



FOOD & BEHAVIOUR

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THE BASICS:

Nutrition, Behaviour, Learning & Mood

- It takes the **right nutrients** for kids brains & bodies to develop, grow & function properly
- Many children's diets are **high in** calories, sugar, refined starches, wrong fats, & artificial additives, **but lack** essential nutrients
- The risks to physical health of '**junk food**' diets are now recognized, but their effects on children's behaviour, learning & mood are still largely ignored (**research is limited**)
- Not just about Nutrition (**Tom's food aversion**)



FOOD & EMOTIONS:

- Research has linked **diets that cut down on all types of fat** with an increase in symptoms of depression.
- Caffeine increases mental alertness and concentration and can improve performance. However, too much caffeine has been found associated with anxiety, cravings, depression, emotional instability, insomnia, mood swings, and nervousness. **(Caffeine is now found in many soft drinks & candy bars. Children's average daily intake is 63mg, equivalent to half a cup of coffee)**
- Emotional outbursts & hyperactivity may be associated with Food Intolerance or allergy **(Elimination vs Rotation Diets)** The rotation diet method for planning meals is highly recommended as a method for managing multiple food sensitivities **(the advantage is that you don't need to cut out any problem foods completely. It can also be used to detect hidden food allergies & minimize the risk of developing new sensitivities).** KIRALEE / NZ



SEROTONIN: The feel good neuro-chemical

- Serotonin is the neurotransmitter responsible for **mood, sleep and appetite** control.
- Vitamin B6, Vitamin C, Folic Acid (Folate) and Zinc are all essential good mood nutrients. They are needed to make serotonin (**from tryptophan [trip'-ta-fan] protein, also found in meat, fish, beans & lentils**).
- Turkey & chicken are especially good sources of tryptophan, **an essential amino acid** which is converted into mood enhancing serotonin
- Carbohydrates are made from tryptophan, and are therefore absorbed more quickly into the brain for serotonin production. **Carbohydrate cravings may be a subconscious attempt to raise serotonin levels.**



HYDROGENATED & TRANS FATS
REFINED CARBOHYDRATES
ADDED SUGARS
CHEMICAL ADDITIVES



HYDROGENATED & TRANS FATS

(SER, DOP, NorE)

Linked with: Dyslexia, Dyspraxia, LD, ASD



Where they are found: Cakes, pastries, biscuits, bread, margarine, snacks (such as popcorn), commercially fried foods – including some French fries & hamburgers



What they do: Unlike the liquid omega-3 fatty acids lacking in most children's diets, these solid man-made fats have been shown in animal studies to make the brain membrane less fluid – and there is good evidence that they alter the signaling ability of neurotransmitters or chemical messengers.





REFINED CARBOHYDRATES

(Sucrose/Glucose/Starch ≠ Dopamine & Norepinephrine)

Linked with: Irritability, depression, aggression, low IQ, antisocial behaviour, reduced sense of smell and taste (affecting appreciation of healthy food).

Where they are found: Products made from processed white flour (white bread and pasta), cereals, potato-chips and snacks.

What they do: It isn't so much what they do as what they don't. A diet high in refined carbs is likely to be low in trace minerals selenium (linked to irritability and depression), & chromium (blood-sugar control), zinc, iron and B vitamins.

- 14-year study examining the links between childhood diet & antisocial behaviour as teenagers, malnourished children (characterized by zinc, iron, vitamin B & protein deficiencies) showed low IQ - led to later antisocial behaviour, 51% rise in aggression at 17.
- 2002 study of young offenders in prison: diet was supplemented with vitamins and essential fatty acids. Antisocial behaviour fell by 35%



ADDED SUGARS

(≠ Tryptophan - essential amino acid/protein)

Linked with: Mood swings, hyperactivity, -concentration

Where they are found: Sugary drinks, sweets, coated breakfast cereals, chocolate (in which sugar is often number two in the ingredients, after milk).

What they do: As a fast-acting carbohydrate, sugar is claimed by some to boost blood-sugar levels & create a surge of energy and an upbeat mood. Its 'empty calories' contribute nothing in terms of nutrition. If children slurp cans of sugary drinks on the way to school, it puts them on an artificial high in terms of brain function, but that stimulates the release of too much insulin which causes blood-sugar levels to plummet. In a short time, their brains are in a fog. They can't concentrate, they're irritable and find it hard to hold on to stable emotional reactions. So far, evidence has been largely anecdotal.



CHEMICAL ADDITIVES

(≠ Dopamine)

Linked with: Hyperactivity, Tantrums.



Where they are found: Potato chips, snacks, sweets and drinks, particularly those with an orange or yellow colour. About 40 per cent of products aimed at children contain chemical additives. Among those claimed to influence behaviour are sunset yellow (E110), carmazoine (E122), ponceau 4R (E124) and the preservative sodium benzoate (E211). MSG, a flavour enhancer in snacks, is another. 'Glutamate is a brain stimulant in the way it's given, because it enhances sensory perception by making things taste better. Some children react badly to it.



What they do: Southampton University study in 2002 found that a quarter of three-year-olds consuming E-additives in a drink showed signs of hyperactivity and tantrums.

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A FISHY HISTORY?



ESSENTIAL OILS



Oxford University, Hugh Sinclair: 1940s

Inuit ate vast amounts of fat yet hardly ever suffered from heart disease. **Theory:** due to the protective effect of one fat, omega-3, found in oily fish (e.g., salmon).

How can fat be good for us? YOUR FIRED!

'Eskimo diet' for 100 days (seal blubber and fish) =

Lost weight despite eating half a kilo of fat per day, and blood become very thin (excessive bleeding). **Theory:** Omega-3 prevents red blood cells from being sticky and therefore clot less and reduce heart failure. **Confirmed!**

1970's: Omega-3 = an essential component of the brain, including the visual system and enhancing mood (-DEP).

Contemporary research: Numerous studies now show omega-3 positively impacts autism, dyslexia, & even IQ.



WHAT'S ALL THE FUSS ABOUT?

- For optimal brain development, the ratio of omega-6 (cereals, whole-grain breads, vegetable oils, eggs & poultry) to omega-3 (cold water oily fish [salmon, herring, mackerel, anchovies & sardines], walnuts, flax (linseed oil) **4:1 or lower**
- The **current** dietary ratio of omega-6 to omega-3 fats ranges from **14:1 to about 20:1** in the western world

Modern diet: Deficient in omega-3 fatty acids & **high saturated & trans fats** (artificial fats found in processed food) linked with auto-immune & Mental Health conditions

RESTORATION: Omega-3s are known to have **membrane-enhancing & damage repairing capabilities** in brain cells (fortifying the myelin sheaths – electric-wave impulse). Not coincidentally omega-3 fatty acids comprise **8% of the brain**



GOING DEEPER?

The two most important omega-3 fatty acids for brain function and brain development are eicosapentaenoic acid (EPA) & docosahexaenoic acid (DHA). (These can be found directly only in fish & seafood. Oily fish contains more EPA & DHA than white fish).

Standard recommends are that children eat at least two portions of fish per week (one of which should be oily fish), providing around 1-2 grams of EPA and DHA combined. However some children may benefit from a much higher intake of these complex omega-3 (as suggested by treatment studies in psychological conditions including dyslexia, ADHD, depression or schizophrenia).

Vegetarians have no direct source of EPA & DHA in their diet, so rely on the body converting a simpler omega-3 fatty acid (alpha-linolenic acid - ALA) into EPA & DHA. ALA is found in green vegetables & some nuts and seeds (conversion of ALA to EPA & DHA appears limited in both males & young infants: tends to decline in senior yrs).

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WARNING SIGNS of Fatty Acid (EPA & DHA) Deficiency

- **Physical** (excessive thirst, frequent urination, rough or dry 'bumpy' skin, dry, dull or 'lifeless' hair, dandruff, & soft/brittle nails)
- **Allergic tendencies** (eczema, asthma, & hay fever)
- **Visual symptoms** (sensitivity to bright light, poor night vision, or visual disturbances when reading - e.g. letters & words may appear to move, swim or blur on the page)
- **Attentional problems** (distractibility, poor concentration, working memory difficulties)
- **Emotional sensitivity** (such as depression, excessive mood swings or undue anxiety)
- **Sleep problems** (especially difficulties in settling at night & waking in the morning)



HARVARD MEDICAL SCHOOL

Fish Consumption by Pregnant Women May Increase Cognitive Ability in Infants

Environmental Health Perspectives (2005)



- Nutrients in fish, such as n-3 polyunsaturated fatty acids, appear to **play a critical role** in an infant's neurocognitive development.
- Pregnant women who limit fish in their diets (**to avoid mercury toxicity which can harm the neurological development of fetuses**) may have the unintended consequence of depriving fetuses of essential nutrients.
- Contrary to popular belief, **tinned tuna is not a good source of omega-3 essential fatty acids** as the canning process reduces the tuna's fat content. Fresh tuna also does not contain as much omega-3 essential fatty acids as other types of non-white fish.

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ROLE OF OMEGA 3 Fatty Acids in behaviour, cognition & mood

Richardson, A.J. (2003)

- ADHD, dyslexia, dyspraxia, autistic spectrum disorders, depression, bipolar (manic-depressive) disorder & psychosis – may involve functional deficiencies of certain highly unsaturated fatty acids (HUFA). **EEG/Diet**
- These conditions often overlap within individuals & cluster in the same families (**shared biological risk factors may include inefficiencies of fatty acid metabolism** that increase the usual dietary requirements for HUFA).
- Existing evidence indicates benefits from increased omega-3 intake – **yet further trials are still needed.** Nutritional approaches should always be seen as complementary to other methods of management for these conditions.



BREAKFAST reduces declines in attention & memory over the morning in schoolchildren

Wesnes, K.A., Pincock, C., Richardson, D., Helm, G., Hails S. (2003)

- Twenty-nine schoolchildren were tested throughout the morning on 4 successive days, having a different breakfast each day (either the cereals Cheerios or Shreddies, glucose drink or No breakfast). Tests of attention, working memory & episodic secondary memory were conducted prior to breakfast & again at 30, 90, 150 & 210 mins.

‘Glucose Drink’ and ‘No Breakfast’ conditions were followed by declines in attention and memory. Declines were significantly reduced in the two cereal conditions.

Cereals rich in complex carbohydrates may help maintain mental performance over the morning. Highs & lows of mood & energy associated with blood sugar levels can be avoided by choosing foods that are digested slowly



**HYPERACTIVE
IMPULSIVE
INATTENTIVE**

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YOU MAY BE SURPRISED TO KNOW...

- Iron deficiency causes abnormal dopaminergic neurotransmission and may contribute to the physiopathology of ADHD. Preliminary studies suggest that ADHD children may benefit from iron supplements
- Zinc sulphate (as an adjunct to methylphenidate) has been found effective for the treatment of ADHD
- **L-carnitine** deficiency has been indicated in the physiopathology of ADHD, either as a primary (inborn errors of metabolism) or secondary condition (inadequate intake or induced by medications).
 - Taken as a nutritional supplement, labeled vitamin Bt, L-carnitine is responsible for the transport of fatty acids.
 - Natural carnitine can also be synthesized in the body from vitamin C.



MULTI-VITAMIN & MINERAL SUPPLEMENTS

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The V-B Factor



Researchers from **Stonybrook University Medical School in New York** investigated the impact of B vitamins on academics. Their study showed significant academic and behavioral improvements after only a few weeks of supplementation, with some children **gaining 3-5 years in reading comprehension** after 1 year of treatment. The researchers also reported that for those students who discontinued supplement usage, academic **declines were not apparent for at least 1 year**, with significant drops not occurring until 2 years after treatment was stopped. **(Cortisol?)**



Early Childhood:

- Supplements have been shown to **give kids a healthful boost** in brain power for academic performance, fewer sick days, as well as decrease in oppositional, disruptive and bullying behavior.
- A survey of 1,372 parents indicated that children taking supplements were **more likely to show improvement** in concentration (37 percent), grades (31 percent), energy (55 percent) and self-esteem (37 percent), as well as having reductions in irritability (31 percent), depression (29 percent) and anger (27 percent).

Emerging Research:

- 6-month study involving 220 Chinese students (8-12 years old) showed that students who take multivitamins not only have **better reading speed, learning capacity & math skills** than children taking a placebo, but they also have higher bone mineral content & bone mass density as well.
- 245 children receiving low-dose multivitamin & multimineral supplements demonstrated significant IQ gains. (**Interestingly, minority children exhibit greater gains due to the greater potential for inadequate nutrient intake among minority students**).



Food and Behaviour Research
www.fabresearch.org

The Food and Mood Community Interest Company
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