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# 2008 CIANS CONFERENCE

Smolenice, Slovakia, September 2008

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**CONFERENCE  
ABSTRACTS**

*Activitas Nervosa Superior 2008;50:3;58-87*

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## THE USE OF PSYCHO-ACOUSTICAL TRANSITIONAL SESSIONS IN PATIENTS SUFFERING OF MODERATE AND SEVERE ALZHEIMER'S DISEASE

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The Psycho-Acoustical Transitional (PAT) session, from a mathematical-physical point of view, is a completely defined setting that promotes large-scale functional connectivity between neural populations (Aiello, Finsterle, 2005). PAT sessions have been administered by Finsterle to 5 subjects with organic brain damages, affected by Alzheimer (3), Frontal Syndrome (1) and Pick (1), obtaining in one case a complete and stable remission of symptoms (Pick), in the other cases an improvement of memory and/or of body control, reducing correlated depressive symptoms. A study was organized to evaluate if PAT sessions could induce a (positive) change in Alzheimer's affected subjects, recovered in a nurse (Fondazione Girolodi-Forcella-Ugoni) for their total inability to conduce an autonomous life. Six subjects were selected, three testable and three non testable for their seriously compromised mental abilities. Mini Mental State Evaluation (MMSE), Token and Corsi test have been evaluated before, during and after the exposition to 13 PAT Sessions, once a week, for 4 months. The three testable subjects showed a significant score's increase in Corsi (+ 50-150%) and Token test (+ 50-110%), less evident in MMSE test. It seems that PAT sessions increase the topologic memory (Corsi) and the comprehension of language (Token), may be "restoring" a primary mental space representation (Finsterle, 2007) and opening some new neural paths between subcortical and cortical areas. These data seems to sustain the idea that PAT sessions' effects are related to an improvement of brain's "flexibility" and computation abilities, widening the research field concerning methodologies able to increase top-down/bottom-up neural communication.

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## CHANGES OF HIPPOCAMPAL-DEPENDENT FUNCTIONS IN LURCHER MUTANT MICE: LTP AND SPACE NAVIGATION AFTER FORCED MOTOR TRAINING AND CEREBELLAR TRANSPLANTATION

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Lurcher mutant mice (LMM) appear as excellent model to study the development of progressive neurodegenerative process and possibilities of its repair. LMM represent a genetically determined olivocerebellar degeneration which is primarily caused by the mutation of delta-2 glutamate receptor gene and results in excitotoxic apoptosis of Purkinje cells and secondary loss of granule cells and inferior olivary neurons. Possible effect of embryonal cerebellar graft transplanted in adult LMM on hippocampal long-term potentiation (LTP) as electrophysiological marker of learning and memory and its combination with long-term forced motor training was studied. Also spatial navigation ability using Morris water maze (MWM) was evaluated as strongly hippocampal-dependent process. LTP ability in four animal groups (transplanted, sham-operated, with and without forced motor activity) and comparison among them showed best LTP improvement in the group with combination of both influences (i.e. transplantation and motor training). Development of spatial learning in MWM revealed better effect of long-term motor activity than expected trophic influence of cerebellar graft. It could be concluded that transplantation of embryonal graft into the adult cerebellum led to positive effect on the LTP magnitude in hippocampal region and it was improved with forced motor training. The motor learning paradigm (performed during motor training) may cause similar enhancement of spatial learning ability. However, details about possible influencing between cerebellar and hippocampal areas remain still unclear and need further investigation.

*This work was supported by the Research Program Project No. MSM 021620816.*

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**GRAY MATTER MORPHOLOGY AND COMPLEX COGNITIVE ABILITIES IN FIRST EPISODE SCHIZOPHRENIA**

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Schizophrenia is linked with a cognitive dysfunction and gray matter volume (GMV) deficits. We investigated the structure-function relationship in first-episode schizophrenia patients. Methods: 105 patients underwent assessment by Wisconsin Card Sorting Test (WCST). The performance parameters were subjected to Principal Component Analysis (PCA). 35 patients also underwent MRI examination. Behavioral Partial Least Square (PLS) analysis was performed on the PCA components and GMV images. Results: PCA extracted one significant factor saturated by most of the WCST parameters. Subjects high on the factor scale had significantly lower performance on individual WCST parameters and their performance was abnormal. PLS analysis revealed one latent variable (permutation statistics,  $p < 0.033$ ), that corresponds to a distributed network of gray matter regions significantly correlated with the WCST factor ( $r = -0.77$ ): the higher the GMV - the better performance. This network includes medial and lateral parts of the prefrontal, parietal cortex, basal ganglia and cerebellum. Discussion: PCA analysis shows that patients with schizophrenia do either good or bad in WCST, evaluating abilities such as strategy generation, set shifting, error monitoring etc. These functions are linked with GMV of the heteromodal associative cortex and interlinked subcortical regions. The cortical GMV in schizophrenia reflects the neuropil abundance in the layer II, III, i.e. the cortico-cortical connectivity; the findings are in context with the disconnection hypothesis. The data also reflects the heterogeneity of the schizophrenia. Conclusion: The integrity of the heteromodal associative cortex is linked with complex cognitive abilities in first-episode schizophrenia.

*Supported by the research project no. MSM0021622404 of the Ministry of Education, Youth and Sports of the Czech Republic.*

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**BIOFEEDBACK OF LOCAL BRAIN ACTIVITY – INTENTIONAL CONTROL OF CORTICAL AREAS (ICCA)**

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It has been known since the 70ies that humans are able to use real-time information to alter brain function. Since recently, it is even possible to regulate cortical activation in specific brain areas using real-time fMRI. However, fMRI-neurofeedback suffers from some limitations, the high costs being only one of them. In addition, inherent delays of the BOLD hemodynamic response lead to delayed feedback, which could, in turn, protract the learning process. To provide an alternative method without these limitations, a research project aims to develop an EEG-based neurofeedback procedure that enables intentional control of localised cortical activity. To provide a reasonable spatial resolution, a real-time and advanced version of standardized Low Resolution Brain Electromagnetic Tomography (sLORETA, Pascual-Marqui, 2002), SMS-LORETA (Simultaneous Multiple Sources- Low Resolution Brain Electromagnetic Tomography, Avni Pllana & Herbert Bauer, 2008) is in the process of emergence. After the development and implementation of this procedure in phase 1, phase 2 is devoted to application and evaluation by simultaneous recording of EEG and fMRI. This allows verifying that the activity changes which are voluntarily produced by the subjects indeed occur in an intended region. Since ICCA allows investigating the effects of systematically enhanced or reduced activity in circumscribed neocortical brain areas, it has the potential to become a valuable tool for neuro-scientific research. Moreover, potential applications may extend to the facilitation of attention and working memory and to clinical therapy.

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## STRESS-INDUCED ALTERATIONS IN BLOOD PRESSURE AND DRINKING IN RODENTS

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This study investigated the influence of two different stress models on blood pressure (BP) and drinking behaviour in rodents. In the first experiment, normotensive adult male mice (C57Bl) were exposed to intermittent shaker stress for 7 days (45 times/d, 2 min, 150 cycles/min). Shaker stress significantly elevated plasma corticosterone levels (x vs y ng/ml) and reduced body weight gain. This was associated with elevated drinking activity in the dark period of day without changed in food intake. BP was elevated on the first day of stress in the light period; however, there was not generalised elevation of BP during shaking. In the second experiment, adult males of normotensive Wistar-Kyoto (WKY) and borderline hypertensive rats (BHR) were exposed to 8-week crowding stress (200 vs. 480 square cm/rat, stress vs. control). These conditions resulted in elevated plasma corticosterone in both phenotypes investigated while reduced relative BW gain was seen only in WKY. In contrast to shaker stress, crowding resulted in reduced drinking in both phenotypes. Interestingly, crowding had no effect on BP in WKY but it elevated BP in BHR. In conclusion, result showed that different stress models have different influence on drinking behaviour of rodents. Moreover the effect of stress on BP was observed only in rats with a genetic predisposition to hypertension.

*Studies were supported by US department of Defence contract No. DAMD17-00-C-0020 and by grants Nos. APVT-51-018-004 and VEGA 2/7064/27.*

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## DISSOCIATION, LIMBIC IRRITABILITY AND CHAOS IN AUTONOMIC RESPONSE IN PATIENTS WITH UNIPOLAR DEPRESSION

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**Objective:** According to recent findings stress experiences represent significant condition in pathophysiology of depression and influence abnormal development in the brain. Repeated stress and cognitive conflict also may determine dissociation, limbic irritability and temporal-limbic epileptic-like activity (Teicher et al., 2003). Because recent findings indicate that epilepsy and epileptiform processes are related to increased neural chaos, in the distinct contrast to normal brain activity, the aim of this study is to find relationship between neural chaos in autonomic responses reflecting brain activity during stress activation and limbic irritability (Bob et al., 2006). In this context also relationship between chaos and dissociation as a consequence of traumatic stress was previously proposed (Bob, 2003, 2007). **Methods:** For empirical examination of suggested hypothesis Stroop word-colour test, ECG recording, calculation of chaos indices i.e. largest Lyapunov exponents (LLEs) in nonlinear data analysis and psychometric measures of limbic irritability (LSCL-33), dissociation (DES) and depression (BDI-II) in 40 patients with unipolar depression and 40 healthy controls were used. **Results:** The depressive patients had significantly higher score of depression, limbic irritability and dissociation. Values of LLEs were higher in depressive patients in comparison to controls, but not statistically significantly. In the group of depressive patients significant correlation  $r=0.69$  ( $p<0.01$ ) between LLEs and LSCL-33 and correlation between LLEs and DES  $r=0.70$  ( $p<0.01$ ) found in this study indicate that degree of chaos in autonomic responses during conflicting Stroop task reflected by LLEs is closely related to limbic irritability. Significant correlation  $r=0.48$  ( $p<0.01$ ) also has been found between LLEs and symptoms of depression assessed by BDI-II. In the healthy control group significant correlations between LLEs and results of psychometric measures were not found. **Conclusions:** The results are in agreement with findings that epileptiform activity represents typical form of chaotic organization and indicate close relationship of chaos, limbic irritability and dissociation.

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### EEG EFFECTS OF SUPRA-MODAL INVOLUNTARY ANTICIPATORY ATTENTION SHIFTS

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FMRI (Marx, 2003; 2004) and electrophysiological studies (Danko, 2005; 2006; Boytsova, Danko 2007) suggested that changes in patterns of brain activations between an awake resting states with eyes opened (REO) and closed (REC) can be attributed to two components: determined by visual information perception and determined by involuntary anticipatory attention shifts from inside to outside direction (Danko, 2006). The goal of this study was to define whether observed EEG correlates of anticipatory shift of attention are specific for visual modality, or can be considered as reflection of supra-modal process. EEG (1.5–50Hz) from 19 scalp zones were recorded in REO, REC states and in REC state with earplugs (REP) in darkness and silence during 4 minutes each. 30 healthy volunteers participated in the investigation. Spectral power and coherence were calculated for seven EEG frequency bands. Repeated measures analysis of variance (ANOVA), with Greenhouse-Geisser correction was applied. The EEG power changes revealed in REC-REP comparison coincide with changes in REO-REC comparison. We assume that distinctions between REC and REP states (audio modality) can be connected with involuntary anticipatory attention shifts from „interoceptive“ to „exteroceptive“ direction alike distinctions in REO-REC comparison in darkness (visual modality). Along with it REC-REP comparison was characterized by more regional specific changes of coherence as REO-REC – by widespread changes over the whole cortex. So it was demonstrated that involuntary anticipatory attention shifts can have supra-modal components reflected in EEG power

dynamics, as well as modal specific components reflected in EEG coherence.

*Supported by grant N.Sh 1131.2008.4.*

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### GENETIC POLYMORPHISMS RELATED TO TESTOSTERONE METABOLISM IN INTELLECTUALLY GIFTED CHILDREN

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Intelligence is a complex, but highly heritable trait. Genetic factors influencing the variability of IQ are largely unknown. Previous studies have shown that testosterone affects cognitive functions and that intellectually gifted prepubertal boys have lower testosterone levels providing the rationale for choosing candidate genes. The aim of our study was to analyze genetic polymorphisms related to testosterone metabolism in intellectually gifted children. One hundred and thirty nine gifted (IQ>130) and 122 control children (70<130) aged 12-18 years were genotyped and phenotyped. SNPs in the genes coding for 5-alpha reductase (SRD5A2) and aromatase (CYP19) were analyzed by sequencing, the number (CAG)<sub>n</sub> STR repeats of the androgen receptor gene (AR) was determined by PCR and fragment analysis.

Although no differences between the groups were found in the frequencies of SNP variants, the number of CAG repeats in the exon I of the androgen receptor gene was slightly lower in gifted children, reaching statistical significance in boys (p<0,05). The STR was not associated with salivary testosterone levels. The lower number of CAG repeats is associated with higher androgen receptor activity. Our results implicate the potential mechanism for lower prepubertal levels of testosterone in gifted boys. Further genetic factors should be detect in larger genome wide association studies.

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### THE RELATIONSHIP BETWEEN NEURAL COMPLEXITY AND AUTONOMIC EXCITABILITY: NONLINEAR AND STATISTICAL ANALYSIS-BASED EVIDENCE

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The aim of the study was to investigate the relationship between autonomic excitability and neural complexity. EDA records were obtained from 95 healthy subjects (67 males, 28 females; mean age  $21.9 \pm 1.9$ ) during relaxation and non-conflict Stroop task. The autonomic excitability was expressed as a percentage increase of skin conductance induced by the Stroop task. As an indicator of neural complexity, the pointwise correlation dimension (PD2) calculated from EDA records was used. The "percentage increase" correlated significantly with the mean PD2 values in both conditions. On the left hand, r-values were 0.32 in relaxation and 0.52 in load conditions ( $p < 0.01$ ), on the right hand, r-values were 0.23 in relaxation ( $p < 0.05$ ) and 0.50 in load conditions ( $p < 0.01$ ). A comparison of the subgroups with lower and higher "percentage increase" (less than 20 %, more than 20 %, N 63 and 32, respectively) revealed statistically significant differences in PD2 values (Mann-Whitney U test,  $p < 0.01$  in all four cases). The mean PD2 values in the subgroups with lower and higher percentage increase during relaxation were: 0.76 and 0.86 on the left hand; 0.79 and 0.87 on the right hand. The mean PD2 values during Stroop task were: 0.76 and 0.90 on the left hand; 0.78 and 0.89 on the right hand. The results indicate a significant relationship between autonomic excitability and neural complexity indexed by PD2 calculated from EDA.

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#### EEG OSCILLATIONS IN PANIC DISORDER

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Introduction: Due to their high prevalence anxiety disorders are the focus of intense research interest. There is a lot of evidence for the role of brain oscillatory activity in cognition. Disrupted neural oscillation could contribute to the pathophysiology of anxiety disorders. Here we report preliminary results of analysis of oscillatory EEG activity related to retrieval of fearful memories in panic disorder. Methods: EEG was recorded in 5 non-medicated panic disorder (PD) patients and 9 healthy control subjects over frontal, central, temporal and parietal cortex under 2 experimental conditions, at rest and during retrieval of unpleasant fearful memories. Differences in EEG power spectral density (PSD) between the patient and control group were calculated in the range 0.5-30 Hz. Results: At rest, PD patients had lower PSD in the delta/theta band, but higher PSD in the beta band. In the alpha band lower PSD was found in PD patients in the temporal channels whereas it was higher in all other leads. Retrieval of unpleasant memories generally increased PSD in all frequency bands in the control group. In contrast, fearful memory retrieval in PD patients was accompanied with power decrease in the alpha/beta band. Conclusion: These preliminary results suggest changes of brain oscillatory activity in PD. The findings support the arguments that PD is associated with general cortical hyperactivation and abnormal activity of the temporal lobes.

*Supported by VEGA 2/0160/08, APVV-0538-07.*

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#### THE PROMOTION OF THE POSITIVE EMOTIONS IN CHILDREN

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The experimental psychology and the clinical psychology have been studying emotions that share a negative subjective feel as fear, anger, and sadness for many years. Little attention was paid to other emotions that share a pleasant subjective feel like joy even if they have an important role in the adaptation. According to Barbara Fredrickson research, these positive emotions serve to broaden an individual's momentary thought-action repertoire, which in turn has the effect of building that individual's physical, intellectual, and social resources. A large number of international study reports interventions addressed to children and adolescents aimed to promote



emotional skills. Many of these programs are intended to prevent problematic behaviors like school bullying, children abuse, and addiction. A smaller quantity of studies promotes a positive development that is cultivating individual character strengths and building a happy life in the perspective of positive psychology. These studies can provide some examples to spread such interventions among psycho-social workers and trained teachers. Research data will be presented to support interventions aimed to promote positive emotions with children.

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#### METACOGNITIVE THERAPY OF A CASE OF GENERALISED ANXIETY DISORDER

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Sandra manifested a state and trait anxiety and complained of numerous worries, which she used to ruminate for 5-6 hours a day and was not able to control. The assessment, based on a clinical interview and the carrying out of several tests have brought to the diagnosis of GAD: a disease difficult to be treated. It has been therefore chosen to treat the patient with the metacognitive model of GAD (Wells, 2005) since this model permits to make evident the processes which maintain the worries and their uncontrollability. After an initial phase which helped the patient to become aware of her own emotional state and identifying her worries there has been built up a metacognitive model about each situation that worried her. The formulation of that model has been discussed with the patient and has allowed to highlight the positive and negative metacognitive beliefs about the worries. So there have been employed behavioural and cognitive strategies in order to change the metacognitive beliefs. In the course of the therapy there have been manifested a progressive modification of the cognitive process and the metacognitive beliefs,

accompanied by a gradual reduction of the symptoms (being measured with a test as well) and an increasing improvement of the patients quality of life. The above mentioned results have been maintained at the follow up. The work illustrates the method used in the course of the treatment, the obtained results and the difficulties met during the various phases of the therapy.

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#### THE HUMANS AND THE DOLPHINS AT THE MIRROR

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The self recognition which is pointed out in the children of about 18-20 months through the Mirror self-recognition Test is an important cognitive function. It reflects the cognitive ability to have a physical sense of oneself and that allows to contemplate himself mentally. In human beings such ability introduces the psychological processes development of self-awareness and awareness of others, among which the introspection and the empathy. The Mirror self-recognition Test has been employed for the first time by Gallup (1970) with the great apes; recently a properly modified version was used in order to investigate the existence of self-recognition in dolphins and it supplied interesting results. This work, starting from most recent studies of neuroanatomy and comparative psychology, aims to outline the state of art about the studies of the convergence in self-recognition cognitive function in some mammals that had increased their brain mass in their evolutionary history.

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#### NEUROFEEDBACK TRAINING FOR TINNITUS

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Patients with tinnitus show an altered electroencephalographic pattern: less alpha rhythm from temporal lobe and more delta rhythm from frontal lobe, if compared with normal people. We have tried to modify the EEG pattern, thanks to a neurofeedback training. The training is aimed to alpha delta rhythm ratio increasing.

This should be related with a lower intensity of tinnitus. Tinnitus Handicap Inventory (THI), Visuo Analogical Scales (VAS) and ratio of alpha/delta brain wave's rhythms. We have selected a group of 15 patients with tinnitus of neurophysiologic aetiology, submitting them to neurofeedback training. The training is made by 12 sessions, 3 times per week. Acting on cortical plasticity, neurofeedback training stimulates the reorganization of auditory cortex. Our data show significant difference of the tinnitus intensity judged by patients, with a lower intensity at the end of the training. Comparing score of THI administered at the first session to the score of the THI administered at the last session, the difference results significant. The VAS (intensity, annoyance, effect on life, level of problems due to tinnitus) indicate lower values at the end of the training than at the beginning of it. It seems that better results are achieved if there is no comorbidity with audiological diseases (endolymphatic hydrops, Mèniere disease) or with psychiatric diseases and if tinnitus has a recent origin. Our experience suggests neurofeedback training as useful for lowering the tinnitus intensity. The method is worth of deepening, considering also brief period needed to have the results described.

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#### THE DIVERGENCE POINTS OF TARGET AND NON-TARGET EVENT-RELATED POTENTIALS EXHIBITING IDENTICAL INITIAL COURSE IN VISUAL ODDBALL TASK

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We compared the shape of event-related potentials (ERPs) elicited in response to target and non-target stimuli during visual oddball task. In cases of identical initial course followed by clearly visible divergence we measured the latency of this point. The aim was to assess the closure of sensory discrimination process. Frontal, temporal, and parietal lobes of 9 epileptic patients were examined with depth electrodes. Separately for target and non-target trials we averaged 1800ms EEG periods using stimulus as an averaging trigger. In 27 sites (9 subjects) the divergence point(DP) was detected. Its latency varied from 226 to 413ms. We found 12 DPs (8 subjects) with the latency shorter than 280ms (mean 261,6 ± 15,8) and 15 DPs (8 subjects) with the latency longer than 280ms (mean 348,8 ± 38,1). The short-latency DPs were found in : basal

ganglia, frontoorbital cortex, fusiform, cingulate, parahippocampal, medial frontal, middle and inferior temporal gyri. The long-latency DPs were found in: inferior parietal lobule, amygdala, hippocampus, frontoorbital, sensitive, and praemotoric cortices, fusiform, parahippocampal, cingulate, middle frontal, superior and inferior temporal gyri. The existence of short and long-latency DPs suggests that the recorded ERPs are related to different mental processes. We believe that the short-latency DPs indicate the closure of the sensory discrimination process. The finding that responses with short-latency DP occurred in very remote areas supports the view that the cognitive neural network participates in discrimination of the target and non-target stimuli as a whole.

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#### CONCEPT OF ACTIVATION, BRAIN STATES AND QUANTITATIVE EEG

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The concept of activation appeared to explain the relationship between variations in level of physiological activity and changes in behavior. According to Duffy (1972), the description of behavior at any particular instant requires consideration of the goal toward which it is directed and the intensity of the behavior. The intensity of behavior is most commonly called "activation" or "arousal" (J.Andreassi, Psychophysiology: Human Behavior and Physiological Response, 2000). EEG was among physiological variables studied as related to activation. These studies were numerous in XX century (Duffy, Lindsley, Malmo, Sokolov and others), but some kinds of relationships, which seemed very logical at first, have proved rather elusive to establish. An attempt is presented to consider the concept of brain activation in the light of results obtained in studies of certain brain states such as rest, internally induced emotions, verbal memorizing and retrieval, verbal task solving (Danko and collaborators, 2001-2008). The states were approached to with quantitative oscillatory EEG and brain hemodynamic tomography. The concept of brain activation is discussed in connection with concepts of arousal, vigilance, attention, brain functional states and brain functional systems and with electrodynamicshemodynamics interrelations. It is argued that the use of "activation" and "arousal" as synonyms should be avoided,

as well as “level of arousal” and “brain functional states” and that whole-cortex involvement in mental activities should not be treated as unconditional indication of change in level of arousal (non-specific activation).

*Supported with a grant “Schools of thought” 6359.2006.4*

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## VISUAL ATTENTION AND SACCADIC EYE MOVEMENTS

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Considerable advances have been made in recent years in the study of visual attention. It is recognized that visual eye scanning with saccadic movements constitutes one way that visual attention can be deployed but several forms of visual attention occur in the absence of eye movements. In this talk I will review feature-based attention, location-based attention and object-based attention. In each case my concern will be to show how these forms of covert attention interact with the saccadic eye movement system. Attention to a location can often result from the preparation to make a saccadic eye movement to that location. Experimental results from studies of saccadic movements to targets in the presence of nearby visual distractors will be discussed. These allow the conclusion that a separate and spatially precise form of attention exists which is independent of the eye movement preparation process.

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## NOISE SENSITIVITY: AN INFLUENCE OF MUSICAL FACTORS

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The study examined the association between noise sensitivity and various musical factors - musical activity, musical preference, frequency of listening to background music, and acoustical environment in childhood. In the questionnaire survey (N = 1133), participants were asked to rate their sensitivity to various kinds of noises, to describe their music preferences, musical activity, and everyday music listening habits. It was found that active musicians were characterized by higher noise sensitivity

compare to nonmusicians. Also people, who do not listen to background music very frequently, have the slightly higher level of noise sensitivity, as well as those, who prefer complex and reflective musical genres. Individuals, who lived in a noisy environment (with background music), were less sensitive to noise than those, who stayed in a silent environment. The findings are discussed in terms of theories of selective attention and habituation mechanisms to information overload.

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## BEHAVIORAL AND NUTRITIONAL PROBLEMS OF STUDENTS IN A NOVEL CULTURE

Frankova, S.

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The growing process of globalization has affected many societies and diminished difference in the living style. Nevertheless, family traditions, food habits, etc. have persisted. New phenomenon has appeared, labeled as culture shock, associated with traveling, exposing to novel culture, people, food offer. It could disturb both physical and mental health. Czech Republic has become the centre of study stay of students from all continents. We were interested in the way how they admit the novel culture. American students were selected as the target group. After two months of their stay in CR, they had to complete the questionnaire concerning motivation, changes in their life, health, food habits etc. The sample consisted of 236 subjects. Different motivation for the study in Prague appeared, such as our culture, history, location, low prices. Many students experienced mental problems, depression, tension, loneliness. Improper foods induced health problems. They missed vegetables and salads. Rigidity in their food choice, inability to compensate for a favorite branch caused their dissatisfaction. Most of them found new friends among American students, but their contacts with Czechs were limited. They described behavior of Czech people as being unfriendly, hostile. They liked the possibility of traveling, gaining new experiences, they admired Prague. Our findings give stimuli to the organization of the stay of foreign students by paying more attention to their problems with adaptation to non-American culture.

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## SELF-EVALUATION IN SCHOOLCHILDREN WITH NORMAL OR INCREASED BODY WEIGHT

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We were interested in personality and self-evaluation of overweight children (OW) as compared with those with normal weight (NW). We used Czech version of the PAQ, part of Rohner's family diagnostics (Vagnerova and Matejcek, 1992). This scale consists of 42 items divided into 7 subscales: Aggression and hostility, Dependence, Negative self-evaluation, Negative evaluation of the own abilities, Inhibition of emotional displays, Emotional lability and Pessimism. Data were collected from the sample of 249 children aged 10-14 years, NW with BMI <90th percentile, OW with BMI >90th percentile of norms given for Czech children (Blaha and Vignerova, 1999). Various behavioral problems appeared in OW subjects. They manifested themselves in high feeling of dependence, need of overt expression of emotions and affective approach from the part of their parents. The feeling of security provided by adults seemed to be more important for the OW than for the NW subjects. The OW girls perceived higher fear of world, life was full of danger. Their mood oscillated from feeling of happiness to sadness. No marked difference appeared between the NW and OW children in evaluation of their abilities. Despite certain methodical shortcomings of the PAQ scale this test provided to be useful in revealing discrete behavioral problems of the OW children.

*Supported from the Grant agency of CR 406/05/2481*

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## PRENATAL AND PERINATAL STAGE OF LIFE: INTEGRATIVE AND TRANSDISCIPLINARY APPROACH

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The human life has to be considered as an indivisible continuum, where each of the developmental stages is equally important, all stages interdependent and not separable from the whole individual life's continuum.

This continuum is one of the basic needs in human life in order to maintain homeostasis and equilibrium. The prenatal stage represents a unique opportunity for the primary prevention of psychological, emotional, physical and social disorders in later life. Prenatal and perinatal psychology, medicine and allied disciplines represent a relatively new transdisciplinary scientific field. Emphasis is based on the transdisciplinary character, which enables different scientific specialties, such as medicine, psychology, genetics, embryology, anthropology, human ethology, sociology, philosophy and others to meet, find a common language and go through the process of a mutually creative influence or, as it were, a "cross-fertilization". Prenatal and perinatal sciences and practices can also serve as a "psychosomatic" model stressing the indivisibility of "psychological" and "physical" processes in the continuum of human life from its very beginning and also the indivisible development of all functions of the central nervous system and the immunological and neuroendocrinological processes. An organism in its development with all its functions and developing structures reveals an enormous vulnerability towards all kinds of influences. During critical developmental periods of the neuro-endocrine-immune system, neurotransmitters, hormones and cytokines, when occurring in unphysiological concentrations and various toxic agents, can be effective as endogenous malorganizers i.e. "as endogenous teratogens" and result in life-long functional disturbances and diseases. Thus a new field known as "functional teratology" emerged. The bridge between the immune system, neuroendocrinology and the rest of the central nervous system – integrated psychoimmuno-neuroendocrinology – opens the gateway towards common understanding and acceptance across the disciplines. This integration attaches theoretical and applied fields, basic research and clinical experience throughout the whole continuity of human life from conception and onwards.

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## EVENT-RELATED OSCILLATORY PROCESSES IN NEUROTIC PERSONALITY

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The purpose of this work is to investigate the relationship between the personality dimension neuroticism and EEG event-related oscillatory processes. In our study participated 70 healthy volunteers. The personality was tested with Eysenck's personality questionnaire. The EEG was recorded in conditions of passive listening, mental and sensory-motor tasks. The artifact free trials was filtered (bandpass 0.5-45 [Hz]) and the averaged power spectra for each record, tone and task condition was calculated. We compared the power spectra between the groups of stable and neurotic personalities for the different frequency ranges: delta, theta, alpha 1, alpha 2 and beta. Independently on the task condition volunteers with high neuroticism scores showed more prominent power spectra in alpha 2 frequency range and the stable personality showed more prominent power spectra in theta and alpha 1 frequency range compared to the neurotic persons. The obtained data showed specific functional meaning of event related oscillatory activity in cognitive and sensorymotor information processing depending on individual personality type.

*The study was supported by National Fund – project L-1413.*

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#### HEALTH EDUCATION FOR A BETTER QUALITY OF LIFE

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In the field of medical and social sciences the last decade has been featured by an increasing attention towards the welfare analysis and the quality of life. Healthy food and psychophysical well-being mean ever and ever the basic compounds for a suitable quality of life. The importance of a healthy alimentation is supported by studying and researches with have led to the introducing of the food education in the syllabuses of primary schools in order to avoid the psychophysical disturbs deriving from unhealthy alimentation habits. The goal of our survey wants to observe the behavior and to state the knowledge's that the children in a range between nine and ten years old, own concerning alimentation habits. The methodology of a used survey consists in questionnaires administering through multiple choice, an a sample of 300 pupils in the province of Asti. The questionnaires have got the aim to evaluate the perception, the attitudes and the behavior of

the individuals regarding the food. The results that will be worked out and tabulated are going to be introduced, to be discussed and they will be compared to a further research work on a European level.

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#### MENTAL CHALLENGE INFLUENCES ORTHOSTATIC RESPONSES IN HEALTHY HUMANS

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Aims: Cardiovascular responses to orthostatic stress could be influenced by additional stimuli, such as mental challenge. We evaluated whether mental challenge during orthostasis stress leads to cardiovascular and autonomic changes. If our hypothesis is right, mental stressors might increase orthostatic responses in people prone to rapid development of syncope. Methodology: Twenty healthy young males were subjected to orthostatic stress using passive head up tilt (HUT) for 10 minutes. Mental stress was provided by mental arithmetic administered for 10 minutes. Each subject underwent three protocols, separated by two weeks: protocol one (only HUT), protocol two (mental arithmetic during HUT) and protocol three (only mental arithmetic). Pre-baseline psychological screening, individual perception of stress, beat to beat hemodynamic and autonomic variables were measured and analyzed by statistical models. Results: From baseline to mental arithmetic application, increases in heart rate ( $65 \pm 7$  to  $99 \pm 14$  bpm, respectively) and mean blood pressure ( $104 \pm 7$  to  $135 \pm 8$  mmHg, respectively) were observed. These changes were most significant when mental arithmetic was performed during HUT (all changes  $p < 0.05$ ). Conclusions: Mental challenge improves cardiovascular responses in persons subjected to orthostatic stress. Thus mental stress may be able to alleviate the symptoms of posturally related syncope in clinical practice.

## THE INFLUENCE OF THE GENETIC BACKGROUND ON THE DETOXIFICATION OF HEAVY METALS.

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Detoxification processes are essential for all living organisms. Heavy metals such as lead (Pb), cadmium (Cd), and mercury (Hg) are ubiquitous environmental pollutants with high toxic potential. Humans accumulate heavy metals primarily as a result of lifestyle and environmental contamination. However, environmental exposure alone cannot explain the naturally high variability of metal levels in humans, suggesting genetically influenced regulatory mechanisms. In order to identify genetic factors underlying the inter-individual variance in detoxification capacity of Pb, Cd, and Hg, we examined a group of 354 individuals. Single nucleotide polymorphisms in genes involved in metal metabolism, i.e. the metallothionein (MT) genes, the glutation-S-transferase (GST) genes, the hemochromatosis (HFE) gene, the aminolevulinatase, delta-, dehydratase (ALAD) gene, and the vitamin D receptor (VDR) gene, were analysed in relation to metal concentrations in hair, urine, and blood. The heavy metal concentrations were also correlated with the expression of genes of the MT1 and MT3 subgroup in 30 individuals. In brief, our results revealed associations between 1) Pb content and HFE, VDR, and ALAD gene polymorphisms, 2) Cd concentrations and MT (MT1a, MT2a), and HFE polymorphisms, 3) Hg levels and GST (GSTT1, GSTM1, GSTP1) polymorphisms. The expression analysis showed that Hg apparently suppresses MT1X expression in dependence of the GSTT1/GSTM1-genotype. Implications for autism and related disorders are discussed.

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## THE BRAIN BIOELECTRIC ACTIVITY IN THE BELARUSIAN PERSONS IRRADIATED IN UTERO

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**Objective:** The study examined the formation of bioelectric activity (BEA) of the brain in 250 children at 6, 10-12 and 16 years of age from regions highly contaminated by Chernobyl fallout, were irradiated in utero at the time of the Chernobyl accident in 1986. These children were compared to the control group of 250 children from non-contaminated areas of Belarus. **Methods:** The examination included analysis of EEG as well as psychiatric examination and assessment of intellectual level. **Results:** In the both groups of children at the age of 6-7 the dominant were the variants of age norms (46.4% vs 44.8%; P=0.592) and borderline EEG (26.4% vs 28.0%; P=0.763). Quite noticeable was the relevant frequency of the slow type of EEG (19.2% vs 18.4%; P=0.820) as well as paroxysmal activity (8.0% vs 8.8%; P=0.830). At the age of 15-16 in the both groups the slow type of EEG in most cases was transformed into the age norm and synchronized type of EEG. The correlation analysis showed that the intellectual level of children (IQ) estimated by Wechsler Intelligence Scale was in the direct proportion to spectral power of alpha-diapason in frontal lobes of the brain ( $r=0.38$  in the both groups). When comparing the results of BEA research with the dosimetric data we found no relevant correlation of these indices.

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## DYNAMIC NETWORKS: SACCADIC EYE MOVEMENTS AND ATTENTION

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**Introduction:** The attentional control of visual information processing and programming and execution of saccadic eye movements as well as are subserved by functional relations of several frontal, parietal and temporal cortical areas. It is not fully understood how these areas interact to form dynamic networks controlling attention and oculomotor functions. Psycho-physiological aspects of oculomotor behaviour and time-locked EEG activity may offer some insights into the problem. **Methods:** The accuracy of visually triggered saccades evoked potentials time-locked to the onset of saccades (SEMRPs) in a basic condition as well as in divided visual attention task were analyzed in healthy subjects. Their functional brain asymmetry (FBA) was assessed also. The

patients suffering from selected mental disorders underwent the same procedures. Results: In average, the 95% of saccades in healthy subjects are accurate. During processing of basic shape and space characteristics of visual stimuli (the lambda complex of parietal SEMRPs) the markedly decreased activity over the frontal eye fields in the form of a sharp wave peaking at the time of the lambda complex peak was registered. Different attenuation of SEMRPs correlating with the FBA was found. The more sensitivity of frontal SEMRPs as well as an immense increase in saccadic inaccuracy characterized the group of patients. Conclusions: The hypothesis is proposed that the decreased activity over the frontal eye fields may represent a correlate of blocking the frontal eye field executive functions. The findings support the proposed association between the direction of saccades and focusing the attention as well as the higher sensibility of frontal SEMRPs to various mental disorders.

*Supported by VEGA 2/0160/08, APVV-0538-07.*

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#### **A FOLLOW-UP STUDY OF PERSONALITY TRAITS IN WILLIAMS SYNDROME**

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Clinical observations as well as previous research studies have indicated that individuals with Williams's syndrome have distinctive personality characteristics. However, the stability of personality traits across the life span in people with Williams syndrome remains an open question. In the present study, personality traits of the same individuals with Williams syndrome were investigated twice, the second time over a period of several years. Participants were 12 individuals with Williams syndrome (6 males and 6 females) with a mean age of 20 years (age range from 10 to 37 years) at the time of the first assessment. The second assessment was conducted 2 to 8 years later. All participants were assessed by their parents through the FFI-MH inventory developed for the study of the personality of intellectually disabled population (author I. Ruisel). The inventory consists of sentences describing behaviour and personality characteristics assumed to correspond to the Big five personality dimensions (openness to experience, conscientiousness, extroversion,

agreeableness, neuroticism). The results revealed significant test-retest correlations in conscientiousness, agreeableness, and neuroticism. No differences were found between mean-levels of the first and second assessment scores in personality dimensions studied. The results suggest stability of personality traits from adolescence to adulthood in Williams syndrome.

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#### **ANALYSIS OF THE RESTING BRAIN: IMPLICATIONS FOR SCHIZOPHRENIA RESEARCH**

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Resting state network of the brain can be reliably traced using functional neuroimaging methods. The integrity of the network has functional consequences. The easiness of its measurement predisposes it as a tool in the neuropsychiatric research. We present pilot data from 9 healthy subjects performing non-trivial sequencing task, an easily monitored task during fMRI examination, as a method of extracting the resting state network – deactivation during the active task. We were able to extract resting state network that is constituted by several nodes implicated in schizophrenia neurobiology. The method is proposed for assessment of schizophrenia patients in clinical setting.

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#### **TESTOSTERONE INFLUENCE ON REELIN EXPRESSION ASSOCIATED WITH AUTISM PATHOGENESIS**

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Background: Testosterone as a sex steroid hormone plays a crucial role in neurodevelopment. Autism is the most genetically based neurodevelopmental disorder. Reelin protein has a major role during prenatal development of neuronal connections. Autistic brain has been described as

hyper-masculine because of high prenatal testosterone levels. Testosterone influences the expression of reelin in brains of starlings. It is possible that the linkage between testosterone levels and reelin mediated neurodevelopment exists also in mammals, including humans. Our purpose was to reveal the relationship between testosterone levels and reelin expression and to explain one of the possible mechanisms of Autism pathogenesis. Methods: Pregnant rats were exposed to high doses of testosterone (2,5 mg Testosteroni isobutyras, i.m. on day 14 of pregnancy). Pups were sacrificed on the day 10 after birth and reelin expression was measured in hypothalamus, cerebellum, frontal and parietal cortices using Real Time PCR. The rest of the pups were left and at the age of 3 months Morris water maze test was performed. Reelin expression was measured. Testosterone levels in blood were measured using ELISA analysis. Results: In newborns of testosterone group, reelin expression was altered. In males, reelin expression was decreased in hypothalamus, cerebellum and parietal cortex. In females, reelin expression was decreased in hypothalamus, cerebellum and parietal cortex. Conclusions: We can conclude that testosterone treatment does influence reelin expression in newborns.

*Project is supported by grants: 2006/22-UK-01, AV 4/0038/07, VEGA 1/3420/06, UK/116/2008.*

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#### **METABOLIC AND CARDIOVASCULAR ALTERATIONS INDUCED BY CHRONIC SOCIAL STRESS IN NORMOTENSIVE AND HYPERTENSIVE RATS**

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The role of chronic stress in etiology of high blood pressure has not been satisfactorily clarified yet. Genetic predisposition may determine whether the stress situation result either in adaptation to the new environment or in exhaustion associated with behavioral, immune and cardiovascular disorders. We investigated the effect of chronic social stress on metabolism and cardiovascular functions in normotensive WKY and spontaneously hypertensive (SHR) rats. Adult males were exposed to 8-

week crowding (5 rats/cage, 200 cm<sup>2</sup>/rat) mimicking the restriction of life space in crowded cities. Controls were kept 4 rats/cage (480 cm<sup>2</sup>/rat). Such crowding significantly elevated BP only in SHR. pCort was significantly elevated in crowded rats and blood glucose reduced similarly in both phenotypes. Crowding increased activation of extracellular-signal regulated protein kinases in the heart of both WKY and SHR. Crowding reduced NO production in the heart and aorta of SHR and reduced acetylcholine-induced vasorelaxation of the femoral artery while elevating NO production in the aorta of WKY, without changes in the heart, and improved vasorelaxation of the femoral artery. In conclusion, chronic crowding stress evoked similar metabolic changes in both phenotypes while cardiovascular system was affected differently.

*Supported by APVV-51-018004 and VEGA 2/7064/28.*

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#### **COGNITIVE PROFILE IN CHILDREN WITH ASPERGER SYNDROME - DIAGNOSTIC VALUE**

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The authors present partial results of global research – “Autism: challenge for integrative medicine”. The aim of the research was to describe qualities of cognitive style in children with Asperger syndrome (AS), particularly the way of thinking and its influence on personality and social functioning. The focus was given on IQ values, because increased IQ levels are supposed to be the direct indicator of above-average mental performance more than hypertrophy of islets of cognitive abilities. Presence of islets of abilities such as hypermnesia, fragmentation and perception hyperselectivity, hyperprosexion are more likely to be the indicators of High Functioning Autism (HFA). These aspects are very important to consider in the process of differential diagnostics between AS and HFA population. IQ level and general intelligence together with generalized and executive abilities are predictors of integration of AS population into the society. Current study includes 51 participants from the entire Slovakia. Inclusive criteria were the diagnosis of AS and the developmental level allowing cognitive testing. Psychological methods used: WISC, WAIS, IST, Test SQ, EQ (form revised for children), Edinburgh questionnaire of laterality, Test of intuitive physics,



anamnestic data. Psychological aspects of this research involving measurements of empathizing and systemizing are directly connected to the neurohormonal and genetic examinations. Results achieved in this interdisciplinary research are valuable in further biological, psychological and social approaches in neurocognitive research and diagnostics of children with AS.

*Supported by: 2006/22-UK-01, AV 4/0038/07, VEGA 1/3420/06.*

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### BETA 2-BAND SYNCHRONIZATION DURING A VISUAL ODDBALL TASK

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The study investigated whether specific changes in phase synchrony in the beta 2 frequency band of EEG (25-35 Hz) occurred during a recognition task. The level of synchrony was examined between one hundred and eighty loci in the frontal and temporal lobes of eight epileptic patients with intracerebral electrodes; the EEG records were obtained during a visual oddball task. In each pair of records, the correlation curves were created from the sequence of correlation coefficients calculated. These curves consisted of irregular oscillations between the maximal and minimal r-values. Transient highly synchronized activity was observed during the whole time course of the experiment in all record pairs investigated and a significant relationship was found between the number of such episodes and the mean correlation coefficient (Spearman R 0.84; N 3240; p<0.001). On averaged curves, which were calculated using stimulus onsets as the trigger of averaging, a significant increase of the mean correlation coefficient in the post-stimulus epoch was found (p <0.01 after both target and non-target stimuli; t-test for dependent samples). As the cognitive demand significantly increases after stimulus presentation, the results are considered to be the first evidence from intracranial recording of increased synchronization in the beta 2 frequency band related to the cognitive activity.

### HEALTH STATUS TREND OF TEACHERS AND BEHAVIORAL RISK FACTORS

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Objective: Relatively high load of teaching profession is connected with health, psychical, physical and emotional disorders. The aim of this study was to evaluate the health status indicators, professional load and behavioral factors in the comparable sample of basic school teachers after 15 years. Material and methods: The data of health status on the basis of working disability, physician visit with health problems and hospitalization, psychical strain expressed in the negative subjective feelings (Cornel Index 3+ questionnaire) and behavioral risk factors was analyzed in representative samples of 154 teachers from 5 primary schools of Slovakia in the year 1988 and 2003. Results: The results have shown more behavioral risk factors in teacher, which have increasing tendency in alcohol drinking (10.4% of teacher in 1988 vs. 11.3% teachers in 2003), smoking (16.9% vs. 26.6%), low physical activities (27.3% vs. 61%). Increasing of smoking and alcohol consumption revealed in younger teachers. Working disability and morbidity of teachers significantly increased also in younger teachers. In 2003 the teachers presented higher level of anxiety, psychosomatic symptoms and dread reactions. Conclusions: Results confirmed significant relationships between teaching praxis and subjective strain as well as between behavioral risk factors and health disorders. Teaching skills, coping with every day school stress and lower social pressure have shown as the most important factors for health protection of teachers.

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### QUALITY OF SUBJECTIVE PERCEPTION IN GLAUCOMA PATIENTS WITH DIFFERENT LEVEL OF PHYSICAL ACTIVITY

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Aim of the study was to assess the usual psychological state components in glaucoma patients with different level of physical activity. The study group consisted of 19 glaucoma patients – women, mean age 51.4 years. Eleven of them (the exercise group) were in the years 2004 – 2008 enrolled in the 3-month aerobic exercise program 2 times in a year. Eight patients – women, matched in age without any organized physical activity serve as control. The questionnaire method was used in evaluating the psychological state. The Subjective Perception Scale – SUPOS 7 enabled find out the commonly perceived usual feelings and states. The results showed that the values of activity block were significantly higher in exercise group. Values in both groups were higher than 35% (as in non – clinical population). The significant differences between the exercise and control group were found mainly in value A (activity). The values of so called disintegration block were higher (not significantly) in control group. We can conclude, that the glaucoma patients with higher physical activity are more active, more positively oriented and the group with low physical activity showed more impulsivity, explosiveness, irritability, aggressivity and pessimism.

*The study was supported by VEGA grant 1/4508/07.*

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#### THE ROLE OF DEEP LAYERS OF SUPERIOR COLLICULUS IN EMOTIONAL BEHAVIOR

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The intermediate and deep layers of superior colliculus (DLSC) represent a major basal ganglia output, via the nigroreticular GABA pathway. In rodents, DLSC mediates postural and motor functions, but also orienting and defensive responses. In nonhuman primates, we demonstrated the role of the DLSC in movement and posture, but DLSC-evoked defensive and emotional responses have not been documented. Here, we investigated the role of DLSC in emotional behavior in 6 pigtail macaques. Intracerebral infusions of either the GABAA antagonist, bicuculline (BIC, 5-14 nmol) or the GABAA agonist, muscimol (MUS, 9 nmol) were placed in DLSC using removable cannula. Disinhibition of DLSC by BIC (10-14 nmol) elicited defensive behaviors,

including cowering, escape, attack of inanimate objects, and exaggerated startle. The onset of these effects was less than 10 min and they lasted for up to 1 h. Lower doses (2-5 nmol) induced similar effects, but milder and shorter lasting. Aggressive behaviors appeared as part of a heightened fear-response to various stimuli. The hypervigilant, highly defensive emotional state was not sensitive to benzodiazepine anxiolytics administered systemically. MUS infusions produced no observable changes in behavior. These results demonstrate that in the nonhuman primate, the dorsal midbrain zone containing DLSC regulates defensive behavior as has been documented in the rodent, and this area may serve to set the threshold for reactivity to potentially threatening stimuli. DLSC may also provide a critical source of pathological overactivation of the amygdala in post-traumatic stress disorder.

*Supported by HD42269, NS20576, and NS61623.*

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#### PREVENTION OF NEURODEGENERATION CAUSED BY OXIDATIVE STRESS

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Many lines of evidence suggest that mitochondria have a central role in ageing-related neurodegenerative diseases. Mitochondria are critical regulators of cell death, a key feature of neurodegeneration. Mutations in mitochondrial DNA and oxidative stress both contribute to ageing, which is the greatest risk factor for neurodegenerative diseases. In all major examples of these diseases there is strong evidence that mitochondrial dysfunction occurs early and acts causally in disease pathogenesis. The accumulation of free radicals (oxidative Stress) can trigger inflammatory and autoimmune reaction in CNS. Moreover, an impressive number of disease-specific proteins interact with mitochondria or can be used under clinical conditions as a laboratory marker to control successful treatment. Thus, therapies targeting basic mitochondrial processes, such as energy metabolism or free-radical generation, or specific interactions of disease-related proteins, hold great promise. We studied this clinical approach in Multiple Sclerosis (MS). MS is a demyelinating disease of the central nervous system (CNS) and its pathology is characterized by an

inflammatory perivascular mononuclear cell infiltration preceding myelin loss. The cause of MS is yet unknown, but it has been postulated that the myelin damage is immune-mediated, either secondary to a viral infection or due a autoimmune process. There is definite in vitro evidence of an absolute difference in the activation state of myelin-reactive T-cells in the central nervous system of patients with MS in contrast to healthy patients. It has been resumed therefore, that autoreactive T cells have a pathogenic role in this disease. Such autoreactive T cells were characterized as Myelin basic protein (MBP) and Myelin oligodendrocyte glycoprotein (MOG) under clinical conditions. We used such autoreactive T cells as biomarkers in Lymphocyte transformation test (LTT) to study the effect of Choline citrate (1200mg/2x week i.v) in our diagnosed MS patients with myelin degeneration. Choline citrate has been described as a substance to increase ATP in mitochondria and perfusion in CNS and regulating lymphocyte activity. Accordingly, our study was focused on the myelin chemistry and the regulation of inflammation in CNS by Choline citrate. Our 21 patients with positive MOG or MBP stimulation indices (SI) showed a significant decrease in LTT after i.v. treatment with a total dosage of 28,8g Choline over a period of 3 months (twice weekly; over 12 weeks). According to the outcome of our study we resume that phospholipids or substances increasing the phospholipase biosynthesis such as Choline citrate (precursor of phosphotidylcholin; =lecithin) may be effective in the prevention or treatment of certain degenerative disease in CNS. In continuation of our study we validated Citrullin in urine samples as a sensitive marker of mitochondrial induced oxidative stress in our patients. As a result of our studies we suggest, that patients with an increased extinction of Citrullin in urine samples indicating mitochondria impairment, should be kept under close clinical control for neurodegeneration. Such patients may benefit from i.v. Choline citrate applications. In case of intolerance other lipophilic antioxidants may be effective in the regulation of mitochondria oxidative phosphorylation. The effectiveness of this clinical approach needs to be proved in further studies.

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#### **EEG INVESTIGATION OF FIGURAL CREATIVE THINKING COMPONENTS**

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The aim of study was to reveal EEG correlates of creative thinking components - fluency, flexibility and originality (Guilford, 1950; Torrance, 1974) - during performance of figural Torrance test (1974). 21 healthy subjects took part in our EEG study. In FLUENCY task volunteers were to draw as many pictures as possible. In FLEXIBILITY task volunteers were to draw pictures from different classes (animals, flowers, equipment). In ORIGINALITY task volunteers were to draw any original, creative pictures. In CONTROL task volunteers were to draw anything without any system. EEG was recorded from 19 scalp electrodes (10-20). Then we calculated spectral power in 1 (13-18Hz), 2 (18.5-30Hz), (30.5–40Hz) bands, used ANOVA for analyzing Band State Zone interaction and obtained significant EEG power difference ( $p < 0.05$ ) with Greenhouse-Geisser correction. In comparisons: all tasks versus CONTROL one, we observed general increase of EEG power in 2 and bands and increase of EEG power in central and parietal regions for 1 band. In comparison ORIGINALITY vs. FLUENCY tasks we observed increase of EEG power in 2 and bands mostly in right temporal and parietal regions. In comparison ORIGINALITY vs. FLEXIBILITY tasks we observed increase of EEG power in 1, 2 and bands in left and right temporal regions. In FLEXIBILITY vs. FLUENCY comparison we observed decrease in 1 and 2 bands in left fronto-temporal region and increase of EEG power in 2 and bands (similar by topography to differences obtained for ORIGINALITY vs. FLUENCY comparison).

*NSh1131.2008.4*

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#### **THE ROLE OF TESTOSTERONE AND ITS METABOLITES IN AUTISM**

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The reported estimates of the prevalence of autism spectrum disorders (ADS) have increased markedly over the past decade. The underlying neurobiology of autism still remains unknown. Our research project aims to study the etiologic factors related to ADS and particularly the role of testosterone in the development of cognitive style in autistic patients and their specific cognitive abilities and personal characteristics. In our previous studies we have

found differences in salivary testosterone levels between general population of prepubertal children and their academically gifted peers. The higher incidence of intellectual giftedness and also of autism in boys supports the theory that testosterone plays significant role in the etiology of both. The Baron-Cohen theory (2005) of hypermasculine brain in autism might explain the consequences of increased prenatal testosterone on cognition and personal characteristics of autistic patients. Testosterone influences brain tissues also via its metabolite estradiol acting on the expressed receptors within the brain. The genetic polymorphisms of androgen and estrogen receptors were studied in ADS patients and compared to general healthy population. Testosterone is supposed to be related to reelin metabolism and to mercury metabolism, both of which are also central to our research study. The comparison of salivary testosterone levels proved lower testosterone in patients with Asperger syndrome compared to controls with the consequences on cognitive style and personal characteristics.

*Project is supported by grants: 2006/22-UK-01, AV 4/0038/07, VEGA 1/3420/06.*

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#### THE GROWTH OF WHITE MATTER IN THE ADOLESCENT BRAIN: ROLE OF TESTOSTERONE AND ANDROGEN RECEPTOR

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The growth of white matter during human adolescence shows a striking sexual dimorphism; it is present in boys but not girls. Here we provide evidence supporting the role of androgen receptor (AR) in mediating the effect of testosterone on white matter. In a large sample of typically developing adolescents (n=408, 204 males), we used magnetic resonance imaging and acquired T1-weighted and magnetization-transfer ratio (MTR) images. We also measured plasma levels of testosterone and genotyped a functional polymorphism in the AR gene, namely the number of CAG repeats in Exon 1 believed to be inversely proportional to the AR transcriptional activity. We found that the testosterone-related increase of white-matter volume was stronger in male adolescents with the lower vs. higher number of CAG repeats in the AR gene. The MTR results suggest that this growth is not related to myelination; the MTR decreased with age in male

adolescents. We speculate that testosterone affects axonal calibre rather than the thickness of the myelin sheath.

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#### DOES A COMMON LANGUAGE FOR NEUROSCIENCE AND CLINICAL PSYCHIATRY EXIST?

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Achievements in neuroscience during the last couple of decades are extraordinary. After initial fascination by new techniques of brain imaging we are now confronted with many results of imaging of various psychological states. We know which brain regions are activated e.g. in being in love or during cheating. Novel discoveries in other areas such as neuroplasticity, social neuroscience, quantitative EEG are stimulating as well. Considerable advance has been made in identification of genetic contribution to some diseases (e.g. Huntington disease or Rett syndrome) but we have no clear idea about the role of genetic factors in major mental disorders such as depression, schizophrenia or anxiety disorders. Known epigenetic mechanisms can influence almost every trait and genetics as the concept of transmission of information across generations is weakened in its power to answer the question about the etiology of complex diseases. In contrast with these achievements, diagnosis in psychiatry is still based only on symptoms. Current diagnostic systems are purposely non-theoretical and do not reflect the etiology. It is said that with such an approach to classification validity has been sacrificed for higher reliability. In discussions about new classification systems (DSM-V and ICD-11) involvement of validating criteria of outcome, laboratory tests, genetics and other measures are considered. Neuroscience could help in this process. Unfortunately, it seems that up to now the great developments in neuroscience have not brought significant benefits neither for psychiatrists in clinical practice nor for their patients. The notable exception is better understanding of mechanisms of action of psychopharmacological drugs.

## ACTIVATING EFFECT OF PROVINOLSTM ON BRAIN NITRIC OXIDE SYNTHASE IS TIME DEPENDENT

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Red wine polyphenols have been reported to possess beneficial properties in cardiovascular and neurodegenerative diseases. The better performance in visual spatial task after activation of NO production by red wine polyphenols (Provinols™) was hypothesized (1). The aim of this study was to analyze a time course of Provinols™ effects on brain NO synthase activity and oxidative damage in L-NAME-induced hypertension. Male Wistar rats, 12 weeks old, were divided into six groups: control groups, groups treated with N(G)-nitro-L-arginine methyl ester (L-NAME, 40 mg/kg/day) for 4 or 7 weeks and groups receiving Provinols™ (40 mg/kg/day) plus L-NAME for 4 or 7 weeks. At the end of the treatment, marker of membrane oxidative damage - conjugated dienes (CD) in the brain and NO synthase activity in the cerebral cortex, cerebellum and brainstem were determined. L-NAME treatment for 4 or 7 weeks led to the increase in blood pressure, elevation of CD concentration and decrease of NO synthase activity in the brain parts investigated. Provinols™ partially prevented blood pressure rise and elevation of CD concentration. Comparing to the L-NAME treated group, Provinols™ increased NO synthase activity after 4 weeks of treatment. However, the prolonged Provinols™ treatment for 7 weeks had no effect on NO synthase activity decreased by L-NAME treatment. In conclusion, Provinols™ partially prevents L-NAME induced hypertension via the different mechanisms depending on the duration of treatment. Prevention of oxidative damage in the brain with modulating effect on NO synthase activity is suggested.

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*Supported: VEGA 2/6148/26, APVV-0586-06, APVV-0538-07.*

## NEUROPROTECTIVE EFFECT OF QUERCETIN ENCAPSULATED LIPOSOMES, A NOVEL THERAPEUTIC STRATEGY AGAINST ALZHEIMER'S DISEASE

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Free radicals have been recognized to be one important factor contributing a crucial role on the pathophysiology of Alzheimer's disease, the most important neurodegenerative disease nowadays. Based on the potent antioxidant effect of quercetin and the burden of blood brain barrier, the neuroprotective effect of quercetin liposomes via nasal administration against Alzheimer's disease has been considered. In the current study, we evaluated the effect of nasal administration of quercetin liposomes on neurodegeneration and its possible mechanism in animal model of Alzheimer's disease. In this case, Male Wistar rats were pretreated with quercetin liposomes, containing 0.5 mg of quercetin in 20 µl (dose .06 mg/kg BW) via intranasal route once daily continually for 2 weeks before and 1 week after AF64A administration. After the quercetin liposomes treatment, the density of neurons and cholinergic neurons in hippocampus were assessed using histochemical and immunohistochemical techniques whereas the activities of superoxide dismutase (SOD), catalase (CAT), glutathione peroxidase (GPx) and lipid peroxidation (MDA) were determined using biochemical assays. The results indicated that quercetin liposomes could attenuate the degeneration of neurons and cholinergic neurons in hippocampus partly via the increase activities of scavenger enzymes while decreased the lipid peroxidation. Therefore, our studies suggested that this approach might be applicable as novel therapeutic strategy against Alzheimer's disease. However, further researches are still essential.

### EVENT RELATED OSCILLATIONS RELATED TO AUDITORY DISCRIMINATION TASK PERFORMANCE IN PARKINSONIAN PATIENTS AND HEALTHY PERSONS

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Introduction: Event related potentials (ERPs) could be considered as originated from the reorganization of the spontaneous EEG rhythms and superpositions of evoked oscillations after the stimulus. The aim of our research was to investigate the brain event related oscillations (BERO) related to auditory sensorimotor task performance and information processing at central brain level in PP and HP. Method: EEG from Fz, Cz, Pz, C3' and C4', the reaction time parameters were recorded in Parkinsonian patients (PPs) and healthy persons (HPs) by Nihon Kohden apparatus simultaneously in sensorimotor task conditions – answering to high (1000 Hz) and low (800 Hz) tones with left and right hand respectively. Results: The investigation of the BERO of 0 – 600 ms period after the tones showed lower amplitude power spectrum in PP, lower amplitude alpha (7.1-13), delta (1-4), and gamma (32-50) activity and higher amplitude beta (13.1-32) activity. Theta (4.1-7 ) was predominantly higher in patients but lower in this group for C3' (high and low tone) and Pz (low tone). More expressed fronto – central theta desynchronization during the period 250 – 600 ms after the high tone and at alpha and theta desynchronization after two tones at Fz were found in PPs. Conclusions: The obtained data showed event related oscillatory differences to auditory discrimination task performance and different task relevant frontal alpha and theta dynamic between PP and HP .

*The study was supported by National Fund – project L-1413.*

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### METHAMPHETAMINE AND ANXIETY

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Psychostimulants change behavior of individual. Particularly, they induce aggressive behavior and impair social interaction. Experimental data are ambiguous. The increase in aggressive behavior or increase/decrease of social interactions has been observed. We have proven that methamphetamine (MA) at the low doses decreases time of social interaction in the social interaction test. In general, this considered to be a demonstration of an anxiogenic effect. The aim of this study was to confirm this finding in the further test of anxiety – elevated plus maze (EPM). In the current work, in addition to classical parameters for estimation of anxiety we observed stretched attend posture (SAP) in EPM test. SAP is a modern anxiety sensitive parameter, which described as attempt at entry into open arms followed by avoidance response (the rat stretches forward and retracts to origin position). Although, we have establish that social interaction decreases gradually at MA 0.5, 1.0, 1.5 mg/kg dosages, in the test EPM we did not find any significant differences between those doses. From the results we can conclude that MA single injection at the low dosages affects social interaction but it has neither anxiogenic nor anxiolytic effect in EPM test.

*Supported by: MSM 0021620816 and 1M0517 MŠMT ČR*

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### LEVELS OF TESTOSTERONE AND GENETIC FACTORS PARTICIPATING IN TESTOSTERONE METABOLISM IN AUTISTIC PATIENTS, PATIENTS WITH ASPERGER SYNDROME AND INTELLECTUALLY GIFTED CHILDREN

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Introduction: Autism is diagnosed when a child has abnormalities in: social development, communication, and repetitive behaviors. This can be explained by an impaired capacity of empathy and increased capacity for systemizing. The higher testosterone levels in prenatal development lead to formation of hypermasculine autistic brain. This can explain better results in systemizing. Aim: The aim of the study was to observe free saliva testosterone levels in autistic, gifted, Asperger and control children. We also investigate genetic factors that are

involved in regulation of testosterone production. Androgen receptor polymorphism could indicate its sensitivity to testosterone. Decreased number of (CAG)<sub>n</sub> repeats in androgen receptor is associated with stronger androgen effect. We suppose that the effect of testosterone could be influenced also by other types of polymorphisms in genes, whose products participate on steroid hormone metabolism, e.g.: aromatase gene, -reductase gene and estrogen receptor gene 5. Methods: DNA samples were isolated from buccal cells and amplified by PCR. (CAG)<sub>n</sub> polymorphism in androgen receptor was evaluated by fragment analysis with fluorescently labeled primer. Testosterone levels were measured using ELISA test. Results: We have found lower testosterone levels in gifted children in comparison with children from general population and non-significant differences in testosterone levels between Asperger or autistic children and general population. The differences between evaluated groups of children in the number of CAG repeats were non significant.

*Project is supported by grants: 2006/22-UK-01, AV 4/0038/07, VEGA 1/3420/06.*

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#### **SOCIAL STRESS IMPACT ON BLOOD PRESSURE, VASCULAR FUNCTION, FOOD AND WATER INTAKE IN WISTAR-KYOTO RATS**

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This study investigated the effect of chronic social stress produced by crowding on blood pressure (BP), body weight (BW) gain, vascular function, food and water intake in rats and their ability to cope with chronic stress. Adult, male Wistar-Kyoto (WKY) rats were divided into control (480 cm<sup>2</sup>/rat) or stressed (200 cm<sup>2</sup>/rat) group for 8 weeks. BP (determined by tail-cuff) was not influenced by chronic stress. Body weight gain, food and water intake were reduced in stressed rats. Rings of the isolated branches of the superior mesenteric arteries (MA) were mounted to the myograph for measurement of vascular reactivity. Endothelium-dependent relaxation was evaluated as the response of precontracted MA to acetylcholine. Vasoconstriction was investigated using noradrenaline (NA). Chronic stress increased average value of vasorelaxation of the MA compared to controls.

Vasoconstriction to NA was reduced in stressed rats. The observations showed that stress-exposed WKY rats were able to cope with chronic stress by improvement of vasorelaxation. Increased production of endothelium-derived relaxing factors in the vascular system of rats may attenuate the vasoconstrictor effects of stress mediators and this compensatory mechanism may protect WKY rats from the development of stress-induced hypertension. However, data also showed disordered drinking and eating in stressed rats which may have severe clinical impact in human situation.

*This study was supported by the grants No. APVT-51-018004 and VEGA 2/7064/27.*

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#### **EYE MOVEMENT DESENSITIZATION AND REPROCESSING (EMDR): NEUROBIOLOGY OF AN EFFECTIVE TREATMENT FOR POSTTRAUMATIC STRESS**

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The empirical research shows that psychotherapy is more effective than pharmacotherapy in the treatment of posttraumatic stress disorder. Metaanalytical studies evaluating treatment effects of different psychotherapeutic approaches rate two treatments as most effective: cognitive behavioral therapy and eye movement desensitization and reprocessing (EMDR), with EMDR being more efficient (requiring less time). EMDR is an integrative psychotherapeutic approach using cognitive, behavioral, psychodynamic elements combined with exposure to eye movements or other forms of alternating bilateral stimulation. Alternating bilateral stimulation (ABS) is supposed to stimulate information processing within the central nervous system. The mechanism of action (of ABS) remains unexplained, although several hypotheses have been suggested. They point out similarities of EMDR process to REM sleep, orienting response, role of interhemispheric connectivity etc. The clinical experience suggests that the therapeutic setting that is in radical contrast to traumatic situation, the therapy beginning with developing experience of safety, trust and the therapist explicitly expressing respect of client's autonomy, might be an important psychotherapeutic factor. Psychotherapeutic resolution of psychotrauma results into subjective state of feeling calm and safe, the shift to trophotropic regulation of organism can be assumed and

the traumatic experience becomes a history causing no more emotional disturbance to the client. This presentation offers short overview of EMDR methodology and research. It's illustrated by a case study of successful EMDR treatment of PTSD.

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## EEG OSCILLATORY ACTIVITY DURING MENTAL ROTATION

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**Introduction:** It is now a prevailing view that cognitive processes arise from synchronous activity of large distributed neuronal assemblies. In numerous studies synchronization of activity at different frequencies, time and spatial scales has been related to specific aspects of cognitive functioning. We investigated oscillatory EEG activity during mental rotation, a visuo-spatial task widely used to assess spatial cognition. In particular, we searched for relationship between cortical event-related EEG dynamics and task performance. **Methods:** Alphanumeric characters were displayed in regular or mirror-reversed form, rotated by 0, 60 and 120 deg. In a speeded two-alternative forced choice task, 14 healthy volunteers indicated the form of the presented symbols. EEG signals were time-frequency analyzed with respect to two separate events, stimulus onset and response time. **Results:** In comparison to baseline condition (0 deg), reduction of induced alpha/beta activity was registered in the late phase of mental rotation (600–200 ms before the response). Amplitude of induced alpha/beta oscillations was inversely related to task performance, i.e. smaller reduction of alpha/beta activity was associated with shorter response time. This association was observed earlier (600–400 ms before the response) in parietal channels and later (400–200 ms before the response) in temporal and frontal channels. **Conclusions:** The results indicate that performance in mental rotation is determined by a sequence of cognitive operations and processing stages rather than a single isolated process.

*Supported by VEGA 2/0160/08, APVV-0538-07.*

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## GENDER DIFFERENCES IN NOCICEPTION AND INTERPRETATION OF PAIN

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From the epidemiological studies it is evident that some diseases have important prevalence in women. Well known is the prevalence of depression (9.1% in women, 5% in men). Also the chronic painful disease like fibromyalgia, arthritis, rheumatism, spines problems and migraines occurs more frequently in women than in men. There are many experimental proofs of these epidemiological findings. The cold is more aversive stimulus than heat in females; in males the heat stimulus is found more aversive. Males are more sensitive to morphine and other opioids than females. Gender differences in reaction to opioids consist in decreased sensitivity to  $\mu$  opioids in females but increased sensitivity to  $\delta$  opioids. There exist genes and complexes of neuromodulators which identify sexual dimorphism: neuregulin-1 and its high-affinity receptor RB4, tachykinine-1 and metabotropic glutamate receptor 6. Endothelin-1 evokes mechanical allodynia and its production is sexually dependent with the highest level observed in young females. The men and the women have different perception and interpretation of pain. There are several backgrounds for this difference like physical factors (body size, skin thickness, surface skin temperature, sweating etc.), physiological, genetical and pharmacological factors (different neuronal organization, density of opioid receptors, different metabolic rate, hormonal milieu etc.). Psychological, ethnical, racial and trans-cultural differences are also non negligible. We can not simply conclude which factors are the most important. During the treatment of pain syndromes we have to consider these differences and use those for deepen our targeting of pain therapy.

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## EVOKED AND INDUCED EEG RESPONSES IN A VISUAL ODDBALL TASK (SEEG STUDY)

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Objectives: To study the presence of evoked (event-related potentials) and induced EEG responses (event-related desynchronization and synchronization) in various brain structures during discrimination task. Methods: EEG was recorded from 187 cerebral sites in 6 patients suffering from intractable epilepsy during visual oddball task. Patients were instructed to respond to the target stimulus by pressing the microswitch button. Separately for target and frequent stimuli, artefact-free trials were averaged to obtain (1) event-related potentials (ERPs) and (2) event-related desynchronization (ERD) and synchronization (ERS) in reactive frequency bands. Results: After the target stimuli, the task-specific responses were observed in all 187 investigated sites (in the amygdala, hippocampus, parahippocampal gyrus, lateral temporal cortices, cingulate gyrus, medial, basal and lateral frontal cortices). ERPs were found in 175 sites, ERD and/or ERS in 162 sites. ERPs were accompanied by ERD in 82 cases, ERS in 31 cases and ERD+ERS in 49 cases. After the frequent stimuli, the task-specific responses were observed in 143 sites. ERPs were identified in 98 sites, ERD and/or ERS in 96 sites. ERPs were accompanied by ERD in 21 cases, ERS in 17 cases and ERD+ERS in 13 cases. Conclusion: This study demonstrated that in a great majority of investigated sites (87% in the case of target trials) the evoked responses were accompanied by induced task-specific changes of EEG amplitude. More frequent incidence of evoked and induced EEG responses after the target stimuli probably reflects a greater demand on cognitive functions in target trials.

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#### CHANGES IN THE FEEDBACK-RELATED NEGATIVITY WITH LEARNING

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The aim of this study was to investigate the effect of learning on error processing. ERPs (event-related potentials) were measured whilst subjects performed a gambling task which allowed to maximise gains by learning a sequence of correct responses. However, losses were unavoidable even when all the responses were correct. A learning curve was fitted to the subjects' percent correct responses for those subjects who eventually worked

out the sequence. Three phases were defined on the basis of the fitted values: before, during, and after learning. We then investigated differences in potential amplitudes before and after subjects gained knowledge of the correct response sequence. Potential amplitudes in the interval of the feedback-related negativity (FRN) varied with learning. Losses elicited more negative-going amplitudes than gains in the interval of 250-350ms after feedback presentation at electrode FCz, but only before learning. After learning, the amplitudes to gains and losses were no longer significantly different. The results support the view that the FRN is a response to the motivational impact of negative feedback which favours reward-based learning.

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#### EEG DIFFERENCES BETWEEN ERROR DETECTION AND ATTENTION INTENSIFICATION STATES

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Error detection is one of the basic brain mechanisms, that was opened, determined and described in 1968 (Bechtereva and Grechin, 1968) and re-opened in ninetieth (see Ullsperger, 2004) without naming the priority of the first description. Nowadays it is the one of the wide studied phenomenon (Dahaene et al.,1994; Mathalon et al., 2003; Kerns et al.,2004 e.t.c), that also is still under our interest (Bechtereva et al., 2005). At the present stage of our studies, we investigate error detection in different conditions and in comparison with other basic brain processes. Error detection phenomenon is connected with forming of stable stereotypes in long-term memory in comparison with which information could be evaluated as correct or noncorrect (erroneous). It seems for us, that it is not the same for attention states, when memory gestalts could be situational, rather short and information is not evaluated from the point of erroneous. In EEG study with 36 right-handed subjects (18-34 years), that fulfilled psychological tasks with error detection and attention conditions, we obtained significant (3-way ANOVA: BANDxSTATExZONE with Greenhouse-Geisser correction  $p < 0,05$ ) difference in EEG spectral power in Beta2 and Gamma frequency bands for conditions of error detection versus attention.

*N.Sh.-1131.2008.4; RFBR-06-04-48797-*

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## EEG CORRELATES OF THE MEMORY-GUIDED SACCADES IN HUMAN

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We used memory-guided saccades for the investigation of participation of attention and memory in the visual perception and in the saccadic programming. In 10 healthy subjects were studied saccadic latencies of the visually- and memory-guided horizontal saccades at the 10 deg. and averaged presaccadic EEG-potentials. Increasing of memory-guided saccades latency on 55.6 ms was shown ( $p < 0.005$ ). The smaller values of latencies peaks and amplitudes of sensory potentials before memory-guided saccades was revealed at direct EEG averaging from a signal to saccade beginning ( $p < 0.001$ ). N1 potential before memory-guided prevailed in 55-65% of cases in the left hemisphere and in saggital areas. The foci of 1 potential prevailed in the contralateral hemisphere ( $p < 0.05$ ). The results can reflect spatial processing of stimulus, extraction of stimulus parameters from working memory and attention. The reduction of peaks latencies of initiation potentials (N-1 and P-1) in the latent period of memory-guided saccades was observed at backward EEG averaging from saccade beginning ( $p < 0.001$ ). The foci of potential N-1 prevailed in contralateral areas. In case of visually-guided saccades it was parietal-occipital and in case of memory-guided saccades it was frontal and frontal-saggital areas. Before memory-guided saccades P-1 potential foci were localized in parietal-saggital areas (65% cases). It can reflect extraction of the information from working memory.

*The work is executed at support of the RFBR (the project 08-04-00308-)*

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## INVESTIGATING THE ASSOCIATION AMONG COMMUNITY NOISE EXPOSURE AND CARDIOVASCULAR RISK SCORES

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Background: In our study we are investigating the effect of community noise exposure on a group of young healthy individuals in the urban environment. Objective: Objectives of the present study were to evaluate the influence of environmental noise on community and the impact on cardiovascular risk score. Methods: The study sample ( $n=661$ ; 36.9% males, 63.1% females, university students, mean age  $22.3 \pm 2.2$  years) included the exposed group to road traffic noise ( $n=280$ ,  $LA_{eq,24h} = 67 \pm 2$ dB) and the control group ( $n=379$ ,  $LA_{eq,24h} = 58.7 \pm 6$ dB). Equivalent noise levels were assessed. Subjective response was evaluated by a validated noise annoyance questionnaire. Ten year cardiovascular risk was quantified - SCORE60, Framingham scoring (Framingham risk score and the score after projection to the age of 60) and Relative risk chart. Bivariate and multivariate analyses were carried out to assess and to quantify the association among the road traffic noise exposure and ten year cardiovascular risk scores. Results: Cardiovascular risk score was significantly higher in the exposed group for Framingham score after projection to the age of 60, SCORE60 and Relative risk chart. Results remained significant for SCORE60 ( $OR_{adj} = 3.03$  (95% CI = 1.35-6.79) and Relative risk chart ( $OR_{adj} = 3.12$  (1.6-6.07), as dependent variables, even after adjustment for other important covariates (e.g. gender, psychogenic stress, various community noise annoyance sources). Conclusion: The results proved the need of preventive measures to reduce road traffic noise in the exposed area.

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## VERBAL AND NONVERBAL DICHOTIC LISTENING PERFORMANCE IN DEVELOPMENTAL DYSLEXIA

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The present study focused on lateral asymmetry in auditory perception in developmental dyslexia. Two verbal dichotic listening tasks (nonsense consonant-vowel syllables and monosyllabic consonant-vowel-consonant

words) and two nonverbal dichotic listening tasks (environmental sounds and two-tone sequences) were administered to groups of 25 dyslexic and 25 control right-handed boys, aged 10-15 years. The results revealed a lower total accuracy of recall and a lower left ear advantage for two-tone sequences in the dyslexic group. For nonsense syllables a right ear advantage was found in both groups. For monosyllabic words, no ear advantage was found in either group, but the total accuracy of recall was lower in dyslexics. In contrast, the total accuracy of recall of environmental sounds was higher in the dyslexic group. There was a strong positive relationship between lateralization for syllables and words and a significant negative correlation between lateralization for two-tone sequences and monosyllabic words in the control group. No such relationship was found in the dyslexic group. The results suggest a specific effect of developmental dyslexia on the lateralization of phonological and semantic auditory processing.

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#### EEG STUDY OF CREATIVITY PARAMETERS (FLUENCY, FLEXIBILITY, ORIGINALITY)

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Distinguished are 3 psychological parameters of creativity: fluency, flexibility and originality (Guilford, 1971). Most of psychophysiological studies of creativity were performed using the creativity tasks with no separation of these parameters (Martindale, 1975; Petsche, 1996; Molle, 1999; Carlsson, 2000; Razoumnikova, 2000; Bechtereva et al., 2000, 2004; Howard-Jones, 2005). In order to investigate separate creativity parameters three types of original tasks were developed. The Fluency task was to create as much as possible interrelated sentences using appearing words from one semantic area. The Flexibility task was to create interrelated sentences using appearing words from different semantic areas. The Originality task was to create interrelated sentences in unusual way using appearing words from one semantic area. Fifteen healthy volunteers underwent computer EEG registration while being tested. EEG was recorded from 19 sites (10-20 system). Mean values of EEG power and coherence for each subject in each state were calculated in frequency bands d (1,5-3,5Hz), q (4-7Hz), a1 (7,5-9,5Hz), a2 (10-12,5Hz), b1 (13-18Hz), b2 (18,5-30Hz) and g (30-40Hz). Greenhouse-Geisser correction was applied. Results indicate that fluency and flexibility are

characterized by general increasing of EEG power in gamma and beta bands, especially in frontal and temporal areas, while originality is characterized by decreasing in the same bands.

*Supported by grant NSh -1131.2008.4.*

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#### CORRELATION BETWEEN WHITE MATTER LESIONS PROGRESSION AND COGNITIVE DECLINE IN PATIENTS WITH ALZHEIMER'S DISEASE, MIXED DEMENTIA, VASCULAR DEMENTIA AND NORMAL ELDERLY PERSONS IN PROSPECTIVE STUDY

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Background: White matter lesions (WML) are common finding in normal elderly subjects but also in patients with dementia. There is still no sufficient agreement how does WML impact the cognition mainly in normal elderly subject and patients with Alzheimer's disease, though is accepted that progression of WML worsens the cognitive decline. Patients and Methods: 10 patients with Alzheimer's disease, 11 patients with mixed dementia, 10 patients with vascular dementia and 10 normal elderly persons were enrolled in our study. All 41 persons were examined with psychometric test battery (MMSE, ADAS-Cog.) and MRI of the brain was done in the start of the study and after two years. WML have been assessed through ARWMC rating scale (Wahlund et al., 2001). Results: MMSE decline in two years was 5,1 in the patients with Alzheimer's disease, 3,09 in patients with mixed dementia, 2,70 in patients with vascular dementia and 0,9 in normal elderly persons. Progression of ARWMC score was 1,0 in the patients with Alzheimer's disease, 2,27 in patients with mixed dementia, 3,2 in patients with vascular dementia and 0,6 in normal elderly persons. Conclusion: Our examination has shown that patients with Alzheimer's disease had faster progression of cognitive deficit than patients with mixed and vascular dementia. Moreover these patients had significant less amount of WML in MRI compared with other groups as well as the progression of WML was significant less in this group.

## LIMBIC IRRITABILITY, NEURONAL COMPLEXITY AND SMOKING

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Introduction: Recent findings indicate that child abuse and stressful life events are important co-factors in etiology of smoking. Stressful experiences may determine pathological changes in brain structures that play a role in mediating stress response. According to recent data stress and related sensitization may determine limbic irritability that is frequently linked to cognitive, memory and affective seizure-like symptoms, frequently occurring in temporal lobe epilepsy. Recently, a specific role of nonlinear dynamics and complexity in seizure-like processes has been reported and it suggests a hypothesis that smokers might display characteristic changes in the neural complexity because of more frequently experienced stressful life events and psychopathology. Methods: In the present study we have examined stress related psychopathology and limbic irritability in 31 smokers (mean age 23.4) and 41 nonsmokers (mean age 23.2). Description of neural complexity in both groups was performed using pointwise correlation dimension (PD2) calculated from electrodermal activity (EDA) that is influenced by limbic modulation. Results of psychometric measures show that smokers reported significantly more psychopathological symptoms and limbic irritability in comparison to nonsmokers. Results: Results of nonlinear and statistical analysis of EDA records indicated increased neural complexity in the resting state indexed by PD2 in smokers in comparison to nonsmokers. Conclusion: These results present first supporting evidence for the hypothesis that heightened limbic irritability and neuronal complexity may present an important factor in the etiology of smoking.

## DETECTION OF PHASE SYNCHRONIZATION APPLIED TO AUDIO-VISUAL STIMULATION EEG

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Phase synchronization is a type of cooperative behavior. In the case of experimental data contaminated by noise it can be difficult to distinguish phase synchronized regime from asynchronous one. Here we present a method that is able to quantify a degree of phase synchrony in EEG data. Instantaneous phases were derived from Wavelet transform method. Afterwards, phase differences from 2 EEG signals were constructed. Their distribution was assessed by index called mean phase coherence. In the next step surrogate data procedure tested a null hypothesis whether obtained phase relations are not only a result of chance.

In our previous studies we identified direct, transient as well as long-term changes under impact of audio-visual stimulation (AVS). Here we focused on mutual interconnectedness of different cortex locations under direct influence of AVS with stable stimulation at 4 and 17 Hz. In most of the cases synchronization during AVS increased in comparison to nonstimulation conditions. Significant increases occurred interhemispherically between P3O1 and P4O2 locations, and intrahemispherically between frontal and occipital positions.

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## KAEMPFERIA PARVIFLORA ATTENUATES STRESS INDUCED MEMORY DEFICIT AND NEURONAL LOSS IN AGED MALE RATS

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Stress, an unavoidable phenomenon, is reported to disturb the function of hippocampus which in turn induces

learning and memory impairment. The medicinal plants possessing antioxidant activity have been reported to improve neurodegeneration and memory impairment in many conditions. Thus, the neuroprotective and cognitive enhancing effects of *Kempferia parviflora*, a Thai medicinal plant reputed for longevity promotion and antioxidant effect, has been considered. Aging rats were orally administered the alcoholic extract of *K. parviflora* rhizome prior to stress exposure at a period of 21 days. The results showed that the plant extract at dose of 200 mg/kg BW for 14 days could increase spatial memory accompany with the increase neuron density in dentate gyrus and the increase in cholinergic neurons density of in both CA3 and dentate gyrus. Therefore, our results suggested that *K. parviflora* extract might be served as a potential candidate for neuroprotective and cognitive enhancing agent. However, further studies are still required.

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#### SIMILARITIES AND DISTINCTIONS IN STRUCTURE OF SPATIAL INTERACTION CORTEX BIOPOTENTIALS DURING VERBAL TESTS ON DIFFERENT LANGUAGE LEVELS

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In present investigation analysis of age peculiarities of system organization of neurophysiologic mechanisms, providing speech activity at language levels – phonemic, grammar and semantic was performed. Regional brain biopotentials interaction structure was investigated during the performing of three analytic speech tasks by adult and children – recognition of phoneme in the words, grammar and semantic mistake in auditory presented sentences. Results of the EEG crosscorrelation and coherent analysis in adults (n=18) showed that during all tasks marked intensification of hemispheric interaction was observed, particularly between temporal cortical areas. In children of 5-6 years (n=15) and of 8-9 years (n=17) during the grammar and semantic mistake recognition tasks intensification of hemispheric interaction was also observed, but lesser than in adults. Besides that in children there were more changes in hemispheric interactions – intensification (particularly in 8-9 years old children) and reducing (in 5-6 years old children, particularly in the left hemisphere). Thus, in both children groups'

neurophysiologic mechanisms provided grammatical and semantic language levels are insufficiently developed. In its turn in the phonemic analysis more similarity were revealed between children (5-6 and 8-9 years old) and adults, which reflected itself in a greater intensification of temporal cortical areas interactions. Thus our data shoed that all language levels- phonemic, grammar, semantic characterized by obligatory hemispheric interaction increase. Neurophysiologic mechanisms provided phonemic processes, develop earlier then grammar and semantic ones.

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#### LONG-TERM TREATMENT OF DEPRESSION: WHEN IS MONOTHERAPY USED?

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Monotherapy is preferred in the treatment of depression by most of treatment guidelines published all over the world. However in the clinical practice it is common that – preferably hospitalized patients – are treated with various combinations of psychotropic drugs.

We performed a retrospective analysis of patients treated because of Major Depressive Disorder in the years 2000 through 2006. Only out-patients were included. We followed the correlations of monotherapy and combinations according to age, gender, comorbidity, duration of the disorder and type of antidepressant used. We did not find significant difference between monotherapy and combinations according to age, gender and psychiatric comorbidity. We did not find significant ( $\chi^2 = 1.88$ ,  $p = 0.17$ ) difference between monotherapy and combinations according to duration of the disorder.

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#### HOW CAN WE INFLUENCE THE USE OF PAIN-KILLERS IN DEPRESSION?

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Somatic symptoms and pain are almost common symptoms of many psychiatric disorders. Namely in depression somatic symptoms are part of the diagnosis.

Pain in depression is frequently misunderstood as separate symptom belonging to some other somatic disorder which may or may not be the case. Nowadays dual antidepressants are preferred for the treatment of pain and somatic symptoms of depression. We reviewed 100 charts of patients hospitalized at our department because of severe depressive episode or recurrent depressive episode. 27 of those patients were on treatment with pain killers for mean period one month for various reasons – abdominal pain, back pain, headache, and pain of joints. At the time of discharge from hospitalization 22 patients were without pain killers. 15 patients who were without pain killers at the end of hospitalization because of depression were treated either with citalopram or escitalopram, 4 were treated with paroxetine. In our patient sample pain which occurred during depressive episode was successfully treated with selective serotonin reuptake inhibitors.

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#### THE INCREASED NITRIC OXIDE PRODUCTION IN THE BRAIN CONTRIBUTES TO BENEFICIAL EFFECT OF INDAPAMIDE IN THE PREVENTION OF L-NAME-INDUCED HYPERTENSION

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Objectives: The aim of this study was to investigate the effect of thiazide diuretic (hydrochlorothiazide) and thiazide-like diuretic (indapamide) on blood pressure development in NG-nitro-L-arginine methyl ester (L-NAME) treated rats. Methods: The changes of brain nitric oxide (NO) synthase activity and isoform expressions induced by hydrochlorothiazide (HCT) or indapamide were analyzed particularly. Adult 12-week-old male Wistar rats were treated with L-NAME (40 mg/kg/day) alone, or L-NAME + HCT (10 mg/kg/day), or L-NAME + indapamide (1 mg/kg/day) for seven weeks. Systolic blood pressure was measured by tail - cuff plethysmography every week. NO synthase (NOS) activity as well as expression of NOS isoforms: endothelial NOS (eNOS), neuronal NOS (nNOS) and inducible NOS (iNOS) were determined in the cerebellum. Results: 7-week L-NAME treatment increased blood pressure and decreased NOS activity in the cerebellum comparing to the normotensive Wistar rats. Both indapamide and HCT partially prevented blood pressure increase induced by L-

NAME treatment. In contrast to HCT, indapamide significantly increased NOS activity. Moreover, indapamide elevated expression of eNOS and nNOS modulated by L-NAME treatment. There were no significant changes in the expression of iNOS isoform. Conclusion: Our study demonstrated that indapamide, even used in ten times lower dose than HCT, prevented L-NAME-induced hypertension comparably. The contribution of indapamide-induced increase of brain NOS activity to this prevention is suggested.

*Supported by VEGA 2/6148/26, APVV-0586-06 and APVV-0538-07.*

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#### SECOND TO FOURTH DIGIT LENGTH RATIO (2D:4D) AND GENDER DIFFERENCES IN PAIN PERCEPTION

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Females are more sensitive to experimentally induced pain relative to males and their responses vary across the menstrual cycle. Sexually dimorphic index 2D:4D (digit length ratio between the second and fourth finger) is believed to reflect prenatal effect of testosterone and estrogens. Higher index in women results from prenatal exposure to lower level of testosterone whereas lower index in men results from higher testosterone level. We decided to compare nociceptive sensitivity in adult men and women in dependency on digit ratio. We hypothesized that more masculine index will be associated with lower sensitivity and more feminine index with higher sensitivity to pain. 18 women (23.1 years) and 16 men (23.4 years) underwent two thermal nociceptive tests: modified tail-flick (fingers were stimulated with the beam of radiant heat until appearance of withdrawal reaction) and the cold pressor test. Intensity of perceived cold pain was assessed in 15 s intervals on visual analog scale. Digit ratios were calculated from the photocopies of both hands. Digit ratio was higher in women than in men. We found no significant sex differences in the thermal pain and no correlation between withdrawal latency from the heat stimulus and 2D:4D. During CPT women experienced more intensive pain than men and 2D:4D correlated positively with pain intensity ( $r = 0.38$ ,  $p < 0.05$ ). From these results it can be concluded that sexually dimorphic index 2D:4D is probably more associated with tonic than with phasic pain.