

Eating the right amount of fish: Inverted U-shape association between fish consumption and cognitive performance, and academic achievement in Dutch adolescents

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Eating the right amount of fish

Inverted U-shape association between fish consumption and cognitive performance and academic achievement in Dutch adolescents

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Background

- Brain of adolescents, and especially the prefrontal cortex, continues to mature until their late twenties.
- Omega-3 fatty acids are structural components of the cell membrane.
- They are involved in neuronal membrane fluidity, neurotransmission, signal transduction and blood-brain barrier function.
- Fish consumption, rich in omega-3 fatty acids, has shown its benefits for cognitive functioning in elderly or children with disorders, but has rarely been investigated in relation to cognitive performance and school performance of healthy adolescents.
- Therefore we investigated the association between fish consumption on the one hand and attention, cognitive performance and academic achievement on the other hand in healthy adolescents aged 12-18 years.



Figure 2: Gray matter architecture of the brain.

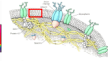


Figure 3: Structural role of fatty acids in the cell membrane.

Methods

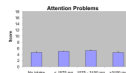
- Cross-sectional study in 700 healthy Dutch high school students aged 12-18 years.
- Fish consumption measured by well-validated questionnaire.
- Outcome measures: scores on Amsterdam Vocabulary Test, Youth Self-Report and end-term grades.
- Covariates: sex, age, and level of parental education.
- Analysis of covariance tests used to examine whether the four fish consumption groups differed in attention, vocabulary, and/or academic performance.
- In order to test for trends polynomial contrast analyses were used.

Results

	No intake	<10 mg	10-30 mg	>30 mg
N (%)	98 (13.7)	441 (63.0)	118 (16.9)	45 (6.4)
Age (yr)	15.1 (1.7)	14.9 (1.5)	15.1 (1.6)	15.2 (1.9)
Gender	37.5	46	41.5	40
Parental education (years)	45.8	45.4	44.9	48.8
LPI	5.5 (1.3)	5.8 (1.4)	5.8 (1.2)	5.6 (1.7)

Note: N=688 = higher parental academic education; LPI = level of parental education.

- Recommended average omega-3 intake from fish is 3150 mg per week.
- Only 6.4% met these national guidelines, 16.9% reached half of the norm, whereas the majority did not eat fish, but either irregularly or too little to meet at least half of the norm.
- Fish consumption did not differ between boys and girls, and educational track, neither it was associated with age, nor with LPI.

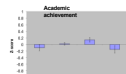


No significant differences between the fish consumption groups regarding attention problems, $F(3,667)=0.54$, $p=.92$.



With respect to vocabulary, significant differences were found between the four fish consumption groups, $F(3,667)=2.50$, $p=.05$.

Polynomial contrast analyses revealed that the relation was quadratic, contrast=-0.39, $p=.01$.



A similar trend for differences between the four fish consumption groups was found regarding academic achievement, $F(3,667)=2.35$, $p=.07$.

Again, polynomial contrast analyses demonstrated a significant quadratic association, contrast=-20, $p=.01$.

Conclusion

- Higher fish consumption is associated with better vocabulary scores as well as better academic achievement.
- However, as soon as the advised norm of 450 mg fatty acids from fish is exceeded, fish consumption is associated with lower vocabulary scores and lower academic achievement.
- Feasible, regular consumption might be, in case of overconsumption of fish, the amount of toxic substances (mercury, cadmium, PCBs, dioxins) present in fish.
- Intervention studies are needed to determine causality in the meantime. It seems prudent to advise adolescents to consume fish twice a week, but not more than that.

