Efek Terapi Neurofeedback untuk Memperbaiki Gejala Attention Deficit / Hyperactivity Disorder (ADHD)
pada Anak
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INTISARI

Latar belakang: Prevalensi Attention Deficit/Hyperactivity Disorder (ADHD) cukup tinggi dan makin meningkat. Terapi neurofeedback mulai banyak dikembangkan sebagai alternatif terapi ADHD namun dari hasil penelitian sebelumnya belum konklusif dan masih heterogen, sehingga masih perlu penelitian lebih lanjut.

Tujuan: Penelitian *Randomized Rontrolled Trial* (RCT) ini bertujuan untuk mengetahui apakah neurofeedback bisa mengurangi gejala ADHD pada anak.

Metode: Subjek dibagi menjadi dua kelompok yaitu kelompok perlakuan yang mendapat terapi neurofeedback dan kelompok kontrol yang mendapat terapi standar dengan methylphenidate+terapi perilaku. Gejala ADHD yang diukur adalah penurunan hiperaktivitas/impulsivitas *(commission error)*, peningkatan atensi *(omission error)*, peningkatan kecepatan respon *(response time)*, peningkatan konsistensi*(response time variability)* dan skor performa atensi secara umum *(Attention Comparison Score)*. Pengukuran menggunakan *Test of Variables of Attention (TOVA)* sebelum dan sesudah terapi, kemudian dianalisis.

Hasil: Didapatkan 38 subjek yang diikutsertakan dalam penelitian ini, terdiri dari kelompok neurofeedback (n=19) dan kelompok terapi methylphenidate+terapi perilaku (n=19). *Intention-to-treat analysis* pada kedua kelompok didapatkan tidak ada perbedaan yang signifikan pada *commission error* (p=0,120; CI -2,31–35,93), *omission error* (p=0,315; CI -14,43–9,93), *respon time* (p=0,638; CI -9,96–5,86), *response time variability* (p=0,191; CI -4,81–25,91) dan skor ACS (p=0,200; CI -0,61–2,41). Tidak didapatkan efek samping yang berat pada kedua kelompok. Analisis pada masing-masing kelompok didapatkan terapi neurofeedback signifikan meningkatkan *commission error* (p=0,001; CI 11,7– 42,8), *omission error(p*<0,001*;* CI 2,4 – 6,6), *response time variability* p<0,001; CI 14,8 – 41,1) dan skor ACS (p<0,001; CI -4,6 – -1,1). Terapi methylphenidate+terapi perilaku meningkatkan *omission error* (p<0,001; CI 8,29 –22,7), *response time variability* p=0,003; CI 7,60 - 27,22) dan skor ACS (p<0,001; CI 0,97 - 2,89).

Kesimpulan: Neurofeedback tidak berbeda signifikan dengan terapi standar (methylphenidate + terapi perilaku) dalam memperbaiki gejala ADHD.

Kata kunci: *Neurofeedback, ADHD, anak, randomized controlled trial*

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ABSTRACT

Background: The prevalence of Attention Deficit/Hyperactivity Disorder (ADHD) is progressively increasing worldwide. Neurofeedback has been proposed as an alternative treatment for ADHD; however, findings from previous studies remain inconclusive and heterogeneous, warranting further investigation.

Objective: This Randomized Controlled Trial (RCT) aimed to determine whether neurofeedback can improve ADHD symptoms in children compared to standard therapy.

Methods: Participants were divided into two groups: the intervention group receiving neurofeedback and the control group receiving standard therapy (methylphenidate + behavioral therapy). ADHD symptoms assessed included hyperactivity/impulsivity (commission error), attention (omission error), response speed (response time), consistency (response time variability), and overall attention performance (Attention Comparison Score/ACS). All measurements were performed using the Test of Variables of Attention (TOVA) before and after therapy.

Results: A total of 38 participants were enrolled, consisting of the neurofeedback group (n=19) and the methylphenidate+behavioral therapy group (n=19). Intention-to-treat analysis showed no significant difference between the two groups in commission error (p=0.120; CI −2.31 – 35.93), omission error (p=0.315; CI −14.43 – 9.93), response time (p=0.638; CI −9.96 – 5.86), response time variability (p=0.191; CI −4.81 – 25.91), and ACS score (p=0.200; CI −0.61 – 2.41). No serious adverse effects were observed in either group. Within-group analysis revealed that neurofeedback significantly improve commission error (p=0.001; CI 11.7 – 42.8), omission error (p<0.001; CI 2.4 – 6.6), response time variability (p<0.001; CI 14.8 – 41.1), and ACS score (p<0.001; CI −4.6 – −1.1). Methylphenidate + behavioral therapy significantly improved omission error (p<0.001; CI 8.29 – 22.7), *response time variability* p=0.003; CI 7.60 – 27.22) and ACS score (p<0.001; CI 0.97 – 2.89).

Conclusion: Neurofeedback did not differ significantly from standard therapy (methylphenidate + behavioral therapy) in improving ADHD symptoms in children.

Keywords: *neurofeedback, ADHD, children, randomized controlled trial*