Clinical and neurophysiological data of neurofeedback therapy in children with ADHD.

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Abstract

INTRODUCTION:
ADHD occurs in 3% of school-age children (and in 70% of them in adulthood) and represents an important medical and social problem. It is characterized by attention deficits, hyperactivity and impulsiveness. Neurofeedback therapy (EEG biofeedback, NF) is carried out based on the analysis of EEG.

OBJECTIVE:
To investigate the effect of NF therapy on clinical status and parameters of the EEG in ADHD.

MATERIALS AND METHODS:
In the years 2007-2014, 287 children (191 boys), aged 6-17 years were included into the study. Some children with ADHD had other coexisting disorders like: tics, dyslexia, emotional or behavior disorders. Visual analysis of EEG was made and 7 selected parameters of bioelectrical activity were assessed. EEG tracing before and after NF therapy were compared. NF therapy lasted from 9 months to 3 years (mean 1.5 years). 60-240 NF training sessions were performed with the use of NF device, video-games and 16-channel Elmiko devices. Statistical analysis of the results was made.

RESULTS:
Children with ADHD additionally presented low self-esteem, anxiety and sleep disorders. The baseline theta/beta ratio in children with ADHD and ADHD with cooccurring dyslexia was >4.0 and in children with ADHD and coexisting tics 3.0-3.8, with coexisting behavioral disorders 3.7-4.0 and emotional disorders 3.3-3.7. After therapy, this ratio decreased significantly in all groups, but most significantly in ADHD and ADHD with dyslexia group. In the group with dyslexia theta and alpha activity in the left fronto-temporo-parietal region (the speech centers) has been increased. In children with ADHD and behavior disorders right-sided paroxysmal changes in the form of slow and sharp waves in the temporo-centro-parietal regions were found. In emotionally disturbed children increased fast beta activity in the right hemisphere (anxiety, fear) was observed. Initially NF therapy reduced hyperactivity and impulsivity of children, subsequently improvement of attention was observed and eventually reduction of emotional and behavior disturbances was noticed. Noticeable improvement in the self-esteem was observed as well. The therapy had a positive impact on the spatial organization of EEG in each group. It proved to be particularly useful in children with ADHD and dyslexia.

CONCLUSIONS:
Neurofeedback therapy is a valuable tool with beneficial impact on children with ADHD and accompanying disorders. Characteristics of brain bioelectric activity provides a reliable basis to establish individual EEG biofeedback protocols of therapy in children and monitor the effectiveness of treatment. In the last 4 years the number of children with ADHD and cooccurring tics who applied for neurofeedback therapy has increased significantly.