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**Does neurofeedback training normalize reward-processing in
ADHD? An ERP study**

Autor: Szarah Peters
Institut / Klinik: Zentralinstitut für Seelische Gesundheit Mannheim (ZI)
Doktorvater: Prof. Dr. med. Dr. rer. nat. T. Banaschewski

Altered reward processing has been discussed as a core deficit in Attention-Deficit/Hyperactivity Disorder that has been increasingly investigated in the past years. Compared to healthy subjects, patients affected by Attention-Deficit/Hyperactivity Disorder showed reduced amplitudes of the Cue-P3 and the contingent negative variation; two event-related potentials that have been associated with reward anticipation on a neurophysiological level.

Within a randomized controlled trial design, the current study investigated the effects of slow cortical potential neurofeedback on these neurophysiological indices during reward anticipation. Therefore, 14 children with Attention-Deficit/Hyperactivity Disorder (mean age 11.6 years) were randomly assigned to either neurofeedback or electromyogram-biofeedback training as an active control condition and received 20 training sessions, each. EEG-data were recorded before and after treatment, while the participants were performing a monetary incentive delay task.

After treatment, children who received neurofeedback showed reduced symptom scores in the clinical assessment. No neurophysiological changes were observed after neurofeedback or electromyogram treatment. Interestingly, when only focusing on pretreatment assessment, medicated patients showed a significantly increased contingent negative variation amplitude in the win condition compared to unmedicated patients. After training compared to before training, they showed a less negative contingent negative variation and a reduced CueP3 amplitude. In contrast, unmedicated patients showed an increased contingent negative variation and CueP3 amplitude after the training.

These results suggest no specific effect of neurofeedback on reward anticipation, but point to an interaction between neurofeedback and stimulant medication. On a neurophysiological level, non-medicated patients seem to benefit more from training than medicated patients.

Thus, this first study exploring the effects of neurofeedback on reward anticipation on a neurophysiological level in children suffering from Attention-Deficit/Hyperactivity Disorder offers important preliminary insights in mechanisms of action. Nonetheless, further larger studies are needed to validate these results and to explore in more detail the interaction effects of medication and neurofeedback.