

characteristics. The complex parameters of motherese required for successful child speech development and its' trend with child's age were revealed. The disorders in child speech development connected especially with social deprivation factor and disease factor were revealed. Our investigation proposed the hypothesis that vocal–speech interaction in mother–child dyad during the first year of child's life causes future speech development.

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Relation of age cognitive disorders with cranial compliance, cerebrospinal fluid mobility and cerebral circulation

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Introduction. Activity of the human brain is supported by a complex of mechanisms, each of equal importance, including the cerebral circulatory system, cranial compliance (CCe) as determined by skull biomechanics, and the compensatory capabilities of CSF system (CCc). Changes in the interaction between these mechanisms could be responsible for age related decreasing of brain circulatory–metabolic supply (BCMS) when accompanied by signs of dementia. The present investigation evaluates these mechanisms in the development of cognitive disorders (CD) during aging.

Methods. Correlation between the factors responsible for BCMS is based on simultaneous transcranial dopplerographic (TCDG) and rheoencephalographic (REG) recordings from the middle cerebral artery (MCA) basin, with their consequent pattern and phase analyses during the cardiac cycle, permitting the determination of CCe and CCc in comparative units. The mean CBF level (blood velocity, cm/s) was measured by TCDG at the base of the MCA. Psychophysiological evaluation by “Prognosis-1” method was used to determine the CD level indicative of the actual BCMS functioning. In that way 42 persons aged 72–87, divided into 4 groups according to their CD level, were investigated.

Results. It was found that the CD level most strongly correlates with CCe and CCc indices. In the group with no apparent signs of CD, CCe ($m \pm SD$, $n=10$) is 0.92 ± 0.08 and CCc is 0.3 ± 0.09 ; for persons with initial CD, CCe is 0.88 ± 0.07 and CCc = 0.22 ± 0.06 ; for persons with pronounced CD, CCe is 0.75 ± 0.07 and CCc is 0.18 ± 0.06 ; for group with deep CD, CCe is 0.64 ± 0.05 and CCc is 0.10 ± 0.04 . Mean CBF, which varied in all persons within wide ranges (40–70 cm/s for MCA), correlated more with age than with CCe or CCc values.

Discussion. Our data show that the CD level depends mainly on the decreased capability of cranium to accept some amount of blood volume during the systolic increase of arterial pressure and to use this blood volume for supporting of BCMS during the diastolic phase of cardiac cycle. Pulse fluctuations of cerebral blood flow are about 40% of stroke volume or about 10 ml. Therefore, decreasing of the accepted blood pulse volume by only 1 ml corresponds with a decrease in CCe of about 0.1 and this is accompanied by diminishing of CSF mobility and may result in BCMS decrease up to 8–10%.

Thus, BCMS depends not only on the functioning of cerebral blood circulatory system, but also on peculiarities of cranial biomechanics and CSF mobility inside the cranium.

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Software development for planning, realization and analysis of results of psychophysiological experiments

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Psycho-physiological experiments, in particular those directed towards the studying of features and mechanisms of visual perception of various stimuli, the working correlations character of cortical neurons with a condition of this or that system of the organism (cardiovascular, endocrine, immune) every time, depending on the purposes of research, requires the creation of new computer programs. Within the framework of a program, one or several ready stimuli with a relatively narrow range of changeable parameters, and a specific way of presentation of these stimuli without the possibility of export data for further statistical processing is usually included. In most cases, data processing has to be carried out semi-automatically. That is, at the present time, no more or less universal program complexes exist that allow the experimenter, who is usually unfamiliar with programming and mathematics, to operatively organize and carry out testing and also to statistically process data received.

The authors have developed an automated complex for planning, realization and analysis of results of psycho-physiological and psycho-physical experiment, which is currently at the test stage. The complex proposed will allow the experimenter, psychologist, psycho-physiologist, neurophysiologist, or doctor of functional diagnosis etc. to use a wide set of basic elements (indecomposable elements of image: letters, figures, sections, etc.) to create, with the help of an intuitively clear interface and display on the monitor, various two- and three-dimensional stimuli, to set the means, sequence and timing of their presentation. The complex will provide registration and automatic saving of test results in electronic form, grouping of data received according to certain attributes (for example, by sex of the examinees), and also automatic statistical processing of results according to set algorithms. Thus, the product offered expands the possibilities of the experimenter in planning psycho-physiological or psycho-physical research connected to presentation of various flat and volumetric visual stimuli, allowing independent and operative organization of testing and processing of statistical data without bringing in programmers and mathematicians.

Use of an automated complex will significantly speed up the process of organizing psycho-physiological and psycho-physical experimentation, its realization and obtaining of scientific results. It allows variation of the set of tests depending on the purposes of research and individual components of the test in realization of professional selection, and also due establishment of the presence of critical conditions and referral of the individual investigated to a specialist.

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Psychophysiological reserve of species adaptation of *Homo sapiens*

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Studies in comfortable climatic regions have shown that the proportions of both left-sided and right-sided laterality phenotypes are insignificant and that the majority of the population has mixed asymmetry patterns. In areas with extreme climatic conditions — Polar Regions and high mountains — studies have found not only a higher proportion of left-handed and ambidextrous individuals but