

Effects of Nutrition and Exercise on Cognitive Performance

Diet, nutrition and exercise are as important in chess as they are in any other sport. The following is a brief guide containing basic advice on nutrition and exercise for optimum physical and cognitive performance. It should be noted from the outset that the advice is general and may not apply to everyone, especially those with underlying medical conditions. As always, the age-old direction to eat a balanced diet and take moderate exercise remains completely valid – anyone interested in creating a detailed, bespoke diet or exercise program should consult their own healthcare professional to devise the best personalised plan.

DIET AND NUTRITION

A balanced diet is as essential for cognition as for any other bodily process – you require protein, carbohydrates, vitamins, minerals and fats for your brain and your body to function properly. A diet high in saturated fats and refined sugars such as sucrose and fructose can contribute to cognitive impairment and decline. To take an advanced case, memory impairment has long been observed in adults with type-2 diabetes and numerous studies have demonstrated that both poor glycemic control and acute ingestion of high glycemic index carbohydrate foods leads to lower performance and memory impairment. For a brief summary see, Barnes J and Joyner M, ‘Sugar highs and lows: the impact of diet on cognitive function’ (2012) 690(12) *Journal of Physiology* 2831.

The consumption of vitamins and minerals can positively affect cognition whilst the consumption of, for example, saturated fats, can have a negative effect on neural plasticity and cognitive function. Omega-3 fatty acids can affect synaptic plasticity and cognition. Adequate levels of folic acid are essential for brain function. See Fernando Gomez-Pinilla, ‘Brain foods: the effects of nutrients on brain function’ (2008) July 9 *Nature* 568 for an overview of the effect of nutrients and diet on brain function. Another good summary of relevant research can be found at Christy C. Tangney and Nikolaos Scarmeas, ‘The good, bad, and ugly? How blood nutrient concentrations may reflect cognitive performance’ (2012) 78 *Neurology* 230. An excellent recent collection is Best T and Dye L (eds), *Nutrition for Brain Health and Cognitive Performance* (CRC Press 2015).

As always, consuming a healthy, balanced diet and exercising moderately and regularly is the best advice for maintaining optimum cognitive and physical health. The following are good general rules:

1. Eat more vegetables and fruits – vegetables especially. Your diet should be rich in variety and colour – different vegetables are implicated in various health benefits.
2. Be aware of where you are getting your protein: fish, poultry, nuts and beans are far better for your long-term health than excessive consumption of red meats such as beef.
3. Don't cut out carbohydrates altogether – consuming carbohydrates is essential, especially for cognitive function and performance, the brain essentially runs on carbohydrates and sugars so depriving yourself of necessary energy can only impact your performance negatively. However, choose good carbs in preference to bad ones – whole grains and carbs with a high glycaemic index are healthiest.
4. Good fats and fatty acids are essential for the optimum functioning of your body and brain – oily fish (see Omega-3 advice below) and nuts are good sources of healthy fats. Avoid saturated fats and trans fats – these are almost always found in processed and fast foods.
5. A fibre-rich diet high in whole-grains, vegetables and fruits is healthy and excellent for gastrointestinal health.
6. Water always was, and still is, the best way to rehydrate. Sugary drinks contain ‘empty calories’ with almost no nutritional value and are very high in sugar.

OMEGA-3 FATTY ACIDS

These are essential fatty acids but the body can't make them so they have to be ingested through the food you eat. Omega-3 fatty acids are polyunsaturated fatty acids necessary for numerous bodily functions including building cell membranes in the brain. There are two types of omega-3 fatty acids: Alpha-linolenic acid (ALA) found in some green vegetables such as Brussels sprouts, spinach and green salad, soybean and flaxseed vegetable oils and walnuts. Eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) is found in fatty fish; some good sources of these omega-3 fatty acids are salmon, tuna and halibut.

These fatty acids play a crucial role in brain development, are highly concentrated in the brain and appear to be highly implicated in cognitive performance, both memory and executive processing, and behavioural function. The American Heart Association recommends eating fish, especially fatty fish such as mackerel, lake trout, herring, sardines, tuna and salmon at least two times a week.

Haast, Roy AM et al, 'Impact of fatty acids on brain circulation, structure and function' (2014) 92(Jan) *Prostaglandins Leukotrienes and Essential Fatty Acids* 3-14.

Fotuhi M, Mohassel P, Yaffe K, 'Fish consumption, long-chain omega-3 fatty acids and risk of cognitive decline or Alzheimer disease: a complex association' (2009) Mar 5(3) *Nature Clinical Practice Neurology* 140-52.

Yashodhara BM, 'Omega-3 fatty acids: a comprehensive review of their role in health and disease' (2009) 85(1000) *Postgraduate Medical Journal* 84-90.

VITAMINS

A recent study examining the connection between good nutrition and optimum cognition used biomarkers in the blood to correlate vitamins with improved or diminished brain health. The researchers found persuasive connections between diet and brain health – high levels of omega-3 fatty acids, the B family of vitamins, and vitamins C, D and E correlated with higher cognitive test scores. Higher levels of trans fats, obtained mainly from fried, processed and fast foods were associated with poorer performance in thinking and memory tests. The team concluded that nutrient intake had a definite and sustained impact on thinking and memory function.

See Bowman GL, Silbert LC, Howieson D et al, 'Nutrient biomarker patterns, cognitive function, and MRI measures of brain ageing' (2012) 78 *Neurology* 241.

The following is a link to an excellent website that accurately summarises much of the recent science concerning diet and the healthy brain:

<http://www.thedoctorwillseeyounow.com/content/nutrition/art3258.html>

EXERCISE

Exercise is important for maintaining both physical fitness and cognitive performance. Increased physical activity has a direct and relatively rapid effect on cognition and brain health. Both aerobic and resistance training are important for maintaining optimum brain health, especially with regards to memory and executive processing functions. A regime of moderate, frequent and varied exercise

is recommended. Please see the articles below for summaries of the current science with regards to cognition and exercise.

Hopkins ME, David FC et al, 'Differential effects of acute and regular physical exercise on cognition and affect' (2012) 215 Neuroscience 59.

Ratey JJ, Loehr James, 'The positive impact of physical activity on cognition during adulthood: a review of underlying mechanisms, evidence, and recommendations' (2011) 22 Rev Neuroscience 1.

Voss MW, Nagamatsu LS, 'Exercise, brain, and cognition across the life span' (2011) 111(5) Journal of Applied Physiology 1505.

PLEASE BE AWARE THAT NONE OF THE INFORMATION PROVIDED HERE SHOULD BE VIEWED AS DIRECT MEDICAL ADVICE AND SHOULD NOT BE PREFERRED TO THE ADVICE OF YOUR PRIMARY PHYSICIAN. IF YOU HAVE ANY QUESTIONS REGARDING YOUR DIET OR EXERCISE REGIME YOU SHOULD FIRST SEEK THE ADVICE OF YOUR PRIMARY CARE PHYSICIAN.