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[Intervention Review]

Polyunsaturated fatty acids (PUFAs) for children with specific learning disorders

May Loong Tan¹, Jacqueline J Ho¹, Keng Hwang Teh²

¹Department of Paediatrics, Penang Medical College, Penang, Malaysia. ²Department of Pediatrics, Hospital Sultanah Bahiyah, Alor Setar, Malaysia

Contact: May Loong Tan, Department of Paediatrics, Penang Medical College, 4 Jalan Sepoy Lines, Georgetown, Penang, 10450, Malaysia. mltan@pmc.edu.my.

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ABSTRACT

Background

About 5% of school children have a specific learning disorder, defined as unexpected failure to acquire adequate abilities in reading, writing or mathematics that is not a result of reduced intellectual ability, inadequate teaching or social deprivation. Of these events, 80% are reading disorders. Polyunsaturated fatty acids (PUFAs), in particular, omega-3 and omega-6 fatty acids, which normally are abundant in the brain and in the retina, are important for learning. Some children with specific learning disorders have been found to be deficient in these PUFAs, and it is argued that supplementation of PUFAs may help these children improve their learning abilities.

Objectives

1. To assess effects on learning outcomes of supplementation of polyunsaturated fatty acids (PUFAs) for children with specific learning disorders.
2. To determine whether adverse effects of supplementation of PUFAs are reported in these children.

Search methods

In November 2015, we searched CENTRAL, Ovid MEDLINE, Embase, PsycINFO, 10 other databases and two trials registers. We also searched the reference lists of relevant articles.

Selection criteria

Randomised controlled trials (RCTs) or quasi-RCTs comparing PUFAs with placebo or no treatment in children younger than 18 years with specific learning disabilities, as diagnosed in accordance with the fifth (or earlier) edition of the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5), or the 10th (or earlier) revision of the *International Classification of Diseases* (ICD-10) or equivalent criteria. We included children with coexisting developmental disorders such as attention deficit hyperactivity disorder (ADHD) or autism.

Data collection and analysis

Two review authors (MLT and KHT) independently screened the titles and abstracts of articles identified by the search and eliminated all studies that did not meet the inclusion criteria. We contacted study authors to ask for missing information and clarification, when needed. We used the GRADE approach to assess the quality of evidence.

Main results

Two small studies involving 116 children, mainly boys between 10 and 18 years of age, met the inclusion criteria. One study was conducted in a school setting, the other at a specialised clinic. Both studies used three months of a combination of omega-3 and omega-6 supplements

as the intervention compared with placebo. Although both studies had generally low risk of bias, we judged the risk of reporting bias as unclear in one study, and as high in the other study. In addition, one of the studies was funded by industry and reported active company involvement in the study.

None of the studies reported data on the primary outcomes of reading, writing, spelling and mathematics scores, as assessed by standardised tests.

Evidence of low quality indicates that supplementation of PUFAs did not increase the risk of gastrointestinal disturbances (risk ratio 1.43, 95% confidence interval 0.25 to 8.15; two studies, 116 children). Investigators reported no other adverse effects.

Both studies reported attention deficit hyperactivity disorder (ADHD)-related behaviour outcomes. We were unable to combine the results in a meta-analysis because one study reported findings as a continuous outcome, and the other as a dichotomous outcome. No other secondary outcomes were reported.

We excluded one study because it used a cointervention (carnosine), and five other studies because they did not provide a robust diagnosis of a specific learning disorder. We identified one ongoing study and found three studies awaiting classification.

Authors' conclusions

Evidence is insufficient to permit any conclusions about the effect of PUFAs on the learning abilities of children with specific learning disorders. Well-designed RCTs with clearly defined populations of children with specific learning disorders who have been diagnosed by standardised diagnostic criteria are needed.

PLAIN LANGUAGE SUMMARY

Polyunsaturated fatty acids (PUFAs) for children with specific learning disorders

Review question

We reviewed the evidence on the effects of polyunsaturated fatty acids (PUFAs), compared with placebo or no treatment, on reading, writing or mathematical abilities of children up to 18 years of age who have specific learning disorders.

Background

Children with specific learning disorders are those whose abilities in reading, spelling, writing and mathematics are considerably below what is expected for their age, and whose problems are not a result of lower intelligence, inadequate teaching or social deprivation. A child may have a single disorder, such as a reading disorder, or a combined disorder, such as a reading and mathematics disorder. Children may have other problems too, such as attention deficit hyperactivity disorder (ADHD), along with a specific learning disorder.

Polyunsaturated fatty acids are known to be necessary for normal brain development and function. The best known PUFAs are the omega-3 fatty acids, which include docosahexaenoic acid (commonly known as DHA), but the omega-6 fatty acids are also well known. Polyunsaturated fatty acids must be obtained from foods or supplements, as the human body cannot make them from other types of fat. Because they are needed for normal brain growth and development, PUFAs might help children with specific learning disorders.

Study characteristics

The evidence is current to November 2015.

We found two small studies involving 116 children that met our inclusion criteria. Both studies gave children a combination of omega-3 and omega-6 capsules as the intervention for three months. Most of these studies involved boys between 10 and 18 years of age - one was conducted in a school setting, and the other at a specialised clinic. One of the studies was funded by the company that supplied the omega-3 and omega-6 supplements.

Another study could not be included in this review because investigators added carnosine (an amino acid that is highly concentrated in the brain) to the PUFAs. Carnosine and PUFAs might have similar effects, so it would not be possible to separate the effects of the two ingredients. Review authors excluded five studies because it was not confirmed that a specific learning disorder was diagnosed in these children.

Key results

None of the included studies reported effects of PUFAs on reading, writing, spelling or mathematical abilities of children.

Evidence of low quality (because studies included few participants and showed evidence of bias) suggests that using PUFAs did not increase the risk of minor disturbances to the digestive system. Included studies reported no other types of adverse effects.

Both studies reported on ADHD-related behaviour. However, the format of available data did not allow us to readily combine them or to reach any conclusions. Included studies reported no other secondary outcomes.

Conclusion

Evidence is not sufficient to support or refute the use of PUFAs in children with specific learning disorders.