EEG Power Spectrum Analysis in Children with ADHD

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ABSTRACT

Background
Attention deficit disorder/hyperactivity disorder (ADHD) is a pathological condition that is not fully understood. In this study, we investigated electroencephalographic (EEG) power differences between children with ADHD and healthy control children.

Methods
EEGs were recorded as part of routine medical care received by 80 children with ADHD aged 4–15 years at the Department of Pediatric Neurology in Tottori University Hospital. Additionally, we recorded in 59 control children aged 4–15 years after obtaining informed consent. Specifically, awake EEG signals were recorded from each child using the international 10–20 system, and we used ten 3-s epochs on the EEG power spectrum to calculate the powers of individual EEG frequency bands.

Results
The powers of different EEG bands were significantly higher in the frontal brain region of those in the ADHD group compared with the control group. In addition, the power of the beta band in the ADHD group was significantly higher in all brain regions, except for the occipital region, compared with control children. With regard to developmental changes, the power of the alpha band in the occipital region showed an age-dependent decrease in both groups, with slightly lower power in the ADHD group. Additionally, the intergroup difference decreased in children aged 11 years or older. As with the alpha band in the occipital region, the beta band in the frontal region showed an age-dependent decrease in both groups. Unlike the alpha band, the power of the beta band was higher in the ADHD group than in the control group for children of all ages.

Conclusion
The observed intergroup differences in EEG power may provide insight into the brain function of children with ADHD.