

Essential Fatty Acids (EFAs) and their effect on children's behaviour and learning

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During the last decade, there has been a significant rise in the number of children identified with Dyslexia, Dyspraxia, Attention Deficit and Hyperactivity Disorder (ADHD) and Pervasive Developmental Disorder (PDD). Some question that we have just become better diagnosticians or perhaps we more aware of the signs? Whilst that is certainly true, teachers of primary age children with 10+ years of experience report that there are more pupils than ever before having specific difficulties with reading, handwriting, coordination and concentration. A recent screening of 3-year old nursery pupils in Durham (Portwood 2004) suggests that delayed development of motor skills and associated problems with attention have reached almost epidemic proportions.

Although neurodevelopmental disorders are classified into discrete categories, many children display the characteristics of more than one: co-morbidity is common in more than 60% of cases (Dewey et al. 2000) and it appears to be more of a rule than an exception. Biederman et al. (1990) suggest that between 50 and 80 per-cent of children with a diagnosis meet the criteria for at least two disorders.

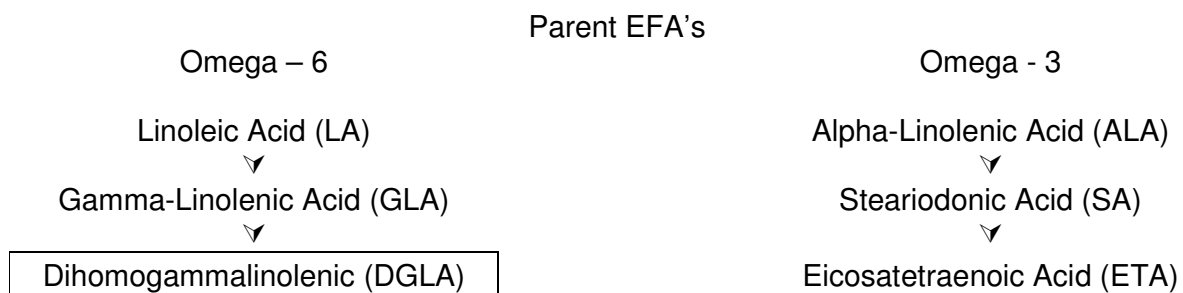
Many common features associated with these neurodevelopmental disorders are:

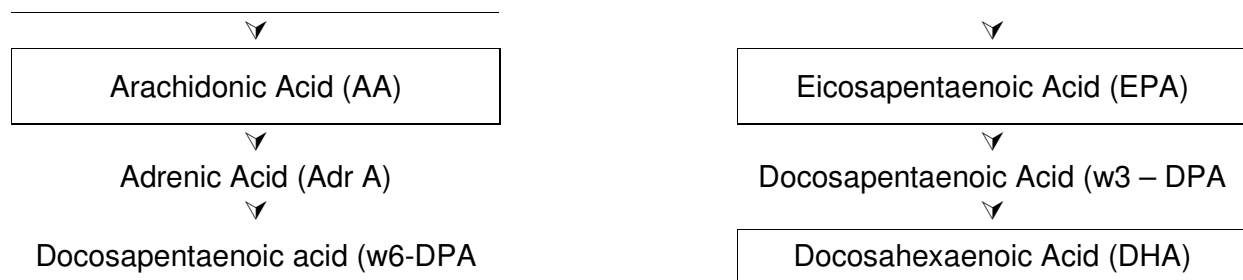
- Prematurity / Small for dates
- Hyperactivity / sleep problems virtually from birth
- Allergies (milk intolerance, eczema, asthma)
- Delayed development of motor skills / coordination difficulties
- Delayed acquisition of language

Whilst the outcomes and survival rates for premature babies continue to improve with advances in medicine, this, in itself, cannot account for the increase in the number of children identified. To find some explanation for increasing levels of hyperactivity, poor concentration (which have a major impact on learning) and a rise in the incidence of autoimmune problems we must consider factors external to the child. The focus of this article is to examine the effects of diet.

Research Evidence

The importance of specific long-chain, highly unsaturated fatty acids (HUFA's) for normal brain development has been the focus of much research (Richardson et al 2001). These fatty acids would normally be synthesised from 'parent' essential fatty acids (EFA's) but some individuals have problems with these conversions.





Arachidonic Acid (AA - omega 6) and Docosahexaenoic Acid (DHA - omega 3) are structural fatty acids and important in the formation of cell membranes. Eicosapentaenoic Acid (EPA – omega 3) is a functional fatty acid and is important for the transmission of messages in the brain.

Modern diets are relatively high in derivatives of the parent omega-6 EFA namely Arachidonic Acid (AA), found in dairy products and meat. AA has inflammatory effects, which can cause sinus problems, blocked nose, glue ear. In contrast Eicosapentaenoic Acid (EPA) acts as an anti-inflammatory and is derived from fish oil. The amount of omega-3 EFA in the diet can have a direct effect on the autoimmune system.

The importance of nutrition and early development is well documented. Since the late 1980s, many studies have compared the abilities of young children fed breast-milk or formula milk.

- Professor Alan Lucas (University of Cambridge) reported in 1992 that children fed mother's breast-milk showed significant IQ advantages in a group of 7 ½ - 8 year olds fed breast-milk when compared with children fed formula milk.
- Makrides et al. (1996) suggested that the differences in ability were due to the presence of long-chain polyunsaturated fatty acids – in particular Docosahexaenoic acid (DHA) an omega-3 derivative.
- Research undertaken by Peter Willats and colleagues at the University of Dundee (1998 & 2001) compared combinations of omega-6 and omega-3 EFAs using supplemented formula milk. The ratio of these fatty acids appears to directly affect the learning outcomes for young children.

The development of infants given supplemented formula milk with ratios of AA:DHA of 1:1 was significantly better than for those where the ratio was 20:1.

The brain is 60% fat, 25% of which is omega-6 and omega-3 fatty acids. The essential fatty acids (EPA, DHA, DGLA and AA) are important not only in early infancy but throughout life. The impact of low DHA intake on neurological functioning has been the focus of research, which concludes that this is evident in adults with a variety of psychiatric disorders and a significant proportion of children with ADHD and specific learning difficulties. Trials have been completed in which dietary supplements, made from natural oils rich in essential fatty acids have been given to children with Dyslexia and ADHD (Richardson 2001) Significant improvement in reading and concentration was evident in the group receiving active treatment.

The Durham Trial

In January 2002, the first controlled trial of EFA supplementation in a group of dyspraxic children began in Durham. It was a randomised, double-blind, placebo-controlled, trial and on recruitment children were allocated either the active treatment (Eye-Q) or an identical-looking placebo. There was a high co-occurrence of neurodevelopmental disorders. The children recruited had difficulties with coordination, concentration and perception. Some also had specific reading difficulties.

Many of the pupils had symptoms of fatty-acid deficiency, which include:-

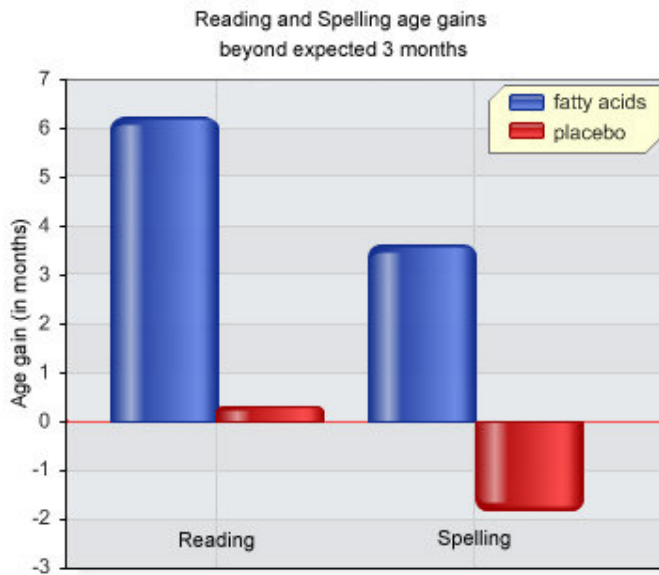
- Dry itchy skin
- Coarse bumpy patches, particularly at the back of the arms
- Soft, broken nails
- Sweaty palms and feet
- Frequent urination
- Excessive thirst
- Dull, dry hair
- Allergies e.g. lactose intolerance, eczema, asthma

Dramatic results were seen within just 3 months of the trial. The children in the active group supplementing with fatty acids saw significant improvements in reading (9.5 months), spelling (6.5 months) and behaviour, compared to the placebo group where no overall improvement was made.

During the 3-6 month period when the placebo group crossed over to fatty acid supplementation, considerable improvements were shown in the same areas, with an average reading gain of 13.5 months and an average spelling gain at over 6 months. The active group that continued with fatty acid supplementation showed further signs of progress or maintained their improvement.

At the start of the trial, all of the school children were a year behind their chronological age for reading and spelling, but after the trial, the active group who had been on fatty acids throughout the trial made spelling and reading gains over and above their chronological age.

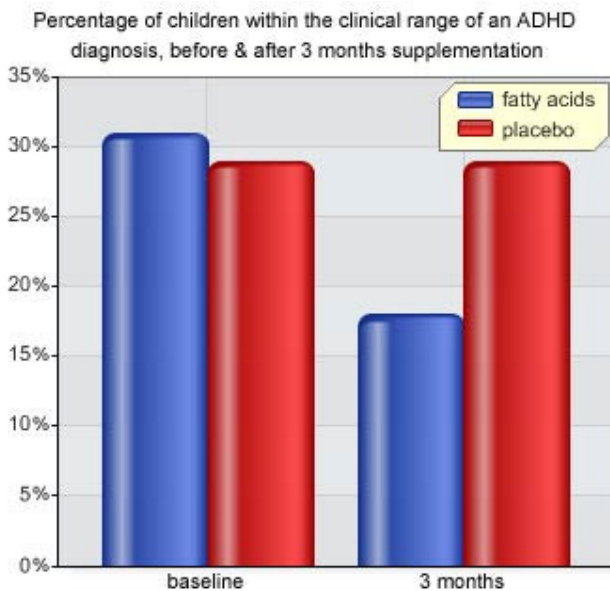
Reading and Spelling



Performance

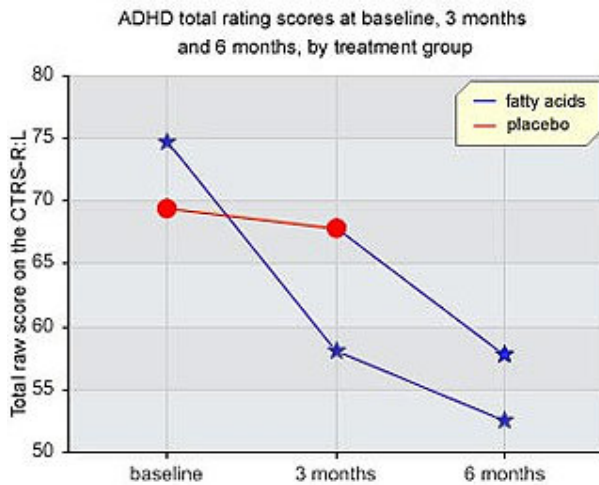
- During the first 3 months the average gain for children taking fatty acids was 9.5 months for reading and 6.5 months for spelling. This was a highly significant improvement compared to the control group gains for reading ($p < 0.004$) and spelling ($p < 0.001$).
- Between 3-6 months, children switching from placebo to active capsules made an average reading gain of 13.5 months and over 6 months for spelling. The fish oil group who had been on fatty acids from the beginning of the trial continued to make reading and spelling gains over and above what would be expected for their chronological ages.

ADHD



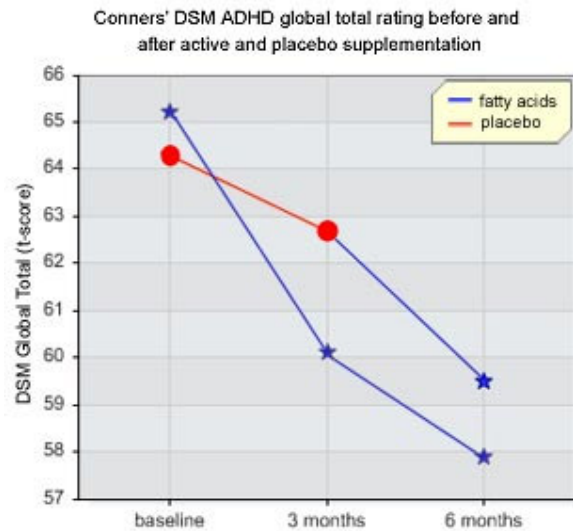
Clinical range of ADHD

- At the start of the trial, the percentage of children within the clinical range of ADHD was set at 32% for the fatty acid group and 31% for the placebo group.
- After 3 months supplementation, the percentage of children with the clinical range of an ADHD diagnosis reduced to 18% for the fatty acid group, whereas this only dropped by 1% in the placebo group.



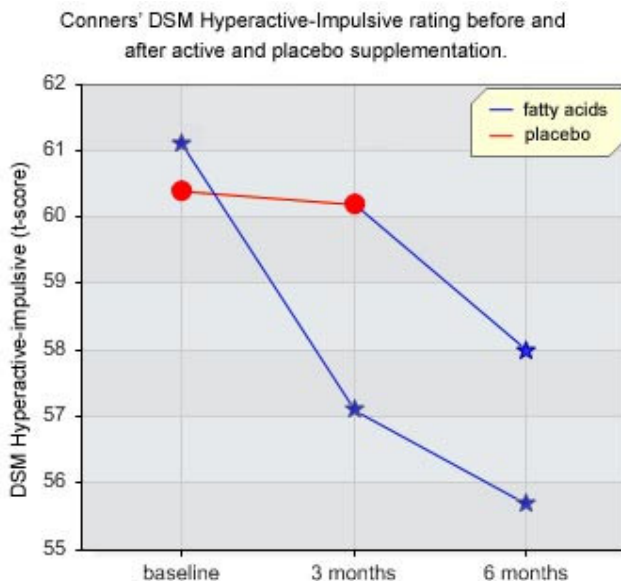
Behaviour Raw Score Total

A raw score was calculated from the teacher rating form that assessed each child's behaviour. After 3 months there was a highly significant reduction ($p < 0.0001$) seen in the active supplement group, compared to those on placebo, in this behavioural score. The fatty acid group reduced from an average score of 74.7 to 58.1, whereas the before and after treatment scores for the placebo group were 69.5 and 67.9.



DSM-IV Total ADHD

The active group saw significantly reduced ($p < 0.00001$) teacher ratings on the Conners' DSM ADHD global scale after 3 months, compared with the placebo group. The placebo group saw similar improvements on this scale after crossing over to the active oils for the 3-6 month period of the trial.



DSM-IV Hyperactive-Impulsive

After just 3 months children on the active supplement saw a significant reduction on the rating scale of Hyperactive-Impulsive behaviour, compared to those on placebo ($p < 0.00001$). Further reductions were seen in the 3-6 month period of the study.

Impact on Behaviour

Compared to those in the placebo group, children taking active supplementation made significant decreases in 11 out of a total of 13 behavioural ratings, including features of inattention, hyperactivity and impulsivity

Additional Studies

Further research in Durham has examined the effect of EFA supplementation on a group of severely hyperactive secondary-age pupils and also on children aged between 18 months and three years in a local Sure Start programme.

As was evident in the Durham Trial, it was the children's concentration that improved significantly and this had a direct impact on behaviour and learning. The older pupils had fewer reported incidents of unacceptable behaviour and their attainments in external examinations exceeded expectation.

With the pre-schoolers, the obvious indicator of change was the improved bonding between parent and child. On average, the children taking the supplement made seven months progress in their language skills during the five months of the trial compared with controls, who made only four.

Information about these trials is available on the website www.durhamtrial.org

Dietary supplementation is not the answer for all children, however, from the research carried out in Durham, it has a significant impact on many.

Where parents have observed, in some cases quite dramatic changes through supplementation, they are encouraged to give greater attention to the foods their children are eating.

It is hoped that ultimately changes in diet alone can make the difference, but that is becoming increasingly difficult when children are 'tempted' by the attractively packaged and marketed products that have little nutritional value. The message for all parents is to examine the ratios of omega-6 and omega-3 in their own and their children's diets: ideally they should be somewhere in the region of 2:1. Characteristically, western diets have an excess of omega-6 and so eating oily fish once a week may not achieve the balance. Try and reduce the omega-6 and this combined with an increase in omega-3 could bring about positive benefits.

Madeleine Portwood is a Specialist Senior Educational Psychologist based in Durham. She is Chair of the Education Committee of the Dyspraxia Foundation and Vice Chair of the Brussels-based Charity 'European Children Our Concern (ECOC)'.

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