Training with ADHD Children: Preliminary Findings in a Double-Blind Placebo-Controlled Study

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Introduction

Attention training or EEG biofeedback (neurofeedback or neurotherapy) has been shown in previous studies to be effective in minimizing the cardinal symptoms of Attention-Deficit/Hyperactivity Disorder (ADHD) in children (Lubar, Swartwood, Swartwood, & O'Donnell, 1995; Monastra, Monastra, & George, 2002).

However, some of the main criticisms of the previous research were a lack of adequate controls, failure to control for treatment bias, and diagnostic workups (Baydala & Wikman, 2001). This was the first randomized double-blind placebo-controlled neurotherapy study performed with ADHD children.

Methods

The design of the study consisted of a diagnostic workup, 40 sessions, and pre-, mid-, and post-assessments. The diagnostic workup consisted of a structuredclinical interview with the parent(s), and IQ, achievement, continuous performance test (CPT), and quantitative electroencephalogram (QEEG) with each child (all the children were tested medication-free with a 48-hour washout period). Each child was required to have ADHD as the primary diagnosis, IQ greater than 80, if on medication only taking psychostimulants, and no history of head injuries, seizures, or other serious mental disorders (i.e., depression, anxiety).

During the sessions each child played Sony PlayStation games with an active sensor placed at FZ. In order to ensure that each child received treatment, a crossover occurred after 20 sessions. The children were randomized into two groups. Group 1 received 20 sessions of brainwave-modulated Sony PlayStation videogames and then received 20 sessions with the videogames while brainwave activity was monitored. Group 2 received treatment in the opposite order.

Pre-testing occurred before sessions began and consisted of parent, teacher, and self-report rating scales. Mid-point-testing occurred at the crossover point and consisted of the previous rating scales, CPT and QEEG with each child. Post-testing occurred after the 40 sessions were completed. Parents and teachers completed rating scales while the children were re-administered the intake procedure.

Results

Twenty-six children (eight girls and 18 boys) seven to 11-years-old (average age 9.0, SD = 1.25) in grades two through five (average grade 3.5, SD =1.1) have completed the study to date. Eleven of the children were medicated on a psychostimulants only and 15 were not medicated.

Each child had a primary diagnosis of ADHD (17 primarily Inattentive and nine Combined). Average Full-Scale IQ was 101 (SD = 12.43) and WISC-III Freedom from Distractibility Index was 97 (SD = 15.75).

Twelve children were in Group 1 (experimental/control) and 14 children were in Group 2 (control/experimental). Session data was collected and examined for trends. Two-way repeated-measures ANOVA indicated a group _condition interaction and had a significant impact on training Theta, Alpha, SMR, and Beta brain wave activity. In particular, effect sizes for Theta, Alpha, and SMR were very large (.77).

Conclusion

The results indicated different learning curves between the two groups and conditions showing that EEG biofeedback does change electrophysiology.

The ANOVA results indicated that the Control-first group had difficulty decreasing Theta or Alpha activity in the following treatment condition. The Treatment-first group had a significant increase in Theta and Alpha activity after a withdrawal of treatment.

It is possible that sham conditions interfered with the learning process. Furthermore, it is not clear to what extent the level of interactivity of the PlayStation interface played a role in the learning process. These results are preliminary and this study is still in progress until 52 children have completed the study. Future plans include a Phase II in which children will complete 20 more active feedback sessions.