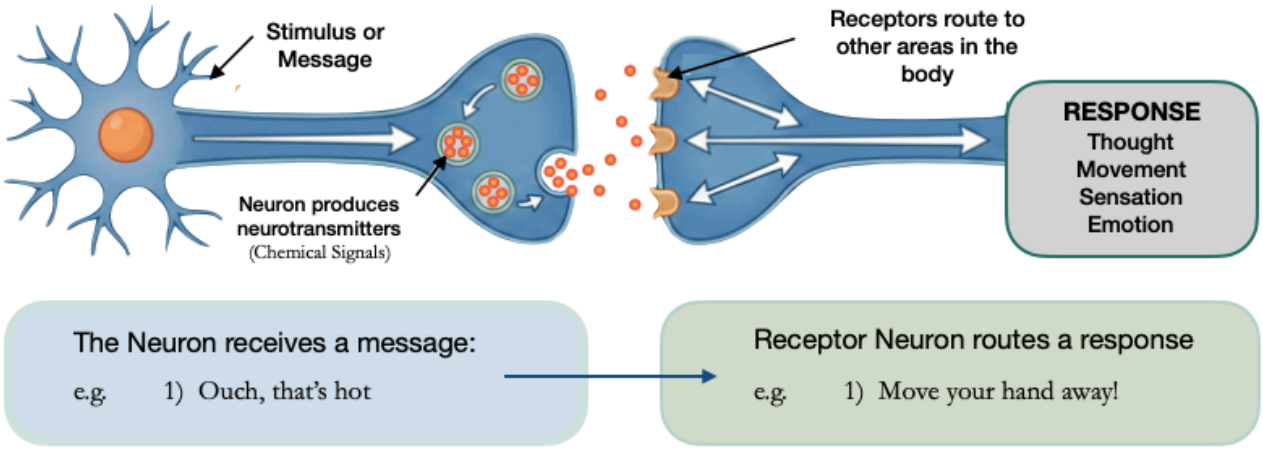
A Neuroscience Guide to the Basics:

The Field of Neuroscience:

Neuroscience studies the nervous system, observing interactions between thoughts, emotions and behaviours, and how they, in turn, affect and are affected by the body. Neuroscience provides an evidence-based *how* & *why* behind practices known to be beneficial (nutrition, sleep & exercise).

How your brain speaks to your body:



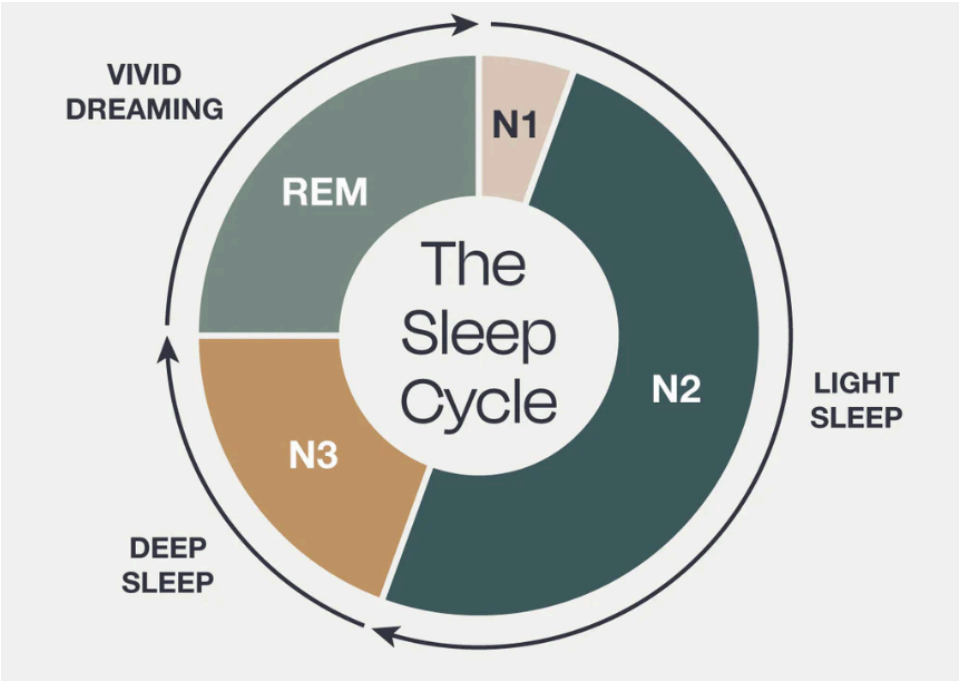
Sleep (A Tale of Two Cycles):

Cycle 1 - Circadian Rhythm

This cycle describes the impact our environment has on the desire to sleep and stay asleep. Internal body clocks respond to changes in light and temperature (both dip as night falls). The brain responds by releasing the hormone *melatonin*, which in turn reduces the core body temperature and increases drowsiness. The opposite happens in the morning; as daylight increases, the brain releases *cortisol* (the stress hormone) to make us more wakeful.

Implications

- Keep a consistent sleep cycle (sleep and wake at the same times on weekdays and weekends).
- Set a marker by establishing a relaxing bedtime routine that helps transition from daytime activities to a restorative night.
- Avoid bright lights and loud sounds, maintain a cool, but comfortable temperature and limit light-emitting electronics (phones, iPads, TVs) in the room.
- Exercise is excellent for promoting sleep hygiene, but not too soon before going to bed.
- Complete the sleep cycle by embracing the daylight. Try to get as much natural light as possible within 30 minutes of waking up.



Cycle 2 - Sleep Cycle

As you sleep, your brain is busy, processing the day's activities and storing them in memory as well as repairing cell damage.

The cycle shows four phases. People typically go through 4 to 6 cycles per night.

The first REM cycle is short, getting longer each time.

N1 Nodding off.

N2 Brain activity takes 2 forms: Sleep spindles (essential for memory & learning) and K-Complexes (memory consolidation & neural maintenance).

N3 Brain activity is now mostly occupied with restoring the physical body (repairing tissue, bone & muscle, removing toxins & strengthening the immune system) as well as memory processing.

REM The brain is believed to 'strip' emotions from memory, enabling recall without intense feelings each time an event is remembered. As well as this emotional processing, REM is linked to learning and maintaining skills.

Implications

A good night's sleep is essential for body & mind. The most important phase for mental health is REM sleep. Because REM sleep increases through the night, a shorter night's sleep is likely to have a greater impact on your mental health.

- Set a bedtime that allows for at least 7 hours of sleep (but don't force it).
- If you're having trouble falling asleep, don't lie in bed awake; get up and do something relaxing.
- Avoid caffeine and nicotine late in the day and limit alcoholic drinks before bed.
- Process your experiences and emotions through the day. Share with friends & family, or try journaling or self-reflection exercises. Yoga and meditation will also relax your body. Processing events and emotions while awake will leave your brain free to 'tidy up' during the night.

Conclusion:

You can't will yourself to sleep; it is an autonomic response to your environment. So focus on making your environment one that helps you to feel relaxed, safe and calm. If you do this, your brain will do what your brain does and regulate both mind and body for optimal living. Ensure that you have processed the day's stresses through chatting, writing or mindfulness.

Mountains & Valleys
Christian Counselling

Nutrition (Garbage in, Garbage out):

Although our brains make up about 2% of our body weight, they consume a massive 20% of our energy intake! So what we eat is very important to keep our brains healthy and happy. The percentages show what the brain is made of (75% water)! These percentages vary slightly from person to person.

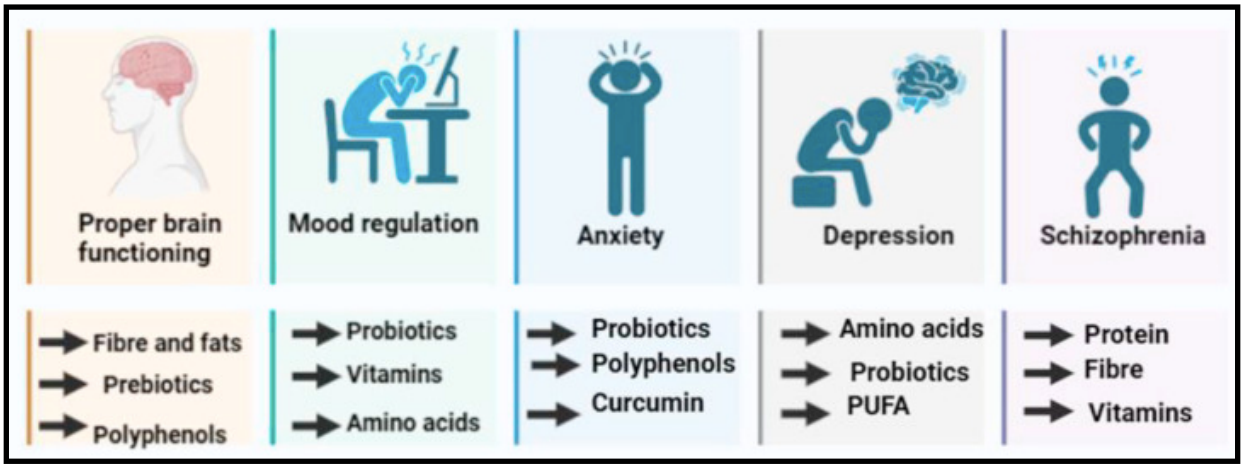
Water (75%): Critical for neurotransmitters to work efficiently.

Fat (10%): Protects & insulates.

Protein (8%): Makes up the brain structure and facilitates chemical processes.

Carb (2%): The body mostly uses our carb intake to produce glucose energy to fuel our brains.

Role of Nutrients in Brain Health



Source: (Aswani et al, 2025)

All food is absorbed in the gut and passed on to the muscles, brain, organs, and tissues.

- **Blood Sugar Level (Glucose):** When glucose levels are low, the brain releases adrenaline, prompting the pancreas to produce more. Adrenaline (stress hormone) causes increased feelings of anxiety.
- **Dehydration:** When lacking water, the brain is low on oxygen, resulting in headaches, fatigue, lethargy & poor concentration.
- **Protein:** The brain uses proteins, broken down into amino acids, to produce serotonin, dopamine and GABA, regulating mood, reward and inhibition.
- **Vitamins:** Vitamins maintain brain/nerve function. Vitamin A improves concentration and reduces feelings of anxiety. B-complex vitamins are essential in the production of dopamine and serotonin neurotransmitters.
- **Gut-Brain Axis (Probiotics, Polyphenols, Curcumin & Fibre)**, the gut also makes neurotransmitters, including mood-regulating serotonin, dopamine, noradrenaline and GABA, affecting stress and relaxation.
- **Polyunsaturated Fatty Acids (PUFA),** are believed to have brain development and maintenance properties. Some mood disorders (including Major Depressive Disorder and Bipolar Disorder) are associated with deficits in PUFAs.

Implications:

While sleep is all about creating the right external environment for the body to take over, nutrition is all about creating the right internal environment for the body to maintain balance (homeostasis). A balanced diet is imperative to achieving balance in your body.

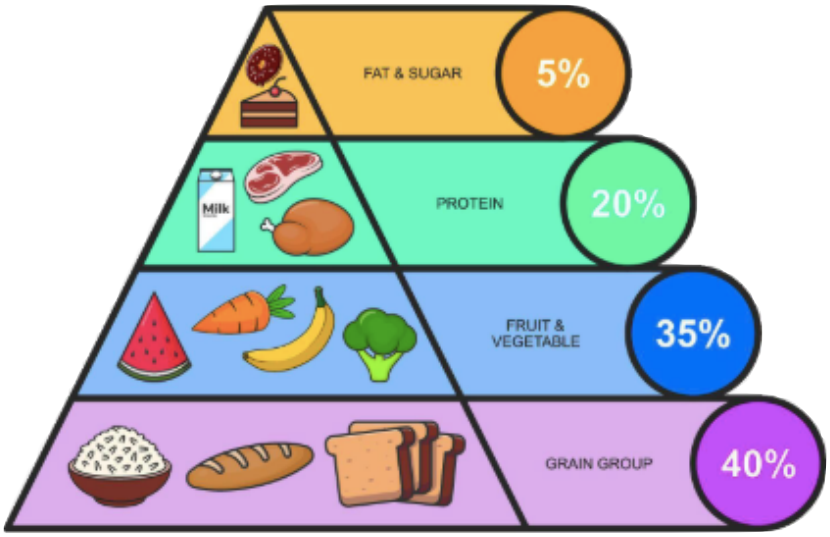
Water: Feeling thirsty is the first sign of dehydration. Dark urine with a strong odour is also a good indicator of dehydration. Avoid it by drinking 6 to 8 glasses a day.

Fats: Avoid saturated fats (e.g. butter, fatty meats & milk chocolate. Choose instead, healthy fats like avocados, nuts, seeds, fish and dark chocolate).

Protein: Good sources of protein include lean meat, fish, eggs, quinoa and tofu.

Carbs: Avoid highly processed foods, opt instead for **fibre-rich** foods like brown rice, oats, sweet potatoes, berries, apples and bananas.

Fruit/Veg: Fresh, frozen or tinned fruit and vegetables should make up the greatest part of your diet. Not only are they naturally rich in **fibre** (good for mood regulation), they're also crammed full of **vitamins** known to alleviate depression.



Conclusion

Eating a diet that is consistently high in bad calories (high in fat, sugar and salt, with little nutritional value) can lead to nutrient deficiencies even if the overall calorie intake is high. Such diets put incredible stress on the functioning of our bodies and impair mental health by affecting our mood.

Eating a balanced diet feeds not only our bodies but also our brain, and along with it our emotions.

Exercise:

Research suggests that physical activity is as powerful in treating anxiety and mood disorders as antidepressants. Similarly, physical exercise has been shown to boost the brain's feel-good hormone (dopamine, norepinephrine and serotonin) levels, all of which help to reduce symptoms of ADHD through improved concentration, motivation, memory and mood. Exercise is known to increase levels of deep sleep (N3) so that your body (muscles) has longer to repair, resulting in a better quality of sleep.

While exercise will improve mood in mild to moderate depression, for major depressive disorder (MDD), and help with symptoms of ADHD, medication will most likely still be necessary. Always speak with your doctor before changing or stopping medications.

Endorphins

Endorphins are known as the '*natural high*' or '*natural pain-killer*'. The brain produces endorphins in response to stress, pain and injury (e.g. overdoing at the gym). They react like an opioid in the system, which reduces stress, anxiety and improves mood. Endorphins are the body's way to reduce unpleasant experiences and reinforce positive behaviour.

How to increase endorphin production:

Exercise, particularly if it is aerobic.

Sex, endorphins are thought to release other hormones that are involved in feelings of love.

Music, singing and dancing all release endorphins.

Laughter, a hearty laugh, does wonders for both body and mind, releasing endorphins as well as serotonin and dopamine.

Daylight. Spending time outdoors in sunshine stimulates the release of endorphins in the skin.

Eating dark chocolate (70% or more cocoa).

Dopamine, Serotonin and Norepinephrine:

Exercise has a dramatic impact on neurotransmitters that produce dopamine, serotonin and norepinephrine (DSN). Whilst endorphins provide a quick hit, DSN chemicals are released over an extended period. How these chemicals interact with the body and with one another is a complex dance, but they will affect pleasure, motivation, and focus.

Implications

Learning how to balance the natural release of endorphins and dopamine can lead to a healthy lifestyle. Eating a chocolate bar will give you a quick hit of feel-good hormones, but going out side for a brisk walk will leave you feeling better for longer.

The Last Word:

Sleep, Nutrition and Exercise can all profoundly impact our moods. Making small changes in our life-style can help lift our mood. Start with a small change in one area and see how it impacts the other areas without even trying. Over time you can introduce new daily habits, one small step at a time.

Sleep References:

Bryan, L (2025) The Sleep Foundation. 'Circadian Rhythm'. Available at: https://www.sleepfoundation.org/circadian-rhythm.

Eugene, A. R., Masiak, J. (2015) MEDtube Sci. '*The Neuroprotective Aspects of Sleep*'. Available at: https://pmc.ncbi.nlm.nih.gov/articles/PMC4651462/.

Pacheco, D. (2025). Sleep Doctor. 'What is NREM Sleep? Available at: https://www.sleepfoundation.org/stages-of-sleep/nrem-sleep

Walker, M.P., Van der Helm, E. (2009). Psychol Bull. *'Overnight Therapy? The Role of Sleep in Emotional Brain Processing'.* Available at: https://pmc.ncbi.nlm.nih.gov/articles/PMC2890316/.

Smith, Y. (2023). News Medical Life Sciences. 'Neuroscience of Sleep'. Available at: https://www.news-medical.net/health/Neuroscience-of-Sleep.aspx.

Zakarin, E.B. (2022). Columbia University Department of Psychiatry. *'How sleep deprivation affects mental health'*. Available at: https://www.columbiapsychiatry.org/news/how-sleep-deprivation-affects-your-mental-health.

Nutrition References:

Aswani, A., Gaur, S.S., Singh, J., Shams, R., Dash, K.K., Mukarram, A.S., Kovács, B. (2025). *'Dietary Influences on the Gut-Brain Pathways'.* Available online: https://www.sciencedirect.com/science/article/pii/S2666149725000532

Delaney, E (2025) BBC Good Food. '*10 Ways the Food you Eat Affects Your Brain*'. Available online: https://www.bbcgoodfood.com/health/how-food-you-eat-affects-your-brain

Mind (2023) '*Food and Mental Health*'. Available online: https://www.mind.org.uk/information-support/tips-for-everyday-living/food-and-mental-health/#HowCanFoodAndDrinkAffectHowIFeel

Dansinger, M. (2025) WebMD '*The Link Between Low Blood Sugar and Anxiety.*' Available online: https://www.webmd.com/diabetes/low-blood-sugar-anxiety-link

Bonda, C. (2024) Lone Star Neurology. The Effect of Dehydration on Brain Function.' Available online: https://lonestarneurology.net/others/the-effect-of-dehydration-on-brain-function/

Solar (N.D) '*The Role of Serotonin, Dopamine, and GABA in Mental Health*.' Available online: https://solal.co.za/the-role-of-serotonin-dopamine-and-gaba-in-mental-health/#:~:text=In%20today's%20fast%20paced%20world,nervous%20system%20and%20reduce%20stress.

Shengwen Lu, Qiqi Zhao, Yu Guan, Zhiwen Sun, Wenhao Li, Sifan Guo, Aihua Zhang (2024). '*The communication mechanism of the gut-brain axis and its effect on central nervous system diseases: A systematic review.'* Biomedicine & Pharmacotherapy. Available online: https://www.sciencedirect.com/science/article/pii/S0753332224010916#:~:text=Gut%20microbiota%20affects%20the%20early,significantly%20affected%20by%20the%20microbiota.

Grabska-Kobyłecka I, Szpakowski P, Król A, Książek-Winiarek D, Kobyłecki A, Głąbiński A, Nowak D. (2023). *'Polyphenols and Their Impact on the Prevention of Neurodegenerative Diseases and Development'.* Nutrients. Available online at: https://pmc.ncbi.nlm.nih.gov/articles/PMC10420887/#:~:text=As%20reversible%20MAO%20(monoamine%20oxidase,amounts%20in%20the%20brain%20tissue.

Exercise References:

Press Office (2023) NeuroscienceNews.com 'Exercise and the Brain: The Neuroscience of Fitness Explored'. Available online at: https://neurosciencenews.com/fitness-neuroscience-23228/#:~:text=Summary:%20The%20neuroscience%20of%20fitness,such%20as%20attention%20and%20memory

Harvard Health Publishing (2021) The No-drug Approach to Mild Depression. Available online at: https://www.health.harvard.edu/mind-and-mood/the-no-drug-approach-to-mild-depression.

Harvard Health Publishing (N.D.) Endorphins: The Brain's Natural Pain Reliever. Available online at: https://www.health.harvard.edu/mind-and-mood/endorphins-the-brains-natural-pain-reliever

Johnson, J. (2021) Medical News Today. 'What to Know about Exercise and ADHD'. Available online at: https://www.medicalnewstoday.com/articles/adhd-cardio#how-it-helps