

Maternal diet and fatty acids levels in pregnancy in relation to child IQ

Dr Pauline Emmett

Senior Research Nutritionist

Colin Steer, Berthold Koletzko, Joseph Hibbeln & Jean
Golding

Background

- Brain cell membranes require fatty acids
 - Particularly the LC-PUFA DHA (docosahexanoic acid)
 - Fish is the main dietary source
- Humans can make LC-PUFA from shorter chain fatty acids from diet
 - There are rate limiting enzymes
 - Genetic control of the pathways is important
- In fetal & infant brain development the requirement is large
 - Maternal DHA may be important

The Avon Longitudinal Study of Parents and Children (ALSPAC)

**A contemporary cohort of
British children followed
from before birth**

www.bristol.ac.uk/alspac

The ALSPAC cohort

- 14,000 pregnant women
- EDD April 1991 to Dec 1992
- Living in Avon in South West England
- Information collected by
 - Self-completion questionnaire
 - Medical records
 - Biological samples
 - Hands-on measurements

Food frequency questionnaire

- Asked about food eaten nowadays
- Gave a list of 50 foods to tick
 - meat - 5 separate questions
 - fish - 3 separate questions
 - vegetables - 7 separate questions
 - fruit - 3 separate questions
 - breakfast cereals - 3 separate questions
 - and so on

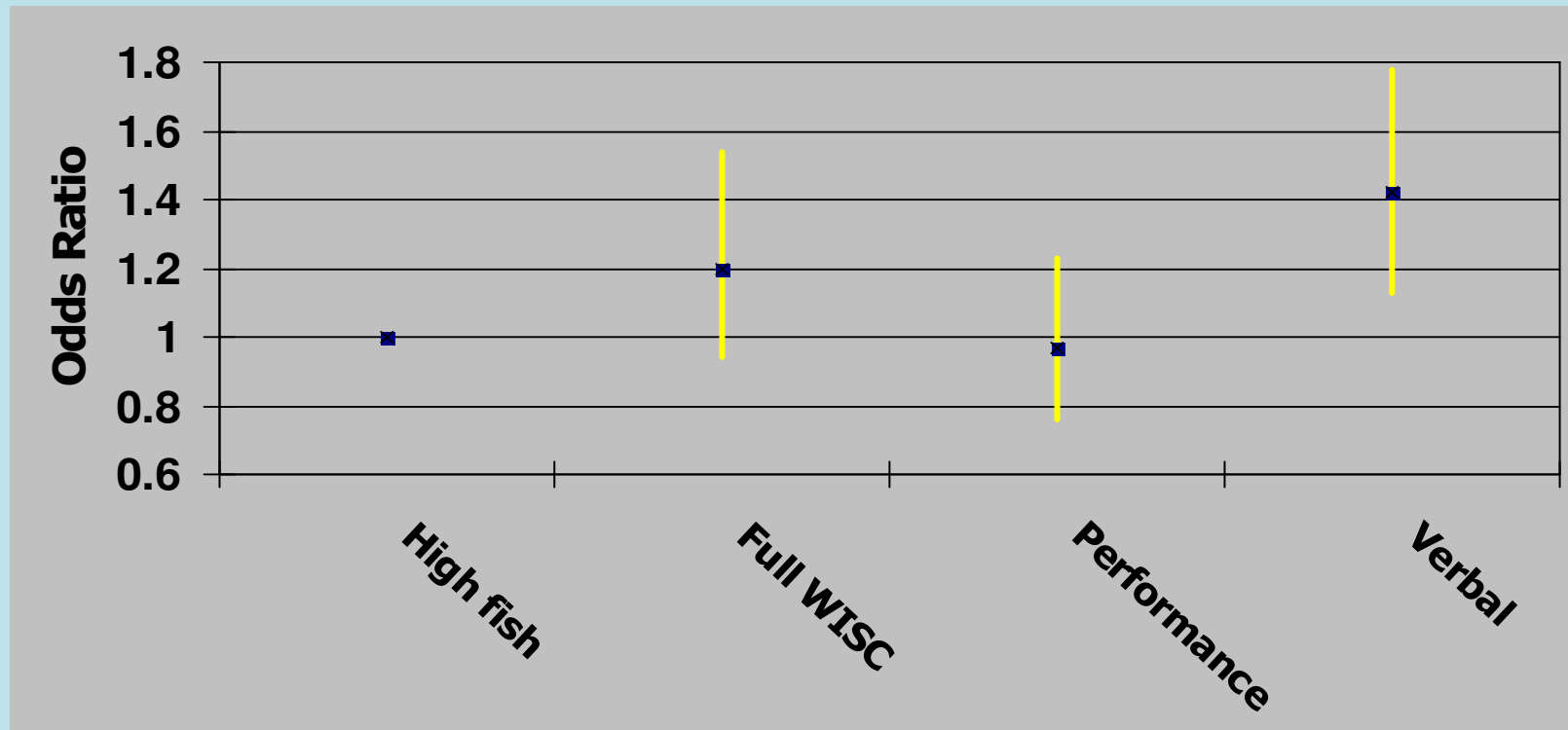
Children tested at age 8 years (n=6000)

- IQ measured by WISC
 - Performance and verbal sub-scales
- Fish eating
 - Maternal – 32 week pregnancy
 - None, low & high intakes
- Confounders
 - Maternal education, age, smoking, housing
 - Sex of child, breast feeding

Lancet 2007;369:578-85

Fish consumption in pregnancy (none v high) related to IQ at 8 yrs (adjusted)

(risk of being in lowest 25%; n = 5262 - 5686)



Maternal Blood Fatty Acids

- Collected in pregnancy
 - 4900 samples
- 13 saturated, 11 monounsaturated
- 8 omega-6, 7 omega-3
 - Including DHA (22:6n-3) & EPA (20:5n-3)
- 2750 with maternal fatty acids and child IQ

Dietary associations with Fatty acids



- Fish eating associated with 22:6n-3 DHA (**Docosahexanoic acid**)
- ‘Processed food’ pattern associated with 18:1n-9 (**trans fatty acid**)
- ‘Healthy’ dietary pattern associated with 18:2n-6 (**Linoleic acid**)

Unadjusted associations of Maternal FAs with child IQ

- Verbal IQ stronger than performance IQ
- Negative associations ($p < 0.001$) with
 - 16:1, 18:1n-9
- Positive associations ($p < 0.01$) with
 - 15:0, 19:0, 18:2n-6 & 22:6n-3

Adjusted associations of Maternal FAs with child IQ

- Adjusted for same factors as previous work [Lancet 2007;369:578-85](#)
 - Maternal education & age, housing, crowding, smoking & alcohol in pregnancy, life events, family adversity score
 - Parity, sex, breastfeeding
 - Further adjusted for parenting at 6 m
- All associations became null on adjustment

Conclusion

- Previous work - positive association of fish eating with child IQ (adjusted)
- No associations of child IQ with maternal blood Fatty Acids after adjustment
- Fish contains many other nutrients which could influence IQ
 - Iodine, Vitamin D, Selenium for example
 - Perhaps IQ is not the best measure to use in relation to DHA

Acknowledgements

- ALSPAC participants & study team
- Funding for this work
 - ❖ National Oceanic & Atmospheric Administration (NOAA), USA Government
 - ❖ Nutrimenthe EU FP7 GA n^o: 212652