Omega-3 and Omega-6 Polyunsaturated Fatty Acid Levels and Correlations with Symptoms in Children with Attention Deficit Hyperactivity Disorder, Autistic Spectrum Disorder and Typically Developing Controls.

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Abstract

BACKGROUND:
There is evidence that children with Attention Deficit Hyperactivity Disorder (ADHD) and Autistic Spectrum Disorder (ASD) have lower omega-3 polyunsaturated fatty acid (n-3 PUFA) levels compared with controls and conflicting evidence regarding omega-6 (n-6) PUFA levels.

OBJECTIVES:
This study investigated whether erythrocyte n-3 PUFAs eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) were lower and n-6 PUFA arachidonic acid (AA) higher in children with ADHD, ASD and controls, and whether lower n-3 and higher n-6 PUFAs correlated with poorer scores on the Australian Twin Behaviour Rating Scale (ATBRS; ADHD symptoms) and Test of Variable Attention (TOVA) in children with ADHD, and Childhood Autism Rating Scale (CARS) in children with ASD.

METHODS:
Assessments and blood samples of 565 children aged 3-17 years with ADHD (n = 401), ASD (n = 85) or controls (n = 79) were analysed. One-way ANOVAs with Tukey's post-hoc analysis investigated differences in PUFA levels between groups and Pearson's correlations investigated correlations between PUFA levels and ATBRS, TOVA and CARS scores.

RESULTS:
Children with ADHD and ASD had lower DHA, EPA and AA, higher AA/EPA ratio and lower n-3/n-6 than controls (P<0.001 except AA between ADHD and controls: P = 0.047). Children with ASD had lower DHA, EPA and AA than children with ADHD (P<0.001 for all comparisons). ATBRS scores correlated negatively with EPA (r = -.294, P<0.001), DHA (r = -.424, P<0.001), n-3/n-6 (r = -.477, P<0.001) and positively with AA/EPA (r = .222, P <.01). TOVA scores correlated positively with DHA (r = .610, P<0.001), EPA (r = .418, P<0.001) AA (r = .199, P<0.001), and n-3/n-6 (r = .509, P<0.001) and negatively with AA/EPA (r = -.243, P<0.001). CARS scores correlated significantly with DHA (r = .328, P = 0.002), EPA (r = -.225, P = 0.038) and AA (r = .251, P = 0.021).

CONCLUSIONS:
Children with ADHD and ASD had low levels of EPA, DHA and AA and high ratio of n-6/n-3 PUFAs and these correlated significantly with symptoms. Future research should further investigate abnormal fatty acid metabolism in these disorders.