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Investigating the effects of long chain omega-3 fatty acids on primary school achievement

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Abstract

Background: All parents are keen to support their child to learn and grow. A variety of studies have identified benefits to children's cognitive development with omega-3 (ω -3) PUFA supplementation. The majority of these studies however have involved children with learning or behavioural difficulties and have generally utilised highly specific cognitive tests. Few studies have involved healthy normally-achieving mainstream children and even fewer have used classroom tests to identify academic rather than cognitive changes.

Aim: The aim of this study was to investigate whether supplementation with ω -3 PUFA (fish oil) affected the academic achievement of 8-13 year old general classroom children. Whether these children, their parents and teachers could detect changes in learning and behaviour attributed to this supplementation was also investigated.

Methods: A double-blind randomised placebo controlled study over a 15 week period was undertaken with 209 children. Randomisation was stratified for age and gender. These were healthy normally-achieving mainstream children who attended the same school. Every school day the active group consumed 900 mg of omega-3 whilst the placebo group consumed 900 mg of vegetable oil. Changes to academic ability was investigated using the Thurstone Word Fluency Tests (testing fluency and spelling), the NZ generated asTTle reading test and maths basic facts tests. The daily consumption of foods enriched in ω -3 PUFA was assessed using food frequency questionnaires at baseline and recording the child's intake of these foods every day at school for the duration of the study. Possible changes in behaviour and attitude were investigated using children, parent and teacher questionnaires.

Findings: The food frequency questionnaire and intake records identified a low consumption of ω -3 PUFA rich foods. Fish oil treatment did not affect fluency and reading compared to placebo treatment. Significant improvements were identified with fish oil compared to placebo in subgroups of 8-9 year olds for an aspect of spelling and in highly numerate and literate children for division. Parents and teachers did not identify any significant differences between treatment groupings when completing the behaviour questionnaire. Children consuming fish oil reported at 4 and 15 weeks

significant improvements related to getting along with the others compared to children in the placebo group. This trend was also reflected in the teacher questionnaires regarding child behaviour.

Conclusions: Despite some significant improvements being evident, because of the fact that these were only in subgroups and potentially the result of multiple calculations, the notion that omega-3 can influence academic achievement cannot be accepted. These findings however strongly highlight the need for additional research.

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Abbreviations

Abbreviation	Term
AA	Arachidonic Acid
ABC	Aberrant Behaviour Checklist
ADHD	Attention-Deficit Hyperactivity Disorder
AFC	Anterior Frontal Cortex
AI	Average Daily Intake Level
ALA	Alpha-Linolenic Acid
ANCOVA	Analysis of Covariance
ANOVA	Analysis of Variance
asTTle	Assessment Tools for Teaching and Learning
CI	Confidence Interval
CNS	Central Nervous System
COWA	Controlled Oral Word Association
CPRS	Connors Parents Rating Scales
CTRS	Connors Teachers Rating Scales
CVLT	California Verbal Learning Test
DCD	Developmental Coordination Disorder (Dyspraxia)
DGLA	Di-homo-gamma-linolenic acid
DHA	Docosaehaenoic Acid
DLFC	Dorsolateral Frontal Cortex
DPA	Docasapentaenoic Acid
EFA	Essential Fatty Acids
EPA	Eicosapentaenoic Acid
ETA	Eicosatetraenoic Acid
FADS	Fatty Acid Deficiency Symptoms
FFQ	Food Frequency Questionnaires
fMRI	Functional Magnetic Resonance Imaging
FSANZ	Foods Standards Australia New Zealand
GLA	Gamma Linolenic Acid
HVLT	Hopkins Verbal Learning Test
HUFA	Highly Unsaturated Fatty Acids
IRT	Item Response Theory
KABC	Kaufman Assessment Battery for Children
LA	Linoleic Acid
LC PUFA	Long-Chain Polyunsaturated Fatty Acid
LTM	Long-Term (secondary) Memory
MABC	Movement Assessment Battery for Children
MRI	Modern Magnetic Resonance Imaging
MUFA	Monounsaturated Fatty Acids
NEPSY	Neuropsychological Assessment
NZ	New Zealand
PET	Positron Emission Tomography
PPVLT	Peabody Picture Vocabulary Test
PUFA	Polyunsaturated Fatty Acids
RAVLT	Rey Auditory Verbal Learning Test
RBC	Red Blood Cell

ROS	Rostock-Oseretzky Scale,
RCT	Randomised Controlled Trials
RDI	Recommended Daily (Dietary) Intake
SA	Stearidonic Acid
SD	Standard deviation
SDT	Suggested Dietary Target
SFA	Saturated Fatty Acids
SNAP	Swanson, Nolan & Pelham Rating Scale
SOLO	Structure of Observed Learning Outcomes
TEA-ch	Test of Everyday Attention for Children
TOVA	Test of Variables of Attention
TWFT	Thurstone Word Fluency Test
UL	Tolerable Upper Intake Limit
VLFC	Ventrolateral Frontal Cortex
WAIS	Wechsler Adult Intelligence Scales
WIAT	Wechsler Individual Achievement Test
WISC	Wechsler Intelligent Scale for Children- Third Edition
WFT	Word Fluency Tests
WJ	Woodcock-Johnston Psycho-educational Test Battery
WM	Working Memory
WRAT	Wide range Achievement Test
ZPD	Zone of Proximal Development
α	Alpha
ω-3	Omega-3
ω-6	Omega-6