

Equazen, science pioneers and creators of brain health supplements*, has teamed up with the ADHD Foundation to help explain the importance of good brain health, celebrate neurodiversity as well as being proud supporters of the Schools Neurodiversity week



Fish, Brains and Dreams

Lesson Plan KS3 and KS4

These activities, suitable for 11-15 year olds, each take about 20 minutes, and can be used separately or together, depending on the time you have.

CURRICULUM LINKS:

● SCIENCE:

○ BIOLOGY:

- structure and function of the brain;
- functions of cell membranes and communication between them; nutrition;
- importance and role of healthy omega 3 fats for the brain;
- association between omega fats and learning differences such as ADHD, dyslexia, dyspraxia and the autistic spectrum

● DESIGN AND TECHNOLOGY (DT):

○ DESIGN AND PREPARE A MEAL CONTAINING FISH

AIM:

- To understand the importance of Omega Fatty Acids for a healthy diet, brain health, development and behaviour, reading ability and memory
- To understand brain health in the context of neurodiversity and learning differences such as ADHD, dyslexia, dyspraxia and the autistic spectrum

THEMES: fish, nutrition and healthy eating, brain development, brain health, brain nutrition, omega fatty acids

RESOURCES NEEDED:

- Interactive brain map/flyer
- Outline of brain diagram with separate labels (science, reading, logics, mathematics, speech/ languages; creativity, music, art, imagination, space orientation, emotions) – 10 copies of each outline and 10 copies of each label
- Celebration of Neurodiversity Week poster (see schools pack)
- Omega fats information sheet (provided leaflet)

**DHA contributes to the maintenance of normal brain function.
The beneficial effect is obtained with a daily intake of 250mg of DHA*

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ACTIVITY 1

Which parts of the brain are responsible for different activities?

AIM TO CONSIDER THE FUNCTIONS OF THE LEFT AND RIGHT SIDE OF THE BRAIN

Split the class into smaller groups. Get a member of each group to be the 'scribe'.

Give each group a copy of the outline of the brain diagram. Ask them to divide the diagram into right and left. Give each group each of the ten labels for the brain diagram. Ask them to place each of the labels on either the right or left of their diagram. (Whilst each of the labels should be placed at a specific point on the left or right brain, ask only whether each label refers to the left or right brain.)

DISPLAY THE INTERACTIVE BRAIN MAP

ASK pupils what they think are the overall differences in the activities of the left and right hemispheres.

EXPLAIN that we use the left brain for logical thinking and the right brain for creative thinking.

BACKGROUND (FOR THE TEACHER) Some experts think the left and right brain concept is not so clear cut although language as a feature of the left hemisphere is thought to be unambiguous. There is little doubt that there are anatomical differences and functions between the left and right sides of the brain.

ASK pupils if they can give a common practical example of the left/right brain distinction (clue: one that they experience throughout much of the day)

Explain that left and right handedness is the best-known example. The right side of the brain controls the left side of the body and vice versa, and humans are typically more dexterous with one hand than the other, so we say that one side of the brain is "dominant". But it is also true that normal behaviour requires cooperation between the two hemispheres and that rational thinking is not diametrically opposed to creative thinking.

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ACTIVITY 2

The importance of communication in the brain

AIM TO CONSIDER SOME CORE CONCEPTS OF NEUROSCIENCE

ASK pupils to identify what types of cells are in the brain and how many there are.

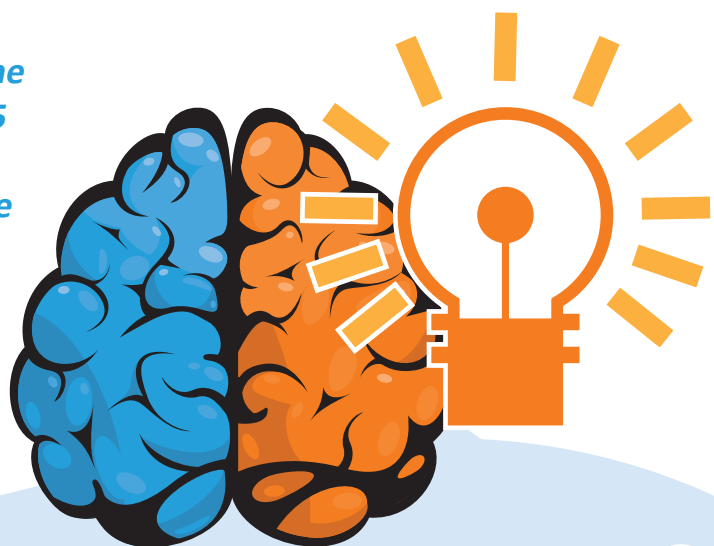
EXPLAIN that a human brain contains 86 billion nerve cells or neurons, of which there are 10,000 types. Neurons communicate with each other, relaying messages throughout the body that power thoughts and actions, using both chemical and electrical signals. A chemical signal crosses the gap (known as a synapse) to the next cell. Neurons are parts of huge electrical circuits, all of which are present before you are born, and which power different types of activities from thinking and saying to feeling and doing. High level brain functions like memory and decision making require highly complex neuron circuits.

The biggest part of the brain is called CEREBRUM. It is the CEREBRUM which is the thinking part of the brain and there are two halves to our brains. See activity lesson 3 for more biology on how the brain works.

One thing that makes humans special is the ability to speak and use language. The human brain possesses an enormous cerebral cortex with neural circuits dedicated to language.



Did you know that the brain runs on only 25 Watts of electricity – enough to power one LED bulb?



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ACTIVITY 3

What is the importance of nutrition for the brain?

AIM TO EXPLORE THE KEY ROLE OF NUTRITION IN THE BRAIN, SPECIFICALLY THE ROLE OF FISH AND OMEGA FATS

ASK the pupils what are the main nutrients in the diet. You could split them into groups or simply ask them to respond as a class.

EXPLAIN OR RATHER REVISE WHAT THEY WILL KNOW: protein, fat, carbohydrate, vitamins and minerals – they may also name specific vitamins and minerals.

ASK which nutrients they think are the most important for brain health.

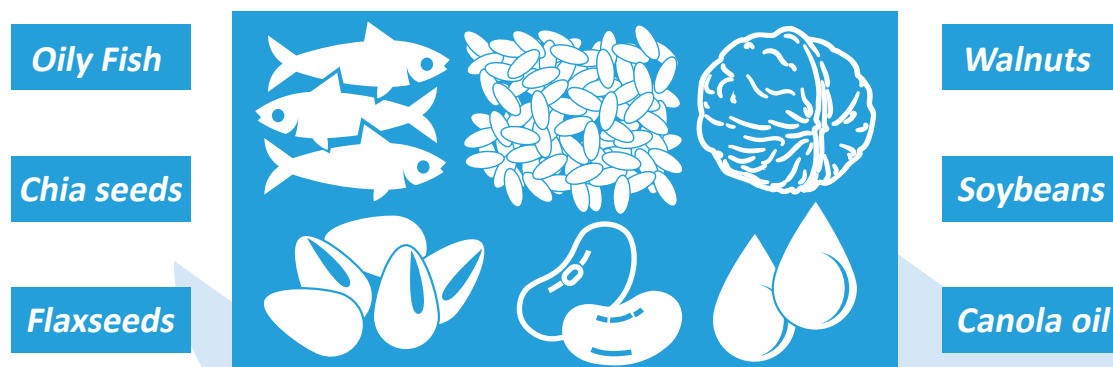
EXPLAIN all nutrients are essential for the brain but explain the importance of fat – that the brain is made up of 60% fat. This makes the intake of dietary fat important.

Continue by explaining about the different types of fat in the diet – saturated fat and unsaturated fat.

Highlight the importance omega 3 fats, particularly DHA (docosahexaenoic acid) for brain health.

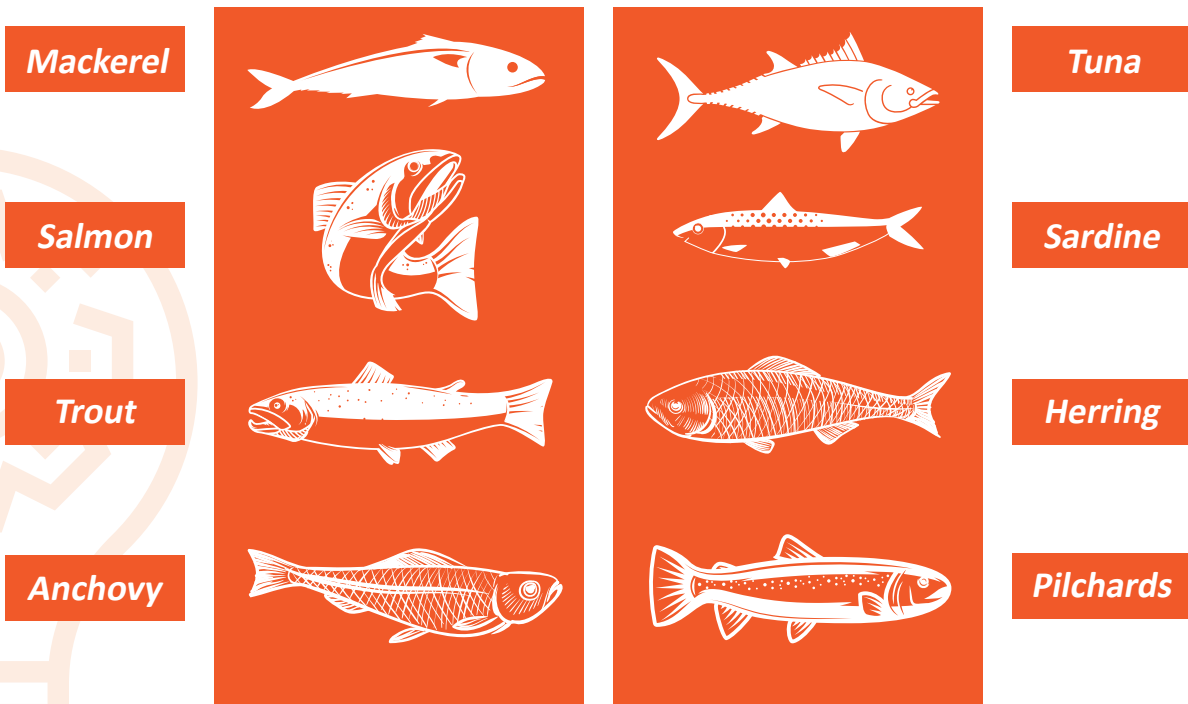
ASK the pupils where omega 3 fats can be found in the diet.

DISPLAY slide. Food sources of omega 3s. Emphasize the importance of oily fish as a source. Although omega 3s can be found in the other foods, it requires converting to DHA. Only oily fish in this slide contains pre-formed DHA.



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ASK pupils to identify some oily fish. Show the next slide.



EXAMPLES OF OILY FISH – SALMON, TUNA, TROUT, MACKEREL, HERRING, SARDINE, ANCHOVY, PILCHARDS

ASK pupils what is the recommended intake of oily fish each week. How much should they be eating?

EXPLAIN that it is one portion each week and fish fingers do not count.

- Average intake of oily fish, our best dietary source of omega-3, is 54g per week, less than half the recommended 140g¹. Children often have inadequate omega-3 status
- High intakes of DHA enhance learning² and low intakes are linked to an increased risk of attention deficit hyperactivity disorder (ADHD) and behavioural change.³

(OPTIONAL EXERCISE) ASK pupils to plan a school lunch menu (can include a lunch they bring from home) containing a portion of oily fish.

¹ https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/310995/NDNS_Y1_to_4_UK_report.pdf

² <https://www.ncbi.nlm.nih.gov/pubmed/10479465>

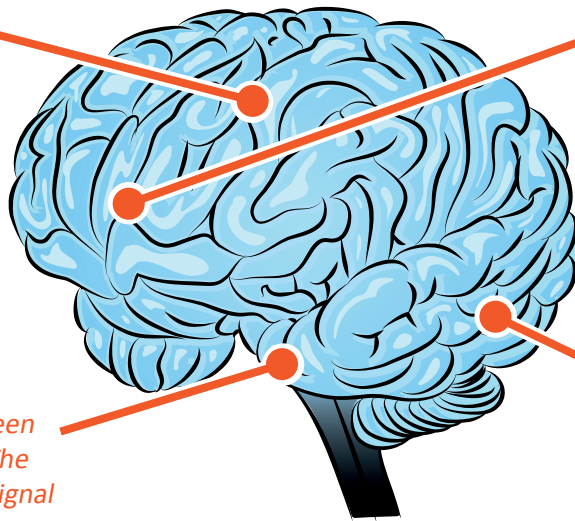
³ <https://www.ncbi.nlm.nih.gov/pubmed/10479465>

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EXPLAIN WHY DHA IS SO IMPORTANT FOR BRAIN HEALTH

The hippocampus is responsible for memory and recall. regular intake of DHA increases DHA levels in the hippocampus, helping cells linked with memory relay increased electrical signals

Electrical signals between nerve cells (neurons) The omega-3 DHA boosts signal transmission



Regular omega-3 intake linked to reduction in risk of brain shrinkage, which is most pronounced in the forebrain region responsible for cognitive function and memory.

DHA can cross the blood-brain barrier and be incorporated into the structure of brain helping to maintain brain health

- Evolution of our large human brain depended on a plentiful source of DHA from fish and marine sources.⁴
- DHA in particular is important for the structural integrity of the brain and may be the most important nutrient for brain health throughout life.⁵
- DHA is foundational for the brain, like the foundation when building a house. It is the most important building block. Without this DHA foundation, it is difficult to build a healthy brain.
- DHA is the preferred foundation for the building of cell membranes and nerve cells.
- DHA accounts for 97% of the omega-3 fatty acids in the brain.⁶
- DHA is a major structural component of the cerebral cortex, the part of the brain responsible for memory, language, creativity, attention and emotion.⁷
- DHA play a major role in brain communication – the signals between nerve cells generated by chemical transmitters.⁸
- DHA increases nerve cell transmitter density so allowing the brain cells to better use brain chemicals.⁹

⁴ <https://www.ncbi.nlm.nih.gov/pubmed/10419087>

⁵ <https://www.ncbi.nlm.nih.gov/pubmed/20329590>

⁶ <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2621042/>

⁷ http://www.dartmouth.edu/~rswenson/NeuroSci/chapter_11.html

⁸ <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3792211/>

⁹ <https://www.sharecare.com/health/omega-3-fatty-acids/wha-health-benefits-docosahexaenoic-acid>

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DID YOU KNOW?

Omega-3 fatty acids are known as “essential fatty acids” because they cannot be synthesized in the body and have to be obtained from our diet. Although we cannot synthesize these fatty acids ourselves, they play an important role in almost every cell.

EPA (known as eicosapentaenoic acid) - is one of the fatty acids that make up the group we know as omega 3 and is found in oily fish.

DHA (Aka docosahexaenoic acid) - another omega-3 marine fatty acid, provides the building blocks of the brain and eyes. It makes up 40% of the polyunsaturated fatty acids, or PUFAs, in the brain and 60% of those found in the retina.

FURTHER INFORMATION

NED HERRMANN. Is it true that creativity resides in the right hemisphere of the brain?

<https://www.scientificamerican.com/article/is-it-true-that-creativit/>

BRAIN FACTS. A primer on the brain and nervous system.

<https://www.brainfacts.org/the-brain-facts-book>

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