Successful cognitive aging can be defined in relation to the person (the best this person can do), or in relation to the population (the best in the group). It has been hypothesized that how well an individual ages may be related to the concepts of brain maintenance, cognitive reserve and compensation. However, there remains a lack of clarity in how these concepts are defined in the field and how they relate to one another. This has led to researchers forming seemingly contradictory predictions for these concepts. For example, some researchers predict compensation in high-performing older adults (OA) because they are the ones supposedly benefitting from, and hence exhibiting, compensation. In contrast, other researchers predict it in low-performing OAs because they "need" compensatory mechanisms to offset cognitive decline. Yet, others have suggested that the term compensation should be reserved for specific cases where a positive correlation between activity and performance is observed only in OA, and not young adults. Clearly, greater consensus on how to define 'compensation' and other key terms in the field is needed to advance research in cognitive neuroscience of aging so that scientists can better communicate research findings using standardized definitions. This is the motivation for the proposed symposium. The organizer (Rajah) will present an overview of the rationale for the symposium and provide initial definitions for these concepts, focusing on the idea of cognitive reserve. The following presenters will provide a more detailed definition of each the concepts of brain maintenance (Nyberg) and compensation (Reuter-Lorenz, Cabeza) with supporting data. The symposium will conclude with a presentation providing a general framework for how the concepts of brain maintenance, compensation and reserve are linked and how to formally examine the validity and utility of these concepts (Rugg).

Discussant: Maria Natasha Rajah

Friday May 4 (10:30 am – 12:30 pm)

Symposium: **Cognition and the Aging Brain: Maintenance, Reserve and Compensation**

Brain Maintenance

Presenter: Lars Nyberg, *Department of Radiation Sciences, Umeå University, S-90197 Umeå, Sweden,; Department of Integrative Medical Biology, Umeå University, S-90197 Umeå , Sweden; Umeå Center for Functional Brain Imaging (UFBI), Umeå University, S-90197 Umeå, Sweden*

Abstract: Neuroimaging studies of the aging brain provide support that a strong predictor of preserved memory and cognition in older age is brain maintenance, or relative lack of brain pathology. Evidence for brain maintenance comes from different levels of examination, but up to now relatively few studies used a longitudinal design. Examining factors that promote brain maintenance in aging is a critical task for the future, and may be combined with the use of new techniques for multimodal imaging.

Friday May 4 (10:30 am – 12:30 pm)

Symposium: **Cognition and the Aging Brain: Maintenance, Reserve and Compensation**

Compensation-Related Utilization of Neural Circuits (Hypothesis) Across the Life Span

Presenter: Patricia A. Reuter-Lorenz, *Department of Psychology, University of Michigan, Ann Arbor*

Abstract: While aging generally brings cognitive decline, performance levels and rates of decline vary greatly. This variability stems partially from individual differences in susceptibility to adverse age effects on brain structure/function. Preserved performance could indicate the capacity to resist brain aging (i.e., brain maintenance). Alternatively, it could reflect compensation for age-related neural decline. Identifying neural signatures of compensation is an important challenge that has received considerable attention in the field. This talk focuses on the frequent observation that older adults (OA) display more brain activation (greater or more widespread) than younger adults (YA) especially during working memory and cognitive control tasks that engage frontal-parietal regions. I consider this general outcome in the context of CRUNCH, the Compensation-Related Utilization of Neural Circuits Hypothesis. CRUNCH proposes that OA recruit more neural circuits at lower levels of task demand than YA to optimize performance given resource limitations. CRUNCH also emphasizes the utility of parametric designs to interpret the functional significance of age differential activation. While especially evident in OA, CRUNCH proposes that overactivation or increased recruitment need not be associated with aging or dysfunction, but is a signature found across the lifespan indicating neural compensation for compromised or insufficient resources to meet task demands.

Friday May 4 (10:30 am – 12:30 pm)

Symposium: **Cognition and the Aging Brain: Maintenance, Reserve and Compensation**

Compensation in the Aging Brain: Networks and Representations

Presenter: Roberto Cabeza, *Center for Cognitive Neuroscience, Duke University*

Abstract: Healthy aging is associated with significant anatomical and physiological brain decline. Fortunately, functional neuroimaging evidence suggests that the aging brain actively compensates for cognitive decline by reorganizing its functions. Whereas most fMRI studies of cognitive aging have investigated changes at the level of univariate activity, we focus on compensation at the level of networks and representations. At the network level, we reliably find age-related increases in prefrontal cortex (PFC) integration with the episodic memory network. In a graph theory study, we found that during episodic memory retrieval, the module (community of nodes) that included the medial temporal lobe showed greater integration with PFC and other regions for older compared to younger adults. Unfortunately, age-related increases in network integration are constrained by white-matter decline. We link functional connectivity (fMRI) to white-matter (DTI) using structural equation modeling. At the representational level, we have found evidence for compensatory mechanisms in the occipitio-temporal cortex (OTC). In this region, activation patterns for different visuo-semantic categories (e.g., faces vs. houses) are usually less differentiated for older adults (age-related dedifferentiation). Using representational similarity analyses (RSA) based on a deep convolutional neural network (DNN), we have found that older adults show sensory-related dedifferentiation in posterior OTC as well as semantic-related “hyperdifferentiation” in anterior OTC. In sum, compensatory changes in the aging brain can be found not only at the level of univariate activity (as usually reported), but also at the level of networks and representations.

Friday May 4 (10:30 am – 12:30 pm)

Symposium: **Cognition and the Aging Brain: Maintenance, Reserve and Compensation**

Age-Related Differences in the Neural Correlates of Cognitive Processing: From Description to Interpretation

Presenter: Michael D. Rugg, *Center for Vital Longevity and School of Behavioral and Brain Sciences, University of Texas at Dallas*

Abstract: Age-related differences in task-related neural activity have been reported for more than two decades, but the interpretation of these differences is still under debate. Using data from my laboratory as examples, I will give an overview of the different classes of findings that have been described in this literature. I will discuss some of the methodological and conceptual barriers that have impeded our ability to interpret patterns of age-related differences in brain activity in terms of such concepts as maintenance, reserve, and compensation. I will conclude with a discussion of strategies for future research that could help establish the functional significance of these differences, and hence advance understanding of the different ways that aging might impact cognitive and neural function.

Friday May 4 (2:00 pm – 4:00 pm)

Plenary: **Individual Differences**

Overview Speaker

Presenter: William Kremen, *University of California, San Diego*

Friday May 4 (2:00 pm – 4:00 pm)

Plenary: **Individual Differences**

Generational Effects For School Performance and Educational Attainment as Early-Life Predictors of Age-Related Memory Decline

Presenter: Sara Pudas, *Department of Integrative Medical Biology, Umeå University*

Sara Pudas, *Department of Integrative Medical Biology, Umeå University*; Michael Rönnlund, *Department of Psychology, Umeå University*

Abstract: Evidence is accumulating that early life characteristics and experiences contribute significantly to differences in cognitive aging. This study investigated the predictive power of school performance at age 12 on old age level and rate of memory change across 20 years. Educational attainment and income at age 40 were investigated as potential mediators of the expected protective effects of higher school performance on memory decline.

Data were from a subsample of the longitudinal population-based Betula study and were analyzed with latent growth curve models. School performance across six school subjects was included as a latent-level predictor of memory in advanced age. Analyses were stratified on age-cohort; separate models were fitted for earlier born (1909-1935, n = 227) and later born (1938-1954, n=301) cohorts.

The results showed that school grades significantly predicted both level and slope in younger age-cohorts, so that higher grades were associated to higher memory performance later in life, but also to less memory decline over time. In the older cohorts, grades only predicted level of memory performance. For the younger cohorts, the protective effect of higher school grades was mediated by educational attainment, but not income. Follow-up analyses indicated that the lack of protective effect on memory slope in the older cohorts may have been driven by a generational effect in access to higher education. Older cohorts had significantly lower education (8.2 vs. 12.6 years), and school performance was predictive of later educational attainment in younger, but not in older cohorts.

These results suggest that higher childhood school performance was only associated with less age-related memory decline in age-cohorts for whom further education had been more accessible. The mechanism by which education protected against memory decline was not exclusively driven socio-economic factors, since income was not a significant mediator. Instead, it likely involved protective mechanisms gained from mental stimulation (e.g., cognitive reserve) or more well-informed lifestyle and health decisions afforded by a higher educational level.

Friday May 4 (2:00 pm – 4:00 pm)

Plenary: **Individual Differences**

Change in Bold Modulation to Difficulty in Cognitively Normal Middle-Aged and Older Adults: Nonlinear Effects of Beta-Amyloid

Presenter: Chris M. Foster, *Center for Vital Longevity, School of Behavioral and Brain Sciences, The University of Texas at Dallas*

Chris M. Foster, *Center for Vital Longevity, School of Behavioral and Brain Sciences, The University of Texas at Dallas*; Kristen M. Kennedy, *Center for Vital Longevity, School of Behavioral and Brain Sciences, The University of Texas at Dallas*; Karen M. Rodrigue, *Center for Vital Longevity, School of Behavioral and Brain Sciences, The University of Texas at Dallas*

Abstract: Beta-amyloid (Aβ) positive individuals hyper-activate brain regions compared to those not at-risk; however, hyperactivation is then thought to diminish as Alzheimer's disease symptomatology begins, evidencing eventual hypoactivation. It remains unclear when in the disease staging this transition occurs. We recently showed that a non-linear trajectory of functional activation exists with Aβ SUVR, explaining both hyper- and hypo-activation on a spatial distance judgment task in bilateral angular and medial frontal cortices in a nondemented aging sample (Foster et al., 2017 NeuroImage). Here we sought to replicate this nonlinear effect in the same sample using a different functional task to test the generalizability of this phenomenon. Using an N-Back working memory task (0-, 2-, 3-, and 4-back), 68 healthy adults (51-94 years) underwent fMRI and 18F-Florbetapir PET imaging. Mean cortical SUVR was calculated from several regions across the neocortex, normalized by whole cerebellum uptake. A linear contrast was used as the dependent variable in a model with age, Aβ, Aβ squared, and average task accuracy as predictors. Performance on both accuracy and response time declined as WM-load increased (p's $< .015$). fMRI results revealed that Aβ squared was a significant negative predictor of activation in two large inferior clusters: bilateral subcortical nuclei and bilateral cerebellum/fusiform, regions strongly associated with working memory and dopaminergic pathways. Individuals with slightly elevated Aβ burden evidenced greater activation as compared to individuals with little or no Aβ burden whereas individuals with the greatest Aβ burden evidenced less activation as compared to individuals with slightly elevated Aβ. The current study extends prior findings by providing further evidence for a dose-response, nonlinear relationship between increasing Aβ burden and alteration in BOLD modulation. Results will be further discussed in light of Aβ ability to modulate presynaptic neurons and control dopamine release in animal models.

Friday May 4 (2:00 pm – 4:00 pm)

Plenary: **Individual Differences**

Markers of Olfactory Memory as Predictors of Future Dementia: Comparisons to Episodic and Semantic Memory For Verbal Information

Presenter: Erika J. Laukka, *Aging Research Center, Karolinska Institutet, Stockholm, Sweden*

Nicola M. Payton, *Aging Research Center, Karolinska Institutet, Stockholm, Sweden*; Maria Larsson, *Department of Psychology, Stockholm University, Stockholm Sweden*; Debora Rizzuto, *Aging Research Center, Karolinska Institutet, Stockholm, Sweden*; Laura Fratiglioni, *Aging Research Center, Karolinska Institutet, Stockholm, Sweden*; Lars Bäckman, *Aging Research Center, Karolinska Institutet, Stockholm, Sweden*

Background: Olfactory deficits are common in neurological disorders and impaired performance on odor-identification tasks is associated with increased dementia risk. It has therefore been suggested that olfactory deficits could be a useful marker for preclinical dementia and Alzheimer's disease and that tests of olfactory memory should be implemented in clinical practice. However, before making such recommendations, a more thorough investigation of the predictive power of different olfactory memory tasks is needed. Moreover, odor tasks need to be evaluated against other, more commonly used, memory tasks, such as memory for verbal materials. Methods: Participants in a large population-based study (SNAC-K) underwent neuropsychological testing at baseline and repeated dementia assessments across 6 years. The sample consisted of 2137 persons with a mean age of 72 years (range = 58-101 years) at the first testing. Of these, 199 developed dementia, 296 died, and 1642 remained free of dementia during the 6-year follow-up. The olfactory memory tasks included odor identification (i.e. providing the odor with the correct label) and episodic odor recognition (i.e. recognizing the odor from a previous presentation). A vocabulary task and a general knowledge task were used to assess semantic memory for verbal information. Verbal episodic memory was assessed with free recall and recognition of a 16-item word list. Results: Both odor identification and odor recognition predicted future dementia after controlling for age, sex, and education. Odor identification was the strongest predictor of the two odor tasks, however, the best predictor overall was a measure of word recall. The prediction model including word recall could be further improved by adding a test of olfactory memory and the best prediction model included three tasks – word recall, odor identification, and odor recognition – where all contributed independently in predicting future dementia.
Conclusion: Measures of olfactory memory may be useful in identifying individuals with increased dementia risk. Although they do not outperform a standard episodic memory task, they still add unique information.

Friday May 4 (2:00 pm – 4:00 pm)

Plenary: **Individual Differences**

Multiple Brain Markers Mediate Age-Related Changes in Cognition

Presenter: Trey Hedden, *Massachusetts General Hospital, Harvard Medical School*

Trey Hedden, *Massachusetts General Hospital, Harvard Medical School*; Hannah E. Nierle, *Massachusetts General Hospital*; Rodrigo D. Perea, *Massachusetts General Hospital, Harvard Medical School*; Jennifer S. Rabin, *Massachusetts General Hospital, Harvard Medical School*; Rachel F. Buckley, *Massachusetts General Hospital, Florey Institute of Neuroscience & Mental Health*; Aaron P. Schultz, *Massachusetts General Hospital, Harvard Medical School*; Keith A. Johnson, *Massachusetts General Hospital, Brigham & Women's Hospital, Harvard Medical School*; Reisa A. Sperling, *Massachusetts General Hospital, Brigham & Women's Hospital, Harvard Medical School*

Abstract: How do age-related changes in cognitive function follow from differences in brain morphometry, function, and disease-related biomarkers? Here, we examined how multiple brain markers mediate age-related changes in several cognitive domains.
Methods: Cognitively normal older adults aged 62-90 from the Harvard Aging Brain Study (N=254) were characterized at baseline on MRI markers of gray matter thickness and volume, white matter lesions (WML) and fractional anisotropy (FA), resting state functional connectivity, and PET markers of glucose metabolism (FDG) and amyloid burden. Longitudinal change in the cognitive domains of processing speed, executive function, and episodic memory were assessed with follow-up of 2-6 years (mean = 4.2 years). Linear mixed models estimated subject-specific slopes. Mediation models examined which brain markers significantly mediated age-related change in cognition.
Results: When all brain markers were simultaneously entered as mediators, approximately 80% of the age-related variance in cognitive change was mediated for all cognitive domains (but only <=34% of total variance in cognitive change was related to brain markers). Backward elimination models identified cortical thickness, FA, and FDG as significant mediators of age-related change in processing speed. Hippocampal volume and amyloid were significant mediators of age-related change in executive function. Hippocampal volume, amyloid, entorhinal thickness, and FDG were significant mediators of age-related change in episodic memory.
Conclusion: These results suggest that the majority of age-related variation in cognitive change can be mediated by multiple brain markers, and that brain markers reflective of Alzheimer's disease pathology are among the most important mediators of cognitive change during aging.

Round Table: **AARP Round Table** Friday May 4 (6:00 pm - 7:30 pm)

Translation and Dissemination of Cognitive Aging Research Round Table

Presenter: Sarah Locke, *Senior Vice President, Policy, Research and International, AARP; Executive Director, Global Council on Brain Health*

Abstract: The round table will discuss the intersection of public policy and cognitive science focusing on how cognitive scientists can join and influence the public health/policy future of cognitive aging. By 2030, 1 in 5 Americans will be 65 and older with the oldest old (those over 85) the fastest growing segment. This transformation in aging will have enormous societal implications. AARP partnered with the Centers for Disease Control and Prevention (CDC), National Institute on Aging (NIA), and the McKnight Brain Institute along with Administration for Community Living and Health Resources and Services (HRSA) to support the Institute of Medicine's (IOM) report on the Public Health's Dimension on Cognitive Aging. We also agreed to help implement the report's recommendations. One of the major outcomes was the launch of the Global Council on Brain Health (GCBH) collaborative. The GCBH's goal is to help translate the scientific evidence relating to cognitive health of older adults and to disseminate the research findings for the benefit of those older adults. All of the roundtable participants have played a critical role in the progress the GCBH has made so far, and each will share their thoughts on the GCBH. However, they are working on other initiatives relating to cognitive health and aging and they will discuss their own efforts/ideas in this space.

1. How can psychologists and other scientists engage, promote best practices, and communicate workable interventions and solutions to promote healthy aging?
2. Why when we talk about public health is it that cognition is only now being discussed?
3. What can we all do to promote good brain health at the individual, community and societal level?
4. How can we disseminate the evidence we have and best fill the knowledge gaps in the evidence?
5. How do we connect scientists with older adults?
6. How best should we engage older adults to institute the behavior change necessary to reduce risks for cognitive decline?

Marilyn Albert
Johns Hopkins University
Chair of Global Council on Brain Health
Institutes of Medicine *Committee Member*

Lee Dockery
McKnight Brain Institute
Institutes of Medicine Report co-sponsor

Lisa McGuire
Centers for Disease Control and Prevention
Global Council on Brain Health Liaison,
Institutes of Medicine Report co-sponsor

Jacobo Mintzer,
Roper St. Francis
Governance Committee of Global Council on Brain Health

George Rebok
Johns Hopkins University
Issue Expert Global Council on Brain Health

Molly Wagster
National Institute on Aging
Global Council on Brain Health Liaison
Institutes of Medicine *Report co-sponsor*

Saturday May 5 (10:30 pm – 12:30 pm)

Plenary: **Memory**

Overview Speaker

Presenter: Cindy Lustig, *University of Michigan*

Saturday May 5 (10:30 pm – 12:30 pm)

Plenary: **Memory**

Memory Guides the Comprehension of Event Changes in Older and Younger Adults

Presenter: Chris Wahlheim, *University of North Carolina at Greensboro*

Christopher N. Wahlheim, *University of North Carolina at Greensboro*; Jeffrey M. Zacks, *Washington University in St. Louis*

Abstract: Healthy aging leads to impaired memory for the everyday activities of others. Features of everyday activities sometimes change between events, such as when a person places their car keys in two different locations. Perceiving these actions could interfere with memory for where the actor last placed their keys, and older adults are often more susceptible to such proactive interference. However, episodic changes can lead to proactive facilitation when those changes are noticed and later recollected (Wahlheim & Jacoby, 2013). This is assumed to occur because noticing change enables features from different episodes to be encoded together along with their relationship, and recollecting change allows access to the temporal relationship between those features. This account leads to the prediction that older adults will notice and recollect fewer episodic changes, which should lead to poorer memory for the order of events. In the present study, two experiments examined how older and younger adults used memory to comprehend changes in everyday activities. Participants viewed movies depicting an actor performing activities on two fictive days in her life. Some activities were repeated across days, other activities were repeated with a changed feature (e.g., waking up to an alarm clock or a phone alarm), and a final set of activities was performed on Day 2 only. After a one-week delay, participants completed a cued recall test for the activities of Day 2. Unsurprisingly, exact repetition boosted final recall. More surprising, features that changed from Day 1 to Day 2 were remembered approximately as well as features that were only presented on Day 2—showing an absence of proactive interference and in some cases proactive facilitation. Proactive facilitation was strongly related to participants' ability to detect and recollect the changes. Younger adults detected and recollected more changes than older adults, which in part explained older adults' differential deficit in memory for changed activity features. We propose that this pattern may reflect observers' use of episodic memory to make predictions during the experience of a new activity, and that when predictions fail, this triggers processing that benefits subsequent episodic memory. Disruption of this chain of processing could play a role in age-related episodic memory deficits. More generally, age-related deficits in change processing could lead to impairment in action selection if older observers fail to update their representations of regularities in the behavior of others.

Saturday May 5 (10:30 pm – 12:30 pm)

Plenary: **Memory**

Age Differences in False Memory Are Magnified At Longer Delays

Presenter: Yana Fandakova, *Max Planck Institute for Human Development*

Yana Fandakova, *Max Planck Institute for Human Development*; Yee Lee Shing, *University of Stirling*; Markus Werkle-Bergner, *Max Planck Institute for Human Development*; Myriam C. Sander, *Max Planck Institute for Human Development*

Abstract: Memory for events situated in specific spatio-temporal contexts declines during aging, with deficits in both veridical and false memory. While research suggests that longer delays decrease veridical memory, it is unclear whether age difference in false memory are preserved or even magnified across time. We investigated age differences in associative memory at short and long delays, and the extent to which they depend on the quality of memory representations formed during learning. On Day 1, younger adults (YA, N = 28) and older adults (OA, N = 26) studied unrelated scene-word pairs. Following initial presentation of the pairs, each picture served as a cue to recall the associated word. Independent of recall accuracy, the correct word was presented again, fostering further learning of the pair. A final cued-recall test without feedback was used to distribute the scene-word pairs for two associative recognition tests 24 hours (Day 2) and seven days later (Day 7). On Day 2, intact and rearranged pairs were composed of either high-quality pairs that were correctly remembered in the final cued-recall on Day 1, or of low-quality pairs that were not correctly recalled on Day 1. On Day 7, participants were presented with all intact and rearranged pairs from Day 2 (retested pairs) along with high-quality and low-quality intact and rearranged pairs that have not been tested on Day 2. This design allowed us to disentangle delay from retest effects. While a longer delay reduced veridical memory for both high- and low-quality pairs across age groups, pairs that were already tested on Day 2 had less reduction on Day 7 for both YA and OA. However, delay and retest differentially affected false alarms to high- and low-quality rearranged pairs in YA and OA: YA generally committed few false alarms to high-quality pairs on both days. In contrast, OA's false alarm rates to high-quality pairs were higher compared to YA on Day 2, and were further magnified by delay and retest. For low-quality pairs, longer delays decreased false alarms in YA but not in OA. False alarm rates to retested low-quality pairs were maintained between Day 2 and Day 7 for YA, whereas OA again showed an increase in false alarms for these pairs across days. Together, these results suggest that the effects of delay and retesting depend on the quality of the learned information, and have opposite effects on younger and older adults' false associative memory.

Saturday May 5 (10:30 pm – 12:30 pm)

Plenary: **Memory**

Neuropsychological Correlates of Source Memory For Actions Depend Upon the Number of Sources

Presenter: Alan Kersten, *Florida Atlantic University*

Alan W. Kersten, *Department of Psychology, Florida Atlantic University*; Julie L. Earles, *Wilkes Honors College, Florida Atlantic University*; Kelley Aucello, *Wilkes Honors College, Florida Atlantic University*; Emilia Tautiva, *Wilkes Honors College, Florida Atlantic University*

Abstract: Prior research on source memory has revealed an association between source memory performance and frontally-mediated executive abilities, suggesting a role for strategic encoding and retrieval processes. Kersten et al. (2008) introduced a test that can also be characterized as a source memory test, namely the Person-Action Conjunction (PAC) test, in which the participant's task is to remember a series of actions and who performed each of them. Unlike traditional source memory tests, which involve a many-to-few relation of targets to sources, the number of sources in the PAC test often equals the number of target items. This large number of sources may discourage strategic processing of source information because of the difficulty in formulating mnemonics to discriminate all of the potential sources of an action. We thus predicted that memory for the sources of actions in the context of a many-to-many relation of actions to sources would relate more strongly to basic associative abilities than to executive abilities. In contrast, we expected source memory performance to relate to executive abilities when only two actors performed all of the actions. To test these predictions, young and older participants viewed a series of videos, each involving an actor performing an action. For half of the participants, each actor appeared only once, whereas for other participants, all of the actions were performed by only two actors. Participants were later tested on their recognition memory for the actions and who performed them. The critical test items involved a familiar action performed by a familiar person other than the one who had performed that action at encoding. The ability to discriminate these conjunction items from old items was used as our measure of source memory. Participants were also given the Glisky battery of tests of executive and associative functioning. Source memory performance in young adults was more strongly related to associative functioning than to executive functioning, regardless of the number of sources. Associative functioning was also predictive of source memory performance in older adults when the number of sources was large, whereas source memory performance was related to executive functioning in older adults when only two sources performed all of the actions. These results suggest that young adults employ basic associative mechanisms to remember who did what in an event, whereas older adults may recruit executive processes to compensate for declines in associative abilities, with these compensatory mechanisms more successful with small numbers of sources.

Saturday May 5 (10:30 pm – 12:30 pm)

Plenary: **Memory**

Age-Related Enhancements in Prefrontal Recruitment During Retrieval of Negative Events From One's Past

Presenter: Jaclyn Ford, *Boston College*

Jaclyn Ford, *Boston College*; Elizabeth Kensinger, *Boston College*

Abstract: Prior research has revealed an age-related shift in how individuals recall events from their personal past, with older adults reporting events that are more positively valenced than young adults. We recently showed that age-by-valence interactions may be partially driven by a prefrontally-mediated control mechanism recruited by older adults during retrieval of negative laboratory events to reduce phenomenological richness. Specifically, age was associated with greater increases in prefrontal recruitment during retrieval of negative relative to positive events, with this recruitment linked to trial-by-trail decreases in hippocampal activity and subjective vividness ratings. In the current study, we examined whether older adults may rely on a similar mechanism during retrieval of events from their personal past. Participants (57, ages 18-87) were presented with images related to the 2013 Boston Marathon Bombings and were asked to retrieve a memory associated with each image. Images were selected to evoke either negative (i.e., fear, destruction, sadness) or positive (i.e., hope, resilience, support) responses from the participants. As was seen during episodic memory tasks, age was associated with greater increases in prefrontal recruitment during retrieval of events related to negative relative to positive images. Such findings suggest that older adults may be recruiting a similar regulatory mechanism during retrieval of both negative laboratory stimuli and highly negative events from their past. Further, these findings may be consistent with prior work from our lab showing that young and older adults interact differently with the negative details related to this same highly negative event. Specifically, in the six months following the bombings, young adults reported thinking about these details more frequently while older adults reported thinking about them less frequently. It is possible that a prefrontally-mediated mechanism recruited during retrieval reduces the vividness or availability of these negative details for older adults, making it less likely for these details to be retrieved in subsequent recalls.

Saturday May 5 (2:00 pm – 4:00 pm)

Symposium: **Prosocial Tendencies across the Adult Life Span: Cognitive, Motivational, and Neural Factors**

Overview Speaker

Presenter: Ulrich Mayr, *Department of Psychology, University of Oregon*

Abstract: Prosocial behavior positively affects the individual as well as society as a whole. Results from prior investigations of demographic trends in prosocial behavior and altruism indicate that prosocial behaviors often increases with age, particularly in the realm of monetary donations. As aging individuals represent a disproportionate source of monetary contributions to the public good, it is important to better understand the relationship between aging and tendencies for prosocial behavior and determine the underlying motivational, cognitive, and neural processes. This symposium encompasses a set of papers that approach the common theme using both social-cognitive and neuroscientific perspectives. Ulrich Mayr will present an overview on aging and prosocial tendencies and discuss potential cognitive and motivational factors. He will also include research results on the presence of an age-modulated, higher-order General Benevolence factor, informed by neural, behavioral, and psychological measures. Ryan Best will present behavioral and affective data on charitable giving in non-monetary domains, where older adults do not hold a resource advantage compared to younger adults. Results are related to the General Benevolence conception and theories of age-related shifts in motivation across adulthood. Julia Spaniol will present a series of studies investigating the mechanisms and boundary conditions of the age-related increase in altruism using the intertemporal choice paradigm. When choosing between immediate and delayed gains, losses, and charitable contributions, choice patterns show greater altruism in older adults compared to older adults. However, this age difference is reduced when decisions are made under acute stress. Pär Bjälkebring will present data on the socioemotional aspects of prosocial behavior. Reporting an age-related positivity bias in charitable giving, older adults are found to draw more positive affect, and hence benefit more, from monetary donations compared to younger adults. Lastly, Natalie Ebner will present a series of studies showing the affective and social-cognitive effects of intranasal oxytocin administration in aging.

Saturday May 5 (2:00 pm – 4:00 pm)

Symposium: **Prosocial Tendencies across the Adult Life Span: Cognitive, Motivational, and Neural Factors**

Decisions Between Self-Interested Vs. Altruistic Outcomes Across Adulthood

Presenter: Ryan Best, *Developmental Psychology Unit, University of Zurich*

Ryan Best, Freund, A. M.,

Abstract: How do older adults make decisions that contrast self-interest with altruistic outcomes? Recent research by Mayr and colleagues utilizing data collected from multiple measurement domains (neural, behavioral, and psychological) has provided evidence for positive relation of age and a general benevolence dimension, a latent factor representing genuine altruism. However, these findings were limited to monetary giving, and the results may be due to older adults generally valuing money less than younger adults. We present an experiment where online participants are asked to make decisions and rate their attitudes towards hypothetical charitable-giving transactions in three non-monetary domains in which older adults generally experience losses (physical energy, remaining life time) or stability (social support) compared to younger adults. We tested the general benevolence model with these domains and found evidence for a domain-specific benevolence dimension. The domain-specific benevolence is positively associated with age in some domains (physical energy) but not others (life time, social support). These findings suggest that age differences in charitable giving may reflect differences in the marginal utility of money as opposed to an age-related increase in altruistic concern for the greater societal good.

Saturday May 5 (2:00 pm – 4:00 pm)

Symposium: **Prosocial Tendencies across the Adult Life Span: Cognitive, Motivational, and Neural Factors**

Aging and Altruism in Intertemporal Choice

Presenter: Julia Spaniol, *Department of Psychology, Ryerson University*

Julia Spaniol, Sparrow, E. P.,

Abstract: Converging lines of evidence suggest that aging is associated with an increase in altruism, but little is known about how this motivational shift interacts with other factors such as time-until-reward, social pressure, and acute stress. We present 3 experiments on altruism in the context of intertemporal choice. Younger and older participants made realistic choices between smaller-sooner and larger-later options that involved financial gains, losses, or charity donations made at personal cost. Altruism was operationalized as the difference in intertemporal choice between the loss and donation conditions. Compared to younger adults, older adults displayed a more altruistic intertemporal choice pattern, both when completing the task in the laboratory (Exp. 1) and when completing the task at home (Exp. 2). When participants underwent a laboratory stress induction before the intertemporal choice task (Exp. 3), there was a positive relationship between stress responsivity and altruistic choice in younger adults. In older adults, in contrast, altruism was not modulated by stress. Together, these findings support and extend previous findings on age-related increases in altruism, and demonstrate stability of this phenomenon across a range of situational contexts.

Saturday May 5 (2:00 pm – 4:00 pm)

Symposium: **Prosocial Tendencies across the Adult Life Span: Cognitive, Motivational, and Neural Factors**

Greater Emotional Gain From Giving in Older Adults: Age-Related Positivity Bias in Prosocial Behaviors

Presenter: Pär Bjälkebring, *Göteborgs Universitet*

Abstract: We investigated age-related positivity bias in prosocial behaviors in three studies. In Study 1, participants (n = 353, age range 20–74 years) were asked to rate their affect toward a person in need and how much money they would be willing to donate to help this person. We found that older adults were more motivated by positive affect and less motivated by negative affect compared to younger adults. In Study 2, participants (n = 108, age range 19–89) used a diary to list prosocial behaviors they performed every day for a week and rated their daily affect toward these behaviors. We found that older adults had more positive affect toward their daily prosocial behaviors. In study 3 we followed up on these participants to rate their affect toward a specific donation made. We found that the level of positive emotional reaction from monetary donations was higher in older participants. Overall, we found support for an age-related positivity bias in charitable giving. We concluded that older adults draw more positive affect from both the planning and outcome of prosocial behavior and hence seem to benefit more from engaging in prosocial behavior compared to their younger counterparts.

Saturday May 5 (2:00 pm – 4:00 pm)

Symposium: **Prosocial Tendencies across the Adult Life Span: Cognitive, Motivational, and Neural Factors**

Uncovering Age-Related Vulnerabilities in Trust-Related Decision Making

Presenter: Natalie C. Ebner, *University of Florida*

Abstract: Older adults are confronted with consequential decisions, which often require trusting others. A rapidly aging population, combined with age-related changes in decision making, render fraud targeting older adults a growing public-health concern. Addressing online fraud, Study 1 recorded browsing activity over 21 days during which phishing attacks were simulated. Older women were the most vulnerable group to these attacks. There was a discrepancy, particularly among older adults, between self-reported susceptibility awareness and behavior. Further, higher susceptibility was associated with lower memory and positive affect particularly in old-old adults. In Study 2, young and older adults self-administered intranasal oxytocin or placebo before investing in partners (trust) and computer lotteries. After half of the trials, participants were informed that only 50% of their investments bore returns. Young but not older adults decreased their investment after breach in trust (but not lottery) trials. Older adults in the oxytocin condition increased while those in the placebo condition decreased their investment after breach in trust (but not lottery) trials. Our data suggest reduced sensitivity to deception cues and a trust-enhancing effect of oxytocin in aging. Integration of cognitive, socio-affective, and neurobiological profiles underlying age-related vulnerabilities in trust-related decisions will inform prevention of victimizations in aging.

Saturday May 5 (4:30 pm – 6:30 pm)

Symposium: **Cognitive and Neural Plasticity in Older Age: Mechanisms of Change in Cognitive Training Interventions**

Overview Speaker

Presenter: Julia Karbach, *University of Koblenz*

Abstract: The field of cognitive training research has been rapidly evolving over the last decade. Given that cognitive functions decline in older age, many studies have focused on older adults and aimed at designing interventions to compensate or delay age-related cognitive decline. Despite many encouraging findings, the evidence for the effectiveness of cognitive training is mixed and inconsistent findings have inspired a heated debate in the field. While most researchers agree that prolonged practice on a task results in significant performance improvements that also benefit performance on similar tasks (near transfer), the more controversial question is whether training on one ability also transfers to related but untrained cognitive abilities or even improves cognitive performance in everyday life (far transfer). A number of recent studies showed that even if training is successful at the group level, individual differences in training-related performance gains are usually very large. As a consequence, the field is slowly shifting from just testing whether or not training works to analyzing for whom it works in order to disentangle the mechanisms driving training-related changes in performance and brain activity. The symposium will highlight recent findings investigating these mechanisms in different cognitive domains and with different methodological approaches. The first talk (Susanne Jaeggi et al.) will be on effects of spacing and consolidation on working-memory training outcomes and on individual differences that might moderate the effectiveness of the intervention. The second presentation (Matthias Kliegel et al.) will zoom in on possible moderators of training and transfer effects by reporting data from a randomized controlled trial comparing strategy training and process-based training of prospective memory. The focus will be on behavioral and neural changes as well as everyday life correlates of those effects. In the third talk (Sandra Dörrenbächer et al.), the focus will be on neural effects of cognitive training. The study combined functional magnetic resonance imaging (fMRI) and region-of interest (ROI) analyses in order to track spatio-temporal interactions underlying changes in neural activity after executive control training. The final presentation (Chandramallika Basak et al.) will report results of a comprehensive meta-analysis on randomized controlled trials comparing training-related cognitive gains between healthy aging and adults with mild cognitive impairment as well as across three different types of cognitive training (trainings targeting specific single cognitive components, trainings targeting multiple cognitive components, or trainings engaging non-specific cognitive abilities). Paul Verhaeghen will discuss the four presentations.

Discussant: Presenter: Paul Verhaeghen, *Department of Psychology, Georgia Institute of Technology*

Saturday May 5 (4:30 pm – 6:30 pm)

Symposium: **Cognitive and Neural Plasticity in Older Age: Mechanisms of Change in Cognitive Training Interventions**

Training Working Memory in Older Adults Using Tablet Technology – the Effects of Spacing and Consolidation

Presenter: Susanne Jaeggi, *University of California, Irvine, CA*

Susanne M. Jaeggi, *University of California, Irvine, CA*; Chelsea Parlett, *University of California, Irvine, CA*; Martin Buschkuehl, *MindResearch Institute, Irvine, CA*; Shafee Mohammed, *University of California, Irvine, CA*; Jacky Au, *University of California, Irvine, CA*; Chelsea Zabel, *University of Michigan, Ann Arbor, MI*; Seung Min Moon, *University of California, Irvine, CA*; Snigdha Kamarsu, *University of California, Irvine, CA*; Michelle Evans, *University of Michigan, Ann Arbor, MI*; Priti Shah, *University of Michigan, Ann Arbor, MI*; Patricia Reuter-Lorenz, *University of Michigan, Ann Arbor, MI*; John Jonides, *University of Michigan, Ann Arbor, MI*

Abstract: The vast majority of our nation's population will experience some cognitive decline as a function of age. Therefore, the development of effective interventions to mitigate age-related cognitive decline is of critical importance in that those interventions might not only impact older adults' cognitive functioning, but ultimately, contribute to their health and quality of life. There is accumulating evidence that cognitive interventions targeting working memory are beneficial in that they show generalizing effects that go beyond specific training effects. Despite the promising results, more research is needed to make cognitive interventions more robust, and to uncover their underlying mechanisms. I will be discussing the results of a randomized controlled multi-site trial in which we focus on the interventions' optimal scheduling (i.e., spacing of training sessions) in a population of healthy older adults. We find that older adults do benefit from training by showing improved performance in non-trained working memory tasks, and importantly, those benefits seem to last up to 6 months after training completion. However, the spacing of training does not seem to result in added benefits, if anything, participants seem to suffer from overnight forgetting as expressed in impaired training performance as a function of spacing, indicating deficits in consolidation. I will be discussing the implications of our findings for learning and plasticity in old age.

Saturday May 5 (4:30 pm – 6:30 pm)

Symposium: **Cognitive and Neural Plasticity in Older Age: Mechanisms of Change in Cognitive Training Interventions**

Prospective Memory Training in Healthy Aging: Moderators of Strategy- and Process-Based Training and Transfer Effects

Presenter: Matthias Kliegel, *University of Geneva, Switzerland*

Matthias Kliegel, *University of Geneva, Switzerland*; Alexandra Hering, *University of Geneva, Switzerland*; Julie Henry, *University of Queensland, Australia*; Simon Haines, *Australian Catholic University, Australia*; Nate Rose, *University of Notre Dame, USA*; Colleen Doyle, *Australian Catholic University, Australia*; Peter Rendell, *Australian Catholic University, Australia*

Abstract: Prospective memory (PM) refers to the processes underlying the formation and realization of delayed intentions (e.g., taking medication in time). PM failures belong to the most frequent everyday memory problems and have been shown to be key predictors for loss of independence in old age. However, despite its importance for everyday functioning, studies targeting PM training in older adults are still scarce and little is known about pathways to improve PM in healthy older adults. In the present project (MemoryTrain, funded by ARC), an RCT was conducted comparing a strategy-based (n= 40; focusing on several compensatory strategies, including homework) and a process-based (n= 40; using a Virtual Week scenario where difficulty can be adapted) PM training arm with an active control group (n= 40; book reading club). Each condition involved four sessions/week for 6 weeks. Pre-Post assessments included both laboratory and everyday life PM tasks as well as key moderators such as cognitive control and working memory, motivation and metacognitive variables as well as markers of cognitive reserve. Data collection will be terminated by the end of 2017. Analyses will particularly target moderators of training and transfer effects comparing strategy training and process-based training in their effects and moderation pathways.

Saturday May 5 (4:30 pm – 6:30 pm)

Symposium: **Cognitive and Neural Plasticity in Older Age: Mechanisms of Change in Cognitive Training Interventions**

Improving Cognitive Control Processes in Older Adults by Means of Task-Switching Training: An ERP Approach

Presenter: Katharina Stenger, *Saarland University, Germany*

Katharina Stenger, *Saarland University, Germany*; Sandra Dörrenbächer, *Saarland University, Germany*; Jutta Kray, *Saarland University, Germany*

Abstract: It is well documented that cognitive control abilities decline in old age. However, scientific evidence suggests that cognitive-control training reduces age-related differences substantially. The present study implemented an event-related potential (ERP) approach to identify the neural dynamics underlying training-induced changes after cognitive-control training in healthy older adults. Ninety older adults were trained either in a task-switching (high demands on cognitive control) or a single-task training setting (lowered demands on cognitive control) and compared against 30 untrained younger adults. Transfer effects of training were expected in a similar, untrained switching task (near transfer) and in dissimilar tasks (far transfer) measuring context processing and interference control. Behavioral results indicated improved performance in older adults in the transfer tasks that were more pronounced after task-switching training than after single-task training. More importantly, we found a selective decrease in the cue-locked P3 amplitudes for non-switch trials and an increase in mean target-locked P3 amplitudes in the near transfer task, reflecting enhanced task preparation and implementation. Furthermore, results showed a selective decrease in the target-locked N450 and an increase in P3 amplitudes in the far transfer tasks, indicating enhanced conflict detection and interference control after task-switching training. These findings suggest a training-specific enhancement of underlying cognitive-control mechanisms that may be associated with distinct neural signatures.

Saturday May 5 (4:30 pm – 6:30 pm)

Symposium: **Cognitive and Neural Plasticity in Older Age: Mechanisms of Change in Cognitive Training Interventions**

Comparing Cognitive Benefits From Single-Component and Multi-Component Cognitive Training Modules: a Meta-Analysis of Randomized Controlled Trials in Healthy Aging and Mild Cognitive Impairments

Presenter: Chandramallika Basak, *University of Texas at Dallas*

Abstract: Although cognitive training is touted to be beneficial during the long pre-clinical phase of Alzheimer's disease (AD) that includes healthy aging and mild cognitive impairment (MCI), past meta-analyses on cognitive training have typically focused either on healthy aging or MCI. Moreover, no meta-analysis so far has compared the extent of transfer between different training modules during this long pre-clinical phase of AD. The main goals of the current comprehensive meta-analysis on randomized controlled trials therefore were to compare the training-related cognitive gains a) between healthy aging and adults with mild cognitive impairment (MCI), and b) compare the extent of transfer from two different cognitive training modules, one that targets a specific single cognitive component (e.g., executive functions) and another that targets multiple cognitive components, either sequentially or simultaneously. Results from 200 training studies using multi-level modeling showed that, in general, cognitive training moderately benefited cognition in older adults when compared to controls (net gain effect size, Hedge's g=.30), with no significant difference between healthy aging and MCI on overall cognition. Simultaneous multi-component training resulted in broadest far transfer. For single component training, the most effective approach for far transfer was training on executive functions/working memory. Additional moderator analyses showed that total hours of training, hours/week, gender distribution, and publication quality did not influence the overall cognitive net gain effect size.

Sunday May 6 (10:30 am – 12:30 pm)

Symposium: **New Insights on the Role of Strategies in Cognitive Aging**

Overview Speaker

Presenter: Dayna R. Touron, *University of North Carolina at Greensboro*

Abstract: Although some cognitive decline with healthy aging appears inevitable, much research demonstrates that a substantial portion of the observed cognitive performance deficits in older adults is due to age-related changes in strategy repertoire, distribution, execution, and selection. Although mnenomic strategies were traditionally the focus of this research, a strategic contribution to cognitive aging has been demonstrated for diverse cognitive domains beyond memory, such as problem solving, skill acquisition, and judgment and decision making. Naturally, this vast research has also yielded inconsistent findings, calling for continued precision of theories on cognitive strategy variations with aging. As a further challenge, strategy trainings often fail to yield transfer effects. Featuring talks by researchers from the USA, Germany, and Italy , the current symposium will therefore focus on new insights on the role of strategies in cognitive aging (across the domains of memory, attention, and event segmentation) that help resolve the aforementioned inconsistencies and challenges. First, Dayna R. Touron (University of North Carolina at Greensboro, USA) will give an overview of basic findings as well as challenges and new directions. The first two research talks will then report novel insights on aging and traditional mnemonic strategies. First, Beatrice G. Kuhlmann (University of Mannheim, Germany) will demonstrate the moderating role of task conditions for age-related strategy deficiencies in episodic memory. Her data demonstrate that test-format expectations (recognition versus recall) during study substantially magnify age-related differences in episodic memory, mediated via age-related differences in encoding strategy production and utilization when attempting to prepare for recall. Next, Elena Cavallini (University of Pavia, Italy) will present a novel concept for cognitive strategy training, specifically aimed at facilitating strategy transfer. On the example of mnemonic training, she will demonstrate how and for whom transfer to novel (laboratory and everyday) tasks can be supported in the training. In turn, Heather Bailey (Kansas State University, USA) will explore the contribution of cognitive strategies to age-related differences in a new domain, event segmentation, which then tie back to age-related differences in memory for events. Finally, Alan Castel (University of California, Los Angeles, USA) will demonstrate an increasingly selective attention focus in older learners and discuss how prior knowledge and metacognitive insights can enable more effective attention allocation in older adults.

Sunday May 6 (10:30 am – 12:30 pm)

Symposium: **New Insights on the Role of Strategies in Cognitive Aging**

Ready … Set … Test! Examining Older Adults' Adaptation to the Expected Memory-Test Format

Presenter: Beatrice G. Kuhlmann, *University of Mannheim, Germany*

Abstract: Age-related memory differences are more pronounced on recall than on recognition tests. Three experiments examined whether older adults are aware of recall's particular difficulty and adapt strategies accordingly. Young (17-30 years) and older (59-87 years) participants either expected a recognition or a recall test while encoding word lists. Whereas young adults had adequate test-difficulty expectations already after reading format descriptions, older adults needed practice with the format. Recall-expecting young adults consistently outperformed their recognition-expecting peers on both test formats. Recall patterns indicated that recall-expecting young adults engaged more inter-item relational processing, both of adjacent unrelated study items (E2) and of distant semantically-related items (E3). For older adults, recall-expectancy effects were mixed: There was consistently no effect on recognition (E1-3) but improved recall of unrelated (E2) but not of semantically-related (E3) words. Recall patterns suggested that recall-expecting older adults did not engage more relational processing of adjacent items in E2 but unsuccessfully tried to use semantic clustering in E3. Thus, there are qualitative differences in how young and older adults prepare for recall and whether older adults can successfully prepare for recall depends on the study material. Thereby, observed age-group differences in memory can be substantially magnified under recall expectancies.

Sunday May 6 (10:30 am – 12:30 pm)

Symposium: **New Insights on the Role of Strategies in Cognitive Aging**

A Learner-Oriented Approach For Improving Older Adults' Memory and Transfer, Based On Strategy Adaptation

Presenter: Elena Cavallini, *University of Pavia, Italy*

Abstract: Training older adults to use mnemonic strategies typically improves their memory performance on the trained tasks. However, standard strategy training rarely produces transfer to tasks that are not practiced during training. Given the general failure of mnemonic training programs to achieve transfer, we developed a novel intervention based on a learner-oriented approach. During the training, older adults are treated as active partners in attempting to achieve generalization of strategic behavior. We explicitly engage older adults in a discussion about how their newly acquired strategies (interactive imagery and sentence generation) could potentially be adapted for use in different task environments. Thus, we promote transfer in the training program itself by giving them a procedure to be followed for every new task based on task analysis and strategy adaptation.

Sunday May 6 (10:30 am – 12:30 pm)

Symposium: **New Insights on the Role of Strategies in Cognitive Aging**

the Role of Knowledge in Age-Related Differences in the Segmentation and Memory of Everyday Activities

Presenter: Heather Bailey, *Department of Psychological Sciences, Kansas State University*

Abstract: Everyday we encounter a continuous stream of activity, and one way that our perceptualsystems deal with such activity is by segmenting the activity into discrete, meaningful events. Segmentation is one type of encoding strategy that helps people organize dynamic activity in memory, and previous work has shown that individuals who segment more normatively are better able to remember the activity. Segmentation ability, however, declines with age, presumably due to changes in working memory. Although working memory and episodic memory often to decline with age, semantic knowledge remains intact. Thus, recent work from our lab has evaluated whether older adults are able to use their intact semantic knowledge to more effectively segment and remember novel everyday activities. Results indicate that activating prior knowledge improves segmentation ability for both young and older adults; however, this manipulation did not benefit memory to the same extent. Age-related changes in segmentation and memory will be discussed as well as implications for future memory interventions.

Sunday May 6 (10:30 am – 12:30 pm)

Symposium: **New Insights on the Role of Strategies in Cognitive Aging**

Selective Memory as a Memory Strategy in Older Age

Presenter: Alan D. Castel, *University of California, Los Angeles*

Abstract: We are often in situations in which we are overwhelmed with information. This places challenges on attention and can influence what is later remembered. In response to these cognitive challenges, older adults may use a metacognitive strategy to selectively focus on important information, in order to remember this high-value information in the future. The ability to selectively remember high-value information may come at a cost of remember less, especially so in terms of lower-value information. I will present a theoretical framework that illustrates how the strategic allocation of attention can be used effectively when people have metacognitive insights that their memory capacity is limited. Older adults may also use prior knowledge and established schemas to incorporate new information with what is already in memory, making decisions about what to remember on a "need-to-know" basis. Older adults may choose to focus on high-need and high-yield information (that has a strong likelihood of future use), in order to maximize rewards and avoid potential losses. I will discuss some findings regarding how "lifelong students of memory" (older adults) find effective ways to remember what is of most importance, forget what is not needed, and how this judicious use of memory can lead to efficient memory in light of the memory impairments that might accompany older age.