ЖУРНАЛ ЭВОЛЮЦИОННОЙ БИОХИМИИ И ФИЗИОЛОГИИ, 2020, том 56, № 7, с. 782

МАТЕРИАЛЫ КОНФЕРЕНЦИИ И ШКОЛЫ

DEVELOPMENT OF COGNITIVE SYSTEMS (ON EXAMPLE OF MATHEMATICAL PROBLEMS SOLVING) IN CHILDREN LIVING IN THE NORTH OF RUSSIA

© 2020 г. Zh. V. Nagornova[1,*] and N. V. Shemyakina[1]

[1] *Sechenov Institute of Evolutionary Physiology and Biochemistry of the Russian Academy of Sciences, Saint Petersburg, Russia*

**e-mail: nagornova_zh@mail.ru*

DOI: 10.31857/S0044452920072103

Morphofunctional development of brain regions is heterochronic and go forward through the adolescence (Farber et al., 1990), providing the development of cognitive functions: cognitive control, voluntary attention, abstract thinking. Education can influence the strategy of solving cognitive problems, in particular, mathematical (Siegler, 1996). The study evaluated age-related changes in event-related potentials (ERPs) in younger (11, 1st-3rd grade) and older (12, 5th-10th grade) school students when solving arithmetic sums. EEG/ERPs were recorded monopolarly from 31 Ag/AgCl electrodes (Mitsar LTD electroencephalograph, Saint Petersburg) in addition and subtraction of single-digit numbers (younger group), single- and double-digit numbers (older group). The exposure of each sum lasted for 400 ms, the answer (correct/incorrect) was presented after 1000 ms (100 trials per type). The participants pressed the mouse button while the answer was correct. All artifact-free trials with correct answers were averaged separately for each child, each electrode, each sum type (with presentation of correct or incorrect solution). ANOVA for GROUP and ZONE with Greenhouse-Geisser correction was used. The amplitude and latency of the early ERP components for the sum presentation significantly decreased in older school students: differences were revealed for 178-282 ms interval after stimulus presentation: ZONExGROUP: $F(17.357) = 6.9$, $e(G-G) = 0.22$, $p < 0.001$, and 320–368 ms time interval: GROUP: $F(1.21) = 4.3$, $p < 0.05$. In later time interval of 600-670 ms in younger group the greater negativity was observed in parietal zones, while in the older group the greater negativity was observed in frontal areas: ZONExGROUP: $F(30.630) = 7.6$, $e(G-G) = 0.14$, $p < 0.001$. The observed differences seems to reflect the maturation processes of the action monitoring and decision-making system, indicating a change in the strategy for solving mathematical examples from junior to senior school age.

Supported by state assignment (AAAA-A18-118012290142-9).