

Excess beta activity in children with attention-deficit/hyperactivity disorder: an atypical electrophysiological group

Adam R. Clarke^a, Robert J. Barry^{a,*}, Rory McCarthy^b, Mark Selikowitz^b

^a*Department of Psychology, University of Wollongong, Wollongong, NSW, 2522, Australia*

^b*Private Pediatric Practice, Sydney, Australia*

Received 2 October 2000; received in revised form 24 May 2001; accepted 19 June 2001

Abstract

Studies of children with attention deficit/hyperactivity disorder (ADHD) have typically found elevated levels of slow wave activity in their EEGs, but in two of our previous studies, a small subset of ADHD children with excess beta activity in the EEG was identified. The aim of this study was to determine whether children with excess beta activity represent a distinct electrophysiological subtype of ADHD, to quantify the differences in their EEGs, and to determine if this group of children with ADHD have behavioural profiles different from other children with ADHD. Results indicated that children with excess beta represent a small independent subset of children diagnosed with ADHD, which primarily consists of children with a diagnosis of ADHD combined type. Behaviourally, this group was similar to other children with ADHD, although the excess-beta group were more prone to temper tantrums and to be moody. The excess in beta activity was found primarily in the frontal regions and may be associated with frontal lobe self-regulation and inhibition control. © 2001 Elsevier Science Ireland Ltd. All rights reserved.

Keywords: Attention deficit/hyperactivity disorder; Children; EEG; Maturation

1. Introduction

Children with attention deficit/hyperactivity disorder (ADHD) typically have increased electroencephalographic (EEG) slow wave activity, primarily in the theta band, compared to normal children (Capute et al., 1968; Wikler et al., 1970;

Satterfield et al., 1973b). Increased relative delta activity in posterior regions is also common in children with ADHD (Matousek et al., 1984). Mann et al. (1992) found children with ADHD had an increase in absolute amplitude in the theta band, which primarily occurred in frontal regions during a resting condition. During cognitive tasks, ADHD children showed a greater increase in theta activity in frontal and central regions, and a decrease in beta activity in posterior and temporal regions. Based on studies of

* Corresponding author. Tel.: +61-24221-3742; fax +61-24221-4914.

E-mail address: robert_barry@uow.edu.au (R.J. Barry).

developmental changes in the EEGs of normal children, these results have been interpreted as ADHD representing either a maturational lag (Mann et al., 1992) or a developmental deviation (Chabot and Serfontein, 1996) of the central nervous system.

As a child becomes older, developmental changes occur in the EEG (Wada et al., 1996; Clarke et al., 2001a), with a reduction in slow wave activity and an increase in faster waveforms (Matthis and Scheffner, 1980). Delta, theta and slow alpha decrease with age and faster waveforms increase, with a strong complementary decrease in theta and increase in alpha being identified (Gasser et al., 1988). These changes in the frequency of the EEG appear to be linear in nature and can be predicted with a high degree of accuracy for relative power, based on age (John et al., 1980). However, the differences within an age group appear to be greater than the differences between age bands (Benninger et al., 1984). It is from these results that a maturational lag model of ADHD has been proposed.

In two of our previous ADHD studies (Clarke et al., 1998, 2001b) a subset of ADHD children with excessive levels of beta activity was identified. In both of the studies, the subset constituted approximately 20% of children with ADHD Combined Type (ADHDcom), using DSM-IV criteria (American Psychiatric Association, 1994). One subject with a diagnosis of ADHD Predominantly Inattentive Type (ADHDin) was also identified in our second study (Clarke et al., 2001b). Chabot and Serfontein (1996) are the only other investigators to have documented the existence of this subset of children with ADHD. In their study, approximately 13% of ADHD children were found to have excess beta activity.

Beta activity rarely occurs in children and adolescents and should not exceed 25 μV in amplitude (Fisch, 1994). In normal awake children, Kellway (1990) found beta activity was 20 μV or less in 98% of subjects and less than 10 μV in 70%. Increased levels of beta activity have typically been associated with drug usage (Kozelka and Pedley, 1990) and beta can be increased by the use of benzodiazepines (Pichlmayr and Lips, 1980; Glaze, 1990). Studies of beta activity have

found excessive levels in patients with psychiatric illnesses (Gibbs and Gibbs, 1950). Increased beta activity has been found in schizophrenia (Morihisa et al., 1983) and major depressive disorders (Pollock and Schneider, 1990) and is also associated with anxiety (Kiloh et al., 1981).

The aim of this study was to ascertain the percentage of children diagnosed as having ADHD who have excess levels of beta activity in their EEG and to determine how their EEGs differ from those of other children with ADHD. A second aim was to determine if ADHD children with excess beta activity have behavioural profiles different from those of other children with ADHD.

2. Method

2.1. Subjects

Two hundred and ninety-eight children diagnosed with ADHD and 80 control subjects participated in this study. Two hundred and eight subjects were diagnosed as ADHDcom and 90 were diagnosed as having ADHDin. All children were between the ages of 8 and 12 years and right-handed and -footed. Subjects had a full-scale WISC-III IQ score of 85 or higher. The clinical group of children was drawn from new patients referred to a Sydney-based pediatric practice for an assessment for ADHD. The ADHD subjects had not been diagnosed as having ADHD previously, had no history of medication use for the disorder, and were tested before being prescribed any medication. The control group consisted of children from local schools and community groups.

Inclusion in the ADHD groups was based on a clinical assessment by a pediatrician and a psychologist; children were included only where both agreed on the diagnosis. DSM-IV criteria were used and children were included in either the ADHDcom or ADHDin groups if they met the full diagnostic criteria for the subtype. A structured clinical interview was used in the assessment of all subjects. This incorporated information from as many sources as were available. The

متن کامل مقاله

دریافت فوری ←

ISIArticles

مرجع مقالات تخصصی ایران

- ✓ امکان دانلود نسخه تمام متن مقالات انگلیسی
- ✓ امکان دانلود نسخه ترجمه شده مقالات
- ✓ پذیرش سفارش ترجمه تخصصی
- ✓ امکان جستجو در آرشیو جامعی از صدها موضوع و هزاران مقاله
- ✓ امکان دانلود رایگان ۲ صفحه اول هر مقاله
- ✓ امکان پرداخت اینترنتی با کلیه کارت های عضو شتاب
- ✓ دانلود فوری مقاله پس از پرداخت آنلاین
- ✓ پشتیبانی کامل خرید با بهره مندی از سیستم هوشمند رهگیری سفارشات