

Integration of Cognitive Psychology and Cognitive Neuroscience in Studies on Aging and Other Research Fields

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I am happy to present a series of articles in this issue of *Acta Psychologica Sinica*. I was invited to do so and here is the outcome. The articles have been written by researchers living and working outside China. None of them has made a contribution to this journal before. The articles cover a broad spectrum of topics within the area of cognitive neuroscience. The purpose of this little article is to introduce the authors and the topics covered to the readership of the journal.

The first paper in this series is written by Lars Bäckman, from the Aging Research Center of Karolinska Institutet in Stockholm, Sweden. The topic is about cognition in the preclinical phase of dementia, which is the period of transition from normal aging to dementia. Individuals who undergo this transition show certain cognitive deficits many years before the diagnosis of both Alzheimer's disease and vascular dementia can be made. It is a challenging task for the scientific community to try to discover such cognitive signs as early as possible. The basic idea is that the success of presently available medication and new types of medication for these diseases depends heavily on how early individuals with such cognitive signs can be identified. The ideal case would of course be if these individuals could be identified even before the stage of preclinical dementia.

As described by Bäckman, current knowledge holds that the most pronounced prodromal

impairment in performance is observed in data from task assessing episodic memory, cognitive speed, and executive functioning. However, even in these tasks with the possibility of discovering early cognitive deficits, the risk of making both false alarms and misses at the individual level is obvious, because the performance distributions of people who will develop dementia and those who will not are partly overlapping. As Bäckman notes and discusses, an important task for future research is to find means to minimize this overlap. One way of doing this is to focus on patterns of data from several cognitive tasks rather than single tasks. Another path of reaching more exact prediction models is to combine early cognitive signs with biological, clinical or social markers.

The next paper in this series, by Maria Larsson, Margareta Hedner and Jonas Olofsson, all from Department of Psychology, Stockholm University and Stockholm Brain Institute, Sweden, includes empirical data on age and sex effects in semantic recognition of odors and words. Maria Larsson is professor of psychology at Stockholm University, Margareta Hedner is a PhD student and Jonas Olofsson is a postdoc fellow at the same university. The data reported in this article emanate from a large-scale prospective study on memory, health and aging, the Betula Study.

This study summarizes briefly the state of the art findings on olfactory function and aging, and then presents empirical data. The aim of the study was to study how two variables (age and sex) affects olfactory function. A cued odor identification task and a semantic memory test were used as tools in this endeavor. Participants were close to 1500 healthy individuals varying in age from 35 to 95 years. The results showed that age

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affected performance negatively in the olfactory task, but to some extent also the performance in the vocabulary task. It was also demonstrated that women identified more odors than men in all age groups.

The paper by Sara Pudas, Jonas Persson, Lars-Göran Nilsson, from Department of Psychology Stockholm University, Sweden and Lars Nyberg, from Departments of Integrative Medical Biology and Radiation Sciences at Umeå University, Sweden, describes how a verbal working memory protocol was designed and evaluated on a group of healthy young adults for the purpose of a large-scale functional magnetic resonance (fMRI) study to be carried out later. The basic design was that letters were presented to the subjects in two main conditions, maintenance and manipulation. The purpose of the study was to examine whether these two conditions would be associated with a reliable dorsal/ventral PFC distinction. More precisely, the authors asked whether manipulation would elicit more dorsolateral activation than maintenance. The authors were also interested in determining whether the additional in the manipulation condition would produce differences in brain regions outside the frontal cortex. The analyses of the fMRI data revealed that the protocol elicited reliable activation in the frontal cortex, with the manipulation condition producing more extensive activation patterns. Moreover, it was found that manipulation elicited more dorsolateral frontal activation. The protocol also elicited activation in various subcortical areas. The authors conclude that the protocol that they had developed is appropriate for investigating age-related changes in the functioning of the frontal cortex.

In their paper, Soledad Ballesteros and Julia Mayas, from Department of Basic Psychology II, Universidad Nacional de Educacion a Distancia in Madrid Spain, claim that within-modal repetition priming is a cognitive function that is preserved in old age. Previous research has demonstrated that this preserved function holds for several

modalities: vision, audition, touch and olfaction. The authors note that fewer earlier studies have examined whether priming is modality specific or whether it can also be demonstrated in cross-modal experiments. The review of the literature indicated evidence that vision-to-touch and touch-to-vision priming was as pronounced as the within-modality conditions, vision-to-vision and touch-to-touch. This result was first demonstrated in studies of young participants only. However, later studies have demonstrated that the same results also hold for old adults. It is thus concluded that cross-modal priming between vision and touch is preserved in old age. It is furthermore reported by the authors that both within-modality and between-modality priming for ecological sounds and pictures are preserved in old age. It is also claimed in this article that the neural correlates for cross-modal priming is the posterior extrastriate occipital areas. Previous research have demonstrated these areas to be preserved in old persons.

In the article by Erik Nilsson, from the Department of Clinical Neuroscience at Karolinska University Hospital, Huddinge in Stockholm, Sweden, a review of the literature is presented as to whether memory is impaired in persons with seasonal affective disorders. Such disorders are prevalent in persons who are living in latitudes, where the length of the day varies over the year. Presence of artificial light does not seem to attenuate the occurrence of these seasonal affective disorders. The article presents an overview over symptoms, prevalence, the biological base, treatment, and the memory impairments demonstrated in previous research. It is concluded from this literature review that the most likely cause of the symptoms of the seasonal affective disorders is a combination of genetic susceptibility and dim light conditions during the winter months. It is also stated that cognitive effects of seasonal affective disorders have been relatively little studied and very much less so than the cognitive effects of clinical depression without

seasonal variation. It is concluded that further research is needed and that larger and more well designed studies are needed in order to understand

The next paper in this special issue is written by Agneta Herlitz and Johanna Lovén, both from Aging Research Center at Karolinska Institutet and Stockholm University in Stockholm Sweden, and it presents an overview of sex differences in cognitive functions. A special focus is given to the sex differences demonstrated in episodic memory. Results from a large number of studies show that women outperform men on verbal production, episodic memory, and face recognition tasks. Men outperform women on visuospatial tasks, including episodic tasks that are visuospatial in nature. The authors present and discuss various explanations that have been proposed in the literature to account for these sex differences. It is concluded that the popular hypothesis that steroid hormones is the underlying cause of the magnitude of the sex differences is not supported by data. It is concluded that neither endogenous testosterone nor estradiol affect cognitive sex differences substantially.

In his contribution to this special issue, Roger Dixon, from University of Alberta in Canada, and Cindy de Frias, from Stockholm University in Sweden, use data from the Victoria Longitudinal Study to illustrate and discuss memory compensation in old adults, especially the issues of long-term stability and long-term variability. The authors form two groups from the Victoria Longitudinal Study for the purpose of studying how the participants use memory compensation techniques in everyday life. One group consists of persons with mild memory deficits and the other

group consists of persons without such deficits and is therefore the control group. Multi-level modeling was used to examine baseline level differences and long-term change patterns. The group with mild memory deficits showed at baseline that they recently had increased their use of memory compensation strategies in everyday life. The results also showed a notable stability in memory compensation use across a 12-year period.

The final contribution to this special issue of *Acta Psychologica Sinica* is a paper by Shu-Chen Li, Martin Lövdén, Sabine Schaefer, Florian Schmidek, Yee Lee Shing, Markus Werkle-Bergner, and Ulman Lindenberger, all from the Center for Lifespan Psychology at the Max Planck Institute for Human Development in Berlin, Germany. The article takes a broad perspective in describing ongoing research at the center. The Center had since its start in 1981 a focus on lifespan psychology. In 2004, the Center extended its research program into developmental behavioral neuroscience. The research at the Center is guided by three propositions, namely (a) to study life span changes in behavior as interactions among maturation, learning, and senescence, (b) to develop theories and methods that integrate empirical evidence across domains of functioning, timescales, as well as behavioral neuronal levels of analysis, and (c) to identify mechanisms of development by exploring age-graded differences in plasticity. The focus on these three propositions is illustrated by an interesting report of recent findings from four research projects on sensory and cognitive development at behavioral and neural levels of analysis.