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Guest Editors: Mary H. Kosmidis, Athanasia Liozidou, Lambros Messinis, Alexandra Thanellou, Ioannis Zalonis

Lecture

On the trail of the neuronal code of memories

Andrew C. Papanicolaou

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Abstract

Among the few propositions on which there is practically universal agreement in Psychology and the Neurosciences is that memories are stored in the brain. The exceptionally high degree of confidence with which this proposition is held is mainly due to our inability to conceive of an alternative analogy to that of storage to account for the survival and re-appearance of past experiences. Yet inability to conceive of alternative solutions to the problem of the survival of the past in no way constitutes direct empirical evidence for the truth of that proposition. Such evidence, however, has been sought in two ways. First, it has been sought in the consequences of focal brain lesions, whether natural or experimental on the ability to form new memories and on the ability of recalling already consolidated ones. Currently, it is also sought in functional neuroimaging data. Both approaches have converged in identifying brain regions apparently specialized in the recognition of particular categories of objects, such as faces, places, words, colors and body parts raising the possibility that such regions are repositories of the concepts of such concrete objects. Yet careful consideration of the relevant facts leads to the conclusion that these regions cannot be storage devices for concepts but, more likely, parts of neuronal mechanisms specializing for the analysis of sensory afferents and the construction of motor plans. Similarly, functional neuroimaging data of object category-specific activation patterns, though uncritically assumed to provide evidence of concept storage, may be more parsimoniously interpreted as representing reconstruction of such concepts, necessary for the process of recognizing the corresponding objects. Specifically, data of both types have mainly contributed to our understanding as to what solutions to the questions of "how" and "where" memories survive, are not realistic. But they have also provided hints, alluded to above, as to how concepts may reappear whenever needed, in the stream of consciousness without having to be deposited for safe keeping in the brain in the form of Hebbian circuits, as it is generally believed. The main goal of this presentation is to demonstrate that, at least in the case of concrete concepts, there is no credible evidence if favor of their being stored and, secondarily, to raise awareness of the need of an alternative conception of concept memory.

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Lecture

The prefronto-temporal circuit for the controlled retrieval of information from memory

Michael Petrides

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Abstract

The findings from a series of studies on patients with damage to the prefrontal cortex, as well as experiments with functional neuroimaging on normal subjects, have highlighted the specialized role of the ventral part of the lateral prefrontal cortex in the controlled retrieval of information from memory. The cytoarchitectonic areas 45 and 47/12 that constitute this part of the prefrontal cortex are connected via a bundle of axons that course through the extreme capsule with areas of the temporal cortex where the processing of auditory, visual and multisensory stimuli occurs. Controlled retrieval is required when recall from memory cannot simply be the result of automatic recognition or strong stimulus-stimulus associations and depends on interaction between the prefrontal cortex and specific temporal cortical areas. In a recent study, patients with damage to the prefrontal cortex that included the ventrolateral region exhibited reduced memory recall only when the stimuli had been presented in various contexts and therefore retrieval could not depend on simple recognition or stable relations between stimuli. In experiments with normal volunteer subjects with functional magnetic resonance imaging, we observed increases in activity of cytoarchitectonic areas 45 and 47/12 and the interaction of these areas with specific parts of the temporal cortex during controlled memory retrieval.

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Lecture

Cognitive Reserve: epidemiology, pathology and neuroimaging

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Abstract

Reserve is a heuristic attempting to explain individual differences in cognition, function or clinical status in relation to cognitive aging and brain disease. The concept of reserve suggests that various aspects of life experience may allow some people to cope with progressing aging and Alzheimer's disease (AD) pathology better than others. Reserve may encompass at least three different constructs. Brain reserve refers to the neurobiological capital (numbers of neurons, synapses, etc.). It is conceptualized as a form of neurobiological hardware or individual variation in the structural characteristics of the brain. The term cognitive reserve refers to cognitive processes and may include properties such as the adaptability, efficiency, capacity, flexibility etc. of networks of brain regions and interactions thereof. It is conceptualized as a form of neurobiological software. Brain maintenance is conceptualized as reduced development over time of age-related brain changes and pathology leading to individual differences in decline of brain morphology over time reflecting the basic notion that the brain is modifiable based on life experience. Epidemiological evidence suggests that higher occupational attainment and education, as well as increased participation in intellectual, social and physical aspects of daily life are associated with slower cognitive decline in healthy elderly and may reduce the risk of incident AD. There is also evidence from structural and functional imaging studies that subjects with such life experiences can tolerate more AD pathology before showing signs of clinical dementia. It has been hypothesized that such aspects of life experience may result in functionally more efficient cognitive networks and therefore provide different aspects of reserve that delay the onset of clinical manifestations of dementia. It is also possible that their effect is mediated by their association with lower exposure to environmental insults or other more 'health conscious' lifestyle. Alternatively, they may be markers of innate capacities that also protect from cognitive decline and dementia. Definitions of cognitive reserve, brain reserve and brain maintenance are not static. Similarly, ways in which these constructs are best estimated, approached and studied are also evolving. In this presentation we review some of the relevant literature of the noted associations between markers of reserve and neurodegeneration and discuss the possible mechanisms that may explain these associations.

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Lecture

Neuropsychological profile as a marker of major depressive disorder subtypes: contribution to treatment strategy formulation.

Tsaltas E, Kalogerakou S, Anyfandi E, Papakosta VM, Kontis D, Angelopoulos E, Papageorgiou CC, Zervas IM, Oulis P.

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Abstract

The findings from a series of studies on patients with damage to the prefrontal cortex, as well as experiments with functional neuroimaging on normal subjects, have highlighted the specialized role of the ventral part of the lateral prefrontal cortex

BACKGROUND: Pharmacoresistant patients with major depression (MDD) and electroconvulsive therapy referral (ECT) may present distinct neuropsychological profiles from drug-respondent patients. Such differences could help identify MDD subtypes, offering insights into the mechanisms underlying differential treatment response. The sensitivity of distinct neuropsychological deficits to clinically effective ECT could extend such insights.

METHOD: Depressed patients with (1) ECT referral (ECTs), (2) no ECT referral (NECTs) and (3) controls (matched groups, n=15) were assessed with Hamilton Depression, Hamilton Anxiety and Mini-Mental State Examination scales and five memory and executive function tests from the Cambridge Neuropsychological Test Automated Battery (CANTAB). ECT candidates were reassessed at the end of ECT (post-ECT) and 2 months thereafter (follow-up).

RESULTS: ECTs scored significantly lower than NECTs in the MMSE ($p=0.01$). NECTs performed worse than Controls in Paired Associates Learning (PAL) task ($p<0.03$; Controls/NECT $p<0.01$) and Spatial Recognition Memory (SRM: $p<0.05$; Controls/NECTs $p<0.05$); ECTs differed neither from Controls nor from NECTs. In Intra/Extradimensional shift (IED), ECTs performed worse that Controls and NECTS (IED: $p<0.01$; Controls/ECTs $p<0.01$) in phases reflecting attentional flexibility. In Stockings of Cambridge (SOC), ECTs tended to abandon prematurely ($H=11$, $p<0.01$) but those who completed SOC performed comparably to the other groups. ECT was effective in relieving MDD. After a post-ECT decline, patients exhibited improvement in PAL and SOC but their IED deficit remained unaffected.

CONCLUSIONS: A double dissociation emerged in ECTs vs. NECTs neuropsychological profiles. ECTs showed significant flexibility deficits but mild memory deficits; NECTs presented the opposite pattern, suggesting frontostriatal involvement in ECTs vs. temporal NECTs involvement. Attentional flexibility deficits may constitute a neuropsychological trait-like feature of pharmacoresistance.

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Lecture

Neuropsychological functions and single photon emission computerized tomography (SPECT) in Greek multiple sclerosis patients: Efficacy of a computerized cognitive rehabilitation program

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Abstract

Cognitive dysfunction is common in multiple sclerosis (MS) patients and significantly influences their daily functioning abilities and quality of life. Cognitive impairment rates of between 30-60 % have been reported, whereas lifetime prevalence rates of 50-75% are now evident in many epidemiological studies, due to the degenerative nature of the disorder. Although disease modifying treatments may delay the onset of cognitive deficits, there is no empirical evidence regarding their efficacy for treating cognitive dysfunction. On the contrary, recent studies evaluating neurobehavioural interventions using cognitive rehabilitation have noted effective results in improving neuropsychological functions. More specifically, there is strong evidence from functional imaging studies utilizing f-MRI that cognitive rehabilitation may enhance the endogenous neuroplasticity of the brain in patients with MS through enhanced recruitment of brain networks subserving the trained cognitive functions. If such interventions are applied timely before brain atrophy becomes significant they may assist in significantly reducing cognitive decline. In this presentation we provide a brief overview of international studies regarding the efficacy of cognitive rehabilitation in this population. Furthermore, we present the results of a Greek functional imaging study utilizing Single photon emission computerized tomography (SPECT) and its correlation with neuropsychological functions in relapsing remitting MS patients. Moreover, we present the positive results achieved by utilizing a computerized cognitive rehabilitation program (REHACOM) in Greek RRMS patients who attended the University hospital of Patras neuropsychological laboratory in collaboration with the laboratory of neurophysiology, neuropsychology and cognitive rehabilitation of TEI Epirus, Department of Speech and Language Therapy

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Lecture

Reaction time and sensorimotor integration in schizophrenia

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Abstract

The deficit of information processing speed reflected in the increase of reaction time (RT) in sensorimotor speeded decision-making tasks is among the most replicated findings in Schizophrenia. In a series of studies focusing on intra-individual variability of RT in patients with schizophrenia, a specific increase of intra-individual variability (ISV) was observed for those patients that separated them from patients with other psychotic disorders. We present results showing that the increase in the ISV of RT in patients with schizophrenia is present in the decision to produce a visually guided saccadic eye movement, a task in which patients do not show an increase of the mean RT. We also present results showing that the variability in the rate of increase of a decision signal in a simple decision-making model for saccadic eye movements predicts increased ISV of RT in patients with schizophrenia dissociating them from the healthy controls and patients with Obsessive Compulsive Disorder (OCD). We will show that increased ISV of RT and not the ability to inhibit inappropriate responses is what distinguishes patients with schizophrenia and patients with OCD in the antisaccade task. Finally, we will provide results showing that the difference in ISV of RT in patients with schizophrenia is not confined to the eye movement system, but can be generalized in sensorimotor control regardless of the final motor system (hand or eye) making ISV of RT a specific cognitive marker for the deviance in speeded information processing in this disorder.

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Lecture

Prevalence of dementia in Greece: the Hellenic Longitudinal Investigation in Aging and Diet (HELIAD)

Mary H. Kosmidis[1], MaryYannakoulia[2], Efthimios Dardiotis[3], Giorgos M. Hadjigeorgiou[3], Paraskevi Sakka[4], & Nikolaos Scarmeas[5]

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Abstract

Comparisons of prevalence rates across geographic regions may elucidate potential protective and risk factors related to dementia, with implications for public health. Data regarding prevalence rates in southern Europe are limited; in Greece they are also outdated and suffer from several methodological shortcomings. We collected data through a population-representative epidemiological study (Hellenic Longitudinal Investigation in Aging and Diet) in order to estimate the prevalence of dementia and its subtypes in Greece. Our sample consisted of 1867 older adults (>64 years old; 41.3% men) in two locations in Greece, who received a full neurological and neuropsychological evaluation. Of these, 5.0% met diagnostic criteria for dementia (based on consensus diagnostic meetings). Among those with dementia, 75.3% (n=67) had a primary diagnosis of Alzheimer's dementia (AD) (3.7% of total sample), 9.0% (n=8) vascular dementia, 9.0% (n=8) Parkinson's dementia (PD) or Lewy Body Dementia (LBD), 1.1% (n=1) Frontotemporal dementia, 2.2% (n=2) alcohol related dementia, and 3.4% (n=3) dementia of other types. In the AD group, 90.3% had probable and 9.7% possible AD. In 58% of the AD group no other diagnoses contributed to the dementia; the remainder of AD participants (42%) had coexisting additional diagnoses contributing to cognitive dysfunction, including vascular dementia (4.3%), LBD (2.2%), PD, stroke and traumatic brain injury with loss of consciousness (each 1.1%), depression (17.2%), anxiety (8.6%) and a history of alcoholism (6.5%). The prevalence of dementia and its subtypes in Greece is similar or at the lower range of that reported in many other developed countries and globally.

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Lecture

Selective Review of the Contribution of Neuropsychological Assessment for the Prediction of Subsequent Dementia: Conclusions and Limitations

Eleni Aretouli

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Abstract

Neuropsychological procedures have been extensively studied as predictors of subsequent dementia in several ways. First, neuropsychological procedures have been used to identify persons with Mild Cognitive Impairment (MCI; persons at high risk for dementia) and its subtypes (amnesic, non-amnesic, with single and multiple impairments). Second, neuropsychological tests have been used to examine the exact cognitive function that best predicts future cognitive decline. Third, studies have assessed the predictive utility of specific tests for subsequent dementia. The predictive ability of all three approaches has been documented in numerous studies. However, the existing studies cannot elucidate which specific MCI subtype, which cognitive domain and which neuropsychological test *best* predicts subsequent dementia. Methodological limitations, such as lack of harmonization of the operational criteria used for the definition of MCI and its subtypes, alternative approaches used to assess a specific cognitive function, various neuropsychological tasks and metrics included in prediction models and various statistical approaches limit the comparability of studies and complicate the identification of the optimal implementation of neuropsychological procedures for the prediction of subsequent cognitive impairment and dementia.

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Lecture

Neuropsychological assessment for the differential diagnosis of Attention Deficit / Hyperactivity Disorder (AD/HD)

Efthymis Aggelakis

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Abstract

Attention Deficit/Hyperactivity Disorder (AD/HD) is a neurodevelopmental disorder present from childhood and often following individuals into adulthood. It is the most frequent reason for referring children to mental health services. Core symptoms of AD/HD (inattention, impulsivity, hyperactivity) present behaviors that parents may rate in standardized questionnaires (e.g., does not study, memory problems, cannot concentrate, cannot stay still, has no motives, etc.), are also present in other developmental or psychiatric disorders (e.g., specific learning difficulties, sensory modulation disorder, mood or anxiety disorders, autistic spectrum disorders). This may cause errors in the differential diagnosis if clinicians do not add objective measures of cognitive deficits associated with each disorder. AD/HD presents neuropsychological deficits (compared to non-clinical populations) that are also present in other disorders, like deficient working memory, whereas other neuropsychological deficits are unique characteristics of AD/HD, such as sustained attention, response inhibition, and variability of response time. Likewise, anxiety disorders present neuropsychological deficits in autobiographical memory, mood disorders present neuropsychological deficits in processing speed and verbal memory. Neuropsychological tests such as the Continuous Performance Test, tests of reading phonetic decoding, and others, may improve the accuracy of differential diagnosis, differentiating AD/HD from other disorders, or revealing the comorbidity of AD/HD with other disorders.

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Lecture

The effects of combined cognitive and physical training on brain and cognition in older adults.

Ana B. Vivas

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Abstract

Are cognitive and physical training interventions effective against age-related cognitive and brain decline, and disease? In the present talk I will present results from a large-scale study that investigated the effect of a combined cognitive and physical training computerized program on overall cognition and brain function. In this multicenter study, 322 cognitively healthy and impaired older adults were allocated to an intervention group or a passive/active control group. In a pre/post-test design, participants were assessed in working memory, executive functions and episodic memory, and a subsample of participants also underwent electroencephalographic (EEG) data acquisition during a resting-state condition. I will present both results from cognitive measures and brain connectivity work to support gains in cognition and brain function after cognitive and physical training in older adults.

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Lecture

Brain, behaviour and evolution

George Paxinos

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Abstract

Pre-Socratic philosophers rejected supernatural explanations for the existence of the physical world and the nature of the soul. Later, Hippocrates argued that from the brain derive our emotions. Aristotle considered the heart as the seat of the soul, attributing the brain the lowly function of cooling the blood. Galen reinstated to the brain the mind and described Aristotle's position as absurd. After the long battle to find the seat of the soul, psychology lost its soul in the 1930s. According to Hebb, the mind is the integration of the activity of the neurons of the brain. Atlases using identical nomenclature enable scientists to navigate between the brain of humans and animals to test hypotheses. In the histological atlases, we make use of genes that are responsible for the segmentation of the brain in development (hox genes). Using evidence from transgenic mice and birds we are proposing a new plan for the organization and function of certain brain regions of mammals. The human brain contains regions shared with the brain of reptiles and likely has the same regions as the brain of the chimpanzee. It places on humans constraints on the intellectual, motivational and emotional sphere. If the brain were "smaller" than what it is it would not have been able to support language and technology that today threaten existence. If the brain were "larger" that what it is, humans might have been able to understand the problem, even solve it. The brain is just not the right "size."

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Lecture

Neuropsychology and development: A revisionist look

Athanasios Protopapas

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Abstract

Neuropsychological research aims to contribute to our understanding of brain function through the study of the effects of nervous system damage on cognitive performance. A focus on dichotomies has led to theoretical models dominated by binary distinctions in function and localization. Such models are occasionally applied to the study of developmental disorders, carrying over neuropsychological contrasts between putatively affected vs. intact domains. This counterproductive approach overlooks the developmental nature of functional system formation through constant interaction with the environment and consequent computational self-organization. Conceptual and empirical dead-ends arising from the neuropsychological approach become evident when, for example, distinctions originating in the study of acquired aphasias and dyslexias are applied to the study of language and reading development, respectively. By reversing the explanatory direction, a focus on developmental processes and on the gradual acquisition of functions and skills may support novel approaches to the description and explanation of acquired disorders, potentially improving the explanatory validity of theoretical neuropsychological models. Achieving this goal would seem to require a change of viewpoint and a close collaboration among neuropsychological and developmental approaches and traditions.

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Lecture

Specialization in neurosurgical-neuropsychology

Giorgos Stranjalis & Evangelia Liouta

Dept of Neurosurgery, University of Athens, Evangelismos Hospital, Hellenic Neurosurgical Research Center "Professor P. Kokkalis"

Abstract

Neurosurgery is the surgical specialty concerned with the treatment of Nervous System and Spine diseases. These disorders are often difficult to diagnose and treat. This surgical treatment should not result in any additional damage, side effects and disability. In addition to neurosurgery these diseases are managed by a multidisciplinary team. The Department of Neurosurgery of the University of Athens, at Evangelismos Hospital, has a long history in the treatment of tumors, trauma, vascular disease, hydrocephalus, chronic pain, drug-resistant neurological syndromes, and spinal disorders. Since 2012 Neuropsychology is the part of a multidisciplinary team in: (1) preoperative evaluation and surgical planning, (2) awake surgery in selected patients, and (3) postoperative follow up.

(1) Preoperative neuropsychological assessment includes the following: a) clinical assessment of cognitive functions, b) evaluation of dominant hemisphere, c) participation in functional neuroimaging, and d) transfer of neuroimaging data to neuronavigation system. This process aims in protecting the eloquent brain areas during the operation, as well as to predict postoperative neurological status.

(2) During awake surgery the role of the Neuropsychologist is to objectively evaluate neurocognitive as well as motor/sensory functions with the appropriate testing and monitor for deficits that may result from electric cortical/subcortical stimulation. This procedure guides the neurosurgeon to excise the pathological lesion and leave intact the healthy neurological tissue.

(3) After surgical treatment patients are re-examined. Pre- and postoperative neurocognitive statuses are compared and combined with the neuroimaging data. The results are stored in a database for clinical as well as educational and research purposes.

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Lecture

The Wechsler Adult Intelligence Scale-IV: Research Challenges

Ariadni Stogiannidou

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Abstract

The Wechsler-Bellevue Scale was released in 1939 and it has recently been revised in its most 4th edition (Wechsler Adult Intelligence Scale-IV (WAIS-IV). The WAIS Intelligence Scale despite has been in use for over 69 years, and yet, is still considered one of the most reliable and valid tools for the measurement of cognitive skills. WAIS revisions largely reflect modern approaches not only to the examination of intelligence, but also to the reduction of previous methodological errors. The latest WAIS version is characterized by smart improvements along with a solid theoretical basis. Many of the improvements are related to its developmental suitability so that the performance of the subject is not affected by sensory deficits which are prevalent in elderly groups. Nevertheless, many unanswered questions remain about the possibility of accurately reflecting age related deficient performance. The presentation discusses relevant biases and methodological errors that make comparisons between ages difficult. Comparative data on the WAIS-IV GR scores and composite scores will be presented for two age groups: (a) 123 people aged 16 to 20 and (b) 158 subjects aged 75 to 90 years. The data stem from the Greek standardization sample which is representative of the general population in terms of gender, region and educational level. The results are discussed in terms of their importance for the understanding of the developmental changes in cognitive functionality and the need for further investigation.

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Lecture

Rehabilitation of cognitive deficits: implementation of personalized and group interventions in persons with acquired brain injury

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Abstract

Cognitive rehabilitation aims at achieving changes that will improve patients' everyday functioning and health–related outcomes, such as social participation and the sense of wellbeing. Cognitive rehabilitation begins after the acute phase of the acquired brain injury, of either traumatic or vascular etiology. Patients are primarily referred to the Neuropsychology Outpatient Service of the 1st Psychiatric Clinic at "Papageorgiou" General Hospital by their physicians and then on to the Cognitive Rehabilitation Outpatient Service. The initial request may often come from the patients' families worrying about the outcome or petitioning for disability benefit and/or insurance compensation after an accident. The goals for the cognitive rehabilitation program are set according to both patients' and their families' requests. Furthermore, they are based on the outcome of extensive neuropsychological assessment to identify patients' strengths and weaknesses. Our framework is the theoretical background of the comprehensive-holistic neuropsychological rehabilitation model. Individually, we work on (a) underlying cognitive functions-like different types of attention, (b) external aids-mainly for memory problems, and (c) metacognitive techniques (feedback, self-regulation, strategy use)–mainly to address deficits in executive functions. We also work in an experiential activities group (sharing our stories group). The group aims at (a) practicing and improving patients' everyday interactions with their environment, b) learning and using alternative communication styles or strategies to facilitate their socialization and social interactions, (c) improving self-awareness regarding their weaknesses, and (d) training in understanding and interpreting both their feelings and other people's feelings.

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Lecture

The Neurocognitive Study for the Aging

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Abstract

The Neurocognitive Study for the Aging (NEUROAGE) was formally established in 2009 with initial funding by the Cyprus Research Promotion Foundation. It is a longitudinal prospective project with a rolling admission process. NEUROAGE aims to investigate cognitive processes such as memory, concentration, speed of information processing, language abilities and executive skills in a large sample of Cypriots (N > 800) who are native speakers of Greek (including the Cypriot-Greek dialect), with ages ranging from 45 through 90+. The project recruits community dwellers living independently who are assessed every two years. In addition to the above general aims, NEUROAGE investigates the contribution of specific biological factors that may affect cognitive functions in adulthood including cardiovascular (e.g., metabolic syndrome, hyperlipidemia) and genetic markers (e.g., genetic polymorphisms including the apolipoprotein E4 allele). The project also aims to examine the relationship between quality of life, cognitive reserve, biological factors and cognitive functions. Finally, the specific study assesses the clinical efficacy of a cognitive rehabilitation program in both healthy adults and adults with mild cognitive impairment. Of additional scientific importance is that NEUROAGE has been able to recruit individuals with very little formal education, thus capturing the true effects of education on cognitive health, and investigate the interplay between education, health, and cognition. It is stressed that this is the last generation of individuals with low education since following the establishment of the Republic of Cyprus in 1960, public education has been free and mandatory through grade 9 or age 15.

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Lecture

Preoperative cognitive rehabilitation of a patient with refractory left medial temporal lobe epilepsy to determine the candidacy for surgery

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Abstract

Objective: The purpose of this study was to explore the effectiveness of a neurorehabilitation intervention to determine the suitability for surgery in a patient suffering from left medial temporal lobe epilepsy (MTLE) and hippocampal sclerosis (HS). The rehabilitation program was aimed at amplifying cognitive resources and improving memory functioning, particularly in the non-dominant healthy hemisphere. **Method:** Inspired by the functional reserve model and the right hemisphere's verbal processing potential, a preoperative neurorehabilitation program was considered, targeting global cognitive and metacognitive enhancement with an emphasis on memory function of the right temporal lobe, in particular the functional upgrade of the healthy right hippocampus and related structures to assist memory after surgery. **Results:** After the six-month rehabilitation program, the patient once again underwent IAT. This time his right hemisphere memory functioning yielded a borderline score, allowing us to consider surgery. Immediately after surgery, the patient was seizure free and did not show any clinically significant memory impairment. At six months postsurgery he had, to a large extent, preserved memory rehabilitation gains. **Conclusions:** Preoperative rehabilitation interventions aiming at enhancing cognition in general and memory of the healthy hemisphere in particular, may contribute to a positive memory outcome after left selective amygdalohippocampectomy.

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Lecture

Remediation effects on P300 waveform in school aged children with developmental dyslexia

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Abstract

Dyslexia can be defined as an unexpected difficulty in reading in individuals who otherwise possess the intelligence, motivation and schooling, thus factors considered to be vital and crucial for accurate and fluent reading. This specific learning disability is assumed to be neurobiological in origin and it is related to a variety of impairments in processing sensory information. Due to these neuropsychological deficits, it is *proposed that Event Related Potentials (ERPs) is a scientific tool for the assessment of dyslexic children by providing data about the neuronal activity which is related to cognitive information processing.*

Despite of the delayed brain activity and latency values differences being observed in dyslexic children comparing to typical readers, scientific research data confirm that normalization can be achieved, as changes in brain activation may occur and children´s reading ability could be improved, through the implementation of a structured intervention. Indeed, even brief periods of training can evoke changes in the brain›s ERPs responses and, actually, with lasting benefits.

The aim of this study was to investigate the effect of a remediation - training program being implemented to dyslexic children, on ERPs esp. P300 waveform latency values. ERPs were obtained from 15 electrode sites (Fp_1, Fpz, Fp_2, F_3, Fz, F_4, F_7, F_8, C_3, Cz, C_4, P_3, Pz, P_4, Oz) according to the 10 – 20 International System (Jasper, 1958), plus 2 reference electrodes at the mastoids of each ear and one ground electrode at the Nz (nose) site in six Greek right handed children with developmental dyslexia (mean age 9 years and 8 months). Impedances for all electrodes were kept below 5 kohms. Six control children matched on chronological age and IQ level were also tested.

Results from the first assessment confirmed that dyslexic children differed significantly from control group, in presenting a longer P300 latency values and anomalous, thus right *hemispheric, lateralization*. After the initial assessment, children with dyslexia received intensive six-month training program included exercises for enhancing phonological skills (syllable counting, phoneme detection, phoneme blending, rhyme detection) visual and auditory memory *(sounds* and *pictures matching, picture & word sequencing), visual perception and attention (coding, spotting the differences between* five similar pictures).

Data analysis displayed significant improvement for the dyslexic group after their participation to the reme-

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diation program, as they showed a significant decrease in P300 latency. Actually, children with dyslexia, after training, tend to have similar to controls *P300 wave latency values* and developed a brain activation profile more similar to that of the typically developing control group, showing, *left hemispheric lateralization.*

Key-words: Neuropsychology, Cognitive Evoked Potentials, Dyslexia, Rehabilitation

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Lecture

Laterality and cognition: Handedness as a factor differentiating cognitive abilities

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Abstract

Laterality refers to humans' tendency to prefer one side of their body instead of the other. The inborn lateralization of cerebral hemispheres is most often expressed through the humans' handedness. Therefore, one common approach to investigate the relationship between cerebral lateralization and cognition is to consider handedness as an indicator of brain laterality and to compare right- and left-handed subjects' performance in cognitive tasks (Vlachos, 2016). The aim of this review is to summarize and evaluate recent evidence, which indicate that handedness can be regarded as a factor differentiating cognitive abilities.

Many studies attempted to assess the association between brain lateralization, as indicated by handedness, and cognitive abilities. Johnston, Nicholls, Shah and Shields (2013), by using data from the US national longitudinal survey of youth found that left-handed children have significantly lower test scores than right-handed children in many domains of cognitive development (memory, vocabulary, mathematics and comprehension) but not in reading. Al-Hashel et al. (2016) explored the cognitive variation between left- and right-handed school-aged children and found that right-handed children had superior visuospatial abilities, while left-handed children showed better simple reaction times. Vlachos, Gaillard, Vaitsis and Karapetsas (2013) examined large left- and mixed-handed groups of children and adults and showed that left- and mixed handedness are associated with an elevated risk for some developmental or cognitive deficits. In addition, Powell (2011) found that left- and right-handed young adults performed similarly in measures of verbal comprehension, perceptual organization and intentionality, but not in working memory tasks, where right-handers performed significantly better than left-handers. These results suggest that any observed difference in cognitive development between the handedness groups is likely to concern specific abilities. Similarly, a recent meta-analysis, which investigated the association of verbal and spatial abilities with handedness, indicated that there is a small but significant cognitive advantage of right-handers on spatial ability (Somers, Shields, Boks, Kahn, & Sommer, 2015). However, in the verbal domain, this advantage is only significant in children.

In conclusion, handedness is considered to relate to cerebral laterality and this asymmetry is fundamental to human cognition. Recent studies have revealed that left- and right-handed groups exhibit differences in their performance on a range of cognitive ability measures. However, these differences remain poorly understood. Prospective studies can further shed light on the relationship between handedness and cognition. The better understanding of the effect of handedness and brain laterality on children's cognitive development could also serve to explain any observed educational differentials.

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Lecture

Hopkins Verbal Learning Test-Revised: Preliminary Greek normative data for research use

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Abstract

Hopkins Verbal Learning Test-Revised (HVLT-R) is a brief test for the measurement of verbal memory and learning that is frequently used in neuropsychological testing. The HVLT-R is available in six equivalent forms and is recommended for repeatable neuropsychological testing beacuse it avoids the learning effect at retest. Moreover, it is a valid and reliable screening test for mild dementia and is well tolerated by patients. In light of the asbsence of a Greek standardised version, we aimed to provide normative data for a sample of community-dwelling Greek adults and adolescents. The research team recruited healthy individuals of a broad age range with various education levels. Individuals were informed for the purpose of the study and were interviewed for their medical history and their ethnicity and maternal language. Individuals with a positive psychiatric and/or neurological history or history of substance abuse, foreigners and immigrants whose dominant language was not the Greek language as well as individuals with a score <24 in the Mini Mental Status Examination and those with uncorrected vision or hearing or prior knowledge of the test, were excluded from the study. Form 6 of the HVLT-R was translated and adapted taking into account the Greek lexical and semantic characteristics of the items. Two hundred and twelve healthy Greek participants enrolled in the study (age 40.3±15.7, 88 males, education in years 13.9±2.7). The HVLT-R was administered as part of a broad neuropsychological battery. Statistical analyses included multiple regression analyses as well as descriptive and relative descriptive analyses. We set the alpha level at 5%. Education proved to be a significant predictor in all HVLT-R indices. Age was a significant factor for most of scores, while female participants showed significantly better performance in the Trial 2 of the test. Normative data were stratified by education level, age and sex. Four age groups were formed: 16-26, 27-40, 41-52, 53-86 years old. Of the four age groups, the 27-40 year old age group showed the optimal performance (Figure 1). Future directions include sample collection to separate participants over 53 years old, validation of the test to provide values of sensitivity and specificity, translation and adaptation of the other forms of the test and comparison of performance with age and education matched patient groups.

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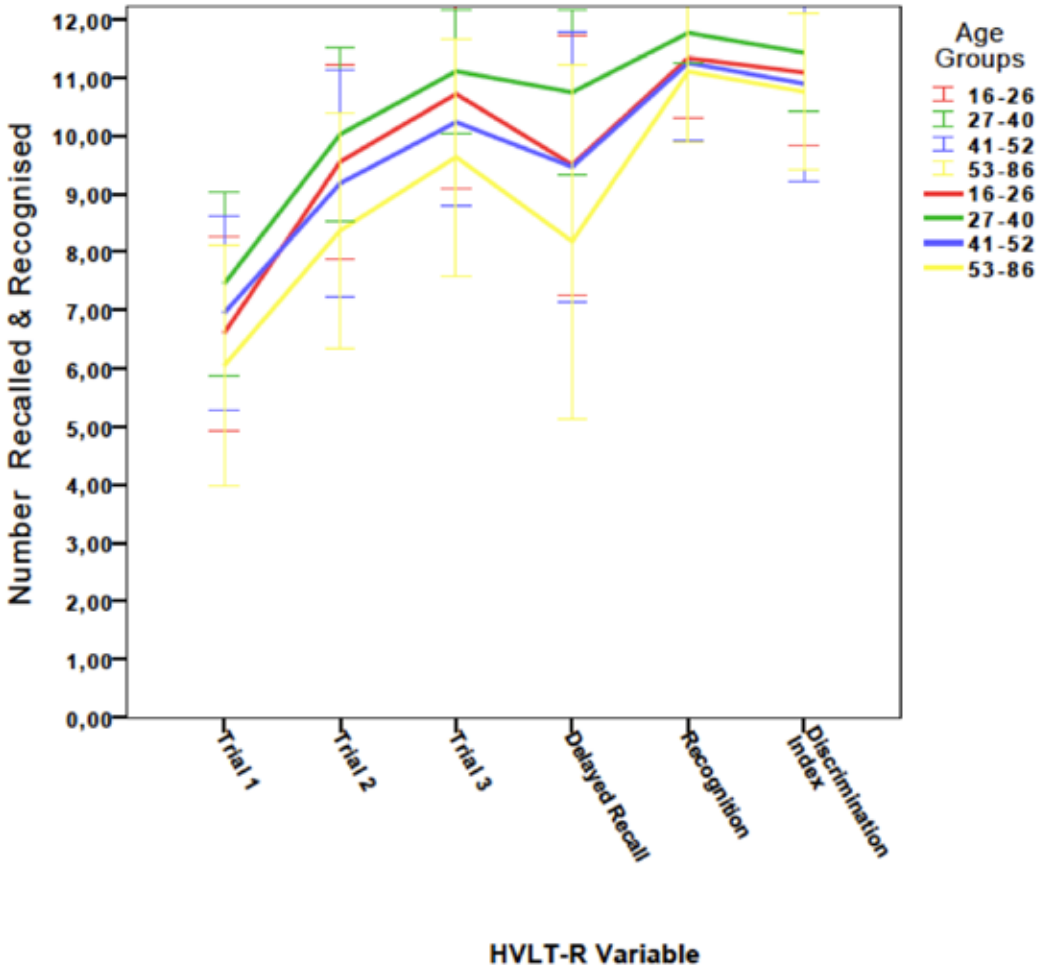

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