


Abstract

Neurofeedback (NF) is increasingly used as a therapy for attention-deficit/hyperactivity disorder (ADHD), however behavioral improvements require 20 plus training sessions. More economic evaluation strategies are needed to test methodological optimizations and mechanisms of action. In healthy adults, neuroplastic effects have been demonstrated directly after a single session of NF training. The aim of our study was to test the feasibility of short-term theta/beta NF in children with ADHD and to learn more about the mechanisms underlying this protocol. Children with ADHD conducted two theta/beta NF sessions. In the first half of the sessions, three NF trials (puzzles as feedback animations) were run with pre- and post-reading and picture search tasks. A significant decrease of the theta/beta ratio (TBR), driven by a decrease of theta activity, was found in the NF trials of the second session demonstrating rapid and successful neuroregulation by children with ADHD. For pre-post comparisons, children were split into good vs. poor regulator groups based on the slope of their TBR over the NF trials. For the reading task, significant EEG changes were seen for the theta band from pre- to post-NF depending on individual neuroregulation ability. This neuroplastic effect was not restricted to the feedback electrode Cz, but appeared as a generalized pattern, maximal over midline and right-hemisphere electrodes. Our findings indicate that short-term NF may be a valuable and economical tool to study the neuroplastic mechanisms of targeted NF protocols in clinical disorders, such as theta/beta training in children with ADHD.