

MPS-UCL Initiative for Computational Psychiatry and Ageing (ICPAR)



MPS-UCL Symposium and Advanced Course on Computational Psychiatry and Ageing Research

Opening Remarks

Ulman Lindenberger Max Planck Institute for Human Development, Berlin

September 16-22, 2012 Ringberg Castle, Tegernsee, Bavaria, Germany



Craik & Bialystok, 2006; Lindenberger, Li, & Bäckman, 2006

Guiding Propositions

- I. Lifespan changes in behaviour need to be understood as interactions among mechanisms related to maturation, learning, and senescence
- II. The exploration of age-graded differences in plasticity is a powerful tool for identifying mechanisms of development
- III. Lifespan theory and methodology needs to integrate evidence across domains of functioning, timescales, and levels of analysis
 - This integration requires formal theory and computational methods

Lindenberger, Li, Lövdén, & Schmiedek, 2007

Integration Across Time: Within-person Trial-to-trial Variability Precedes and Predicts Cognitive Decline in Old and Very Old Age



Cognitive Load of Walking

Learning of Word Lists While Walking: Costs Compared to Sitting





Individual Differences in Change Increase with Age



Brain Structure: Changes in Volume



72 participants Age at first occasion = 20-77 years Raz, Lindenberger, Rodrigue, et al. (2005). *Cerebral Cortex*

Brain Structure: Changes in Volume **HIPPOCAMPUS** 9.0 ADJUSTED VOLUME (CM³) 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 0.0 20 30 50 60 70 80 90 0 40 AGE AT BASELINE (YEARS)

72 participants Age at first occasion = 20-77 years Raz, Lindenberger, Rodrigue, et al. (2005). *Cerebral Cortex* Chemistry: Extrastriatal Age Differences in Dopamine Binding (D_2): Estimated Percent Loss per Decade (20–80+)

	Kaasinen et al. (2001)	Inoue et al. (2001)
Frontal	11%	14%
Temporal	10%	12%
Parietal		13%
Occipital		12%
HC	10%	12%
Amygdala	7%	
Thalamus	5%	5%

A Lifespan View on Cognitive Ageing

- Cognitive ageing comes with profound changes in behaviour and brain chemistry, anatomy, and function
- At all three levels, people vary substantially in age-related decline
- Formal theories of cognitive ageing linking these levels need to capture both mean trends and heterogeneity

Questioning the State of the Art in Cognitive Ageing Research

We have analyzed and understood the fundamental limitations of cross-sectional designs.

But how often do we collect multivariate, multi-level longitudinal data?

In theory, we take a multivariate view on neural activity.

But how multivariate are our analyses of functional brain imaging data?

We like to use the word, dynamic, when conceptualizing the development of brain and behaviour.

But how often do we try to capture the dynamic properties of variability and change?

We conceptualize development in terms of levels of analysis.

But how good are we at measuring each of these levels and interconnecting them?

We emphasize the need for statistical and computational modeling.

But how often do researchers in cognitive ageing use models to parameterize and test theories?

An Agenda for Cognitive Ageing Research

- launch longitudinal studies that investigate changes in brain chemistry, structure, function, and behaviour
- strengthen multivariate approaches to the analysis of functional imaging data
- better capture dynamic properties of brain and behaviour
- intensify measurement efforts to get at brain vasculature, metabolism, and neurochemistry
- formalize theories within and across levels of analysis



MPS-UCL **Initiative for Computational Psychiatry and Ageing (ICPAR)**

MPS-UCL Symposium and Advanced Course on Computational Psychiatry and Ageing Research

September 16-22, 2012 at Ringberg Castle, Germany

Deadline for applications April 15, 2012 Send applications through http://euca-excellence.eu/

Program schedule

· Keynote lectures

· Teaching lectures

· Method workshops

Consultations

Student presentations

Fields of study

· Cognitive neuroscience

· Computational neuroscience

· Computational psychiatry

Computer science

Mathematics

• Medicine

Neuropsychology

· Psychiatry

Psychology

Who may apply?

Late predocs and early postdocs, including those holding clinical fellowships and residencies

The MPS-UCL Symposium and Advanced Course is part of an initiative of the Max Planck Society aimed at promoting the development and application of computational methods that reorganize and improve our understanding of mental illness and behavioral ageing.

For more information, see

http://www.mpib-berlin.mpg.de/mps-ucl

Invited Speakers and Lecturers

Nathaniel Daw New York University, USA **Ray Dolan**

University College London, UK

Emrah Düzel University College London, UK

Brown University, USA

University College London, UK **Quentin Huys**

Máté Lengyel University of Cambridge, UK

Ulman Lindenberger Max Planck Institute for Human Development, Germany

Randy McIntosh Baycrest Centre, Canada

Read Montague Virginia Tech Carilion Research Institute, USA

Klaas Enno Stephan University of Zurich and Swiss Federal Institute of Technology, Switzerland

Xiao-Jing Wang Yale University School of Medicine, USA

Steering Committee

Ray Dolan, Ulman Lindenberger, Klaas Enno Stephan, and Arno Villringer

* * + European

Campus Excellence

Michael J. Frank

Karl Friston

University College London, UK